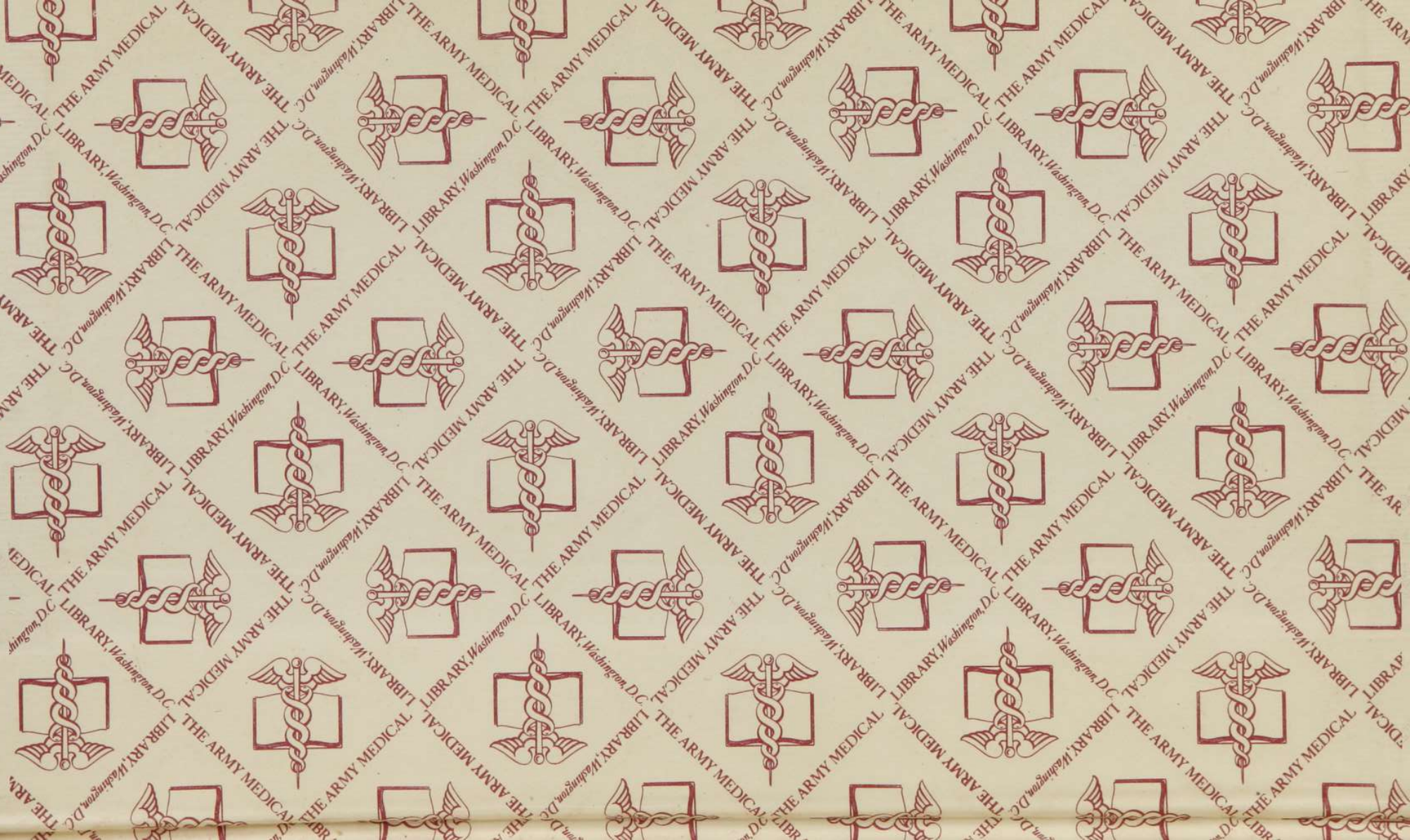
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THE

DISPENSATORY

OF THE

UNITED STATES OF AMERICA.

BY

GEORGE B. WOOD, M. D.,

PROFESSOR OF THE THEORY AND PRACTICE OF MEDICINE IN THE UNIVERSITY OF PENNSYLVANIA,
PRESIDENT OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA,
ONE OF THE PHYSICIANS OF THE PENNSYLVANIA HOSPITAL, ETC. ETC.

AND

FRANKLIN BACHE, M. D.,

PROFESSOR OF CHEMISTRY IN JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA,
PRESIDENT OF THE AMERICAN PHILOSOPHICAL SOCIETY, ETC. ETC.

TENTH EDITION,

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PREFACE

TO

THE FIRST EDITION.

The objects of a Dispensatory are to present an account of medicinal substances in the state in which they are brought into the shops, and to teach the modes in which they are prepared for use. The importance of these objects, and the general value and even necessity of a work of this nature, will not be disputed. It may, however, be a question, how far the wants of the medical and pharmaceutical community in this country are supplied by the Dispensatories already in circulation; and whether such a deficiency exists as to justify the offer of a new one to the public attention. The great merits of the works severally entitled "The Edinburgh New Dispensatory," and "The London Dispensatory," the former edited by the late Andrew Duncan, M. D., the latter by Anthony Todd Thomson, M. D., are well known wherever the English language is spoken. Founded, as they both are, upon the excellent basis laid by Lewis, they are nevertheless entitled, from the great addition of valuable materials, and the distinctive character exhibited in the arrangement of these materials, to be considered as original works; while the style in which they have been executed speaks strongly in favour of the skill and industry of their authors. But they were calculated especially for the sphere of Great Britain, and are too deficient in all that relates exclusively to this country, to admit of being received as standards here. In the history of our commerce in drugs, and of the nature, growth, and collection of our indigenous medical plants; in the chemical operations of our extensive laboratories; and in the modes of preparing, dispensing, and applying medicines, which have gradually grown into use among us; there is much that is peculiar, a knowledge of which is not to be gained from foreign books, and is yet necessary to the character of an accomplished American pharmaceutist. We have, moreover, a National Pharmacopœia, which requires an explanatory commentary, in order that its precepts may be fully appreciated,

and advantageously put into practice. On these accounts it is desirable that there should be a Dispensatory of the United States, which, while it embraces whatever is useful in European pharmacy, may accurately represent the art as it exists in this country, and give instruction adapted to our peculiar wants. It appears due to our national character, that such a work should be in good faith an American work, newly prepared in all its parts, and not a mere edition of one of the European Dispensatories, with here and there additions and alterations, which, though they may be useful in themselves, cannot be made to harmonize with the other materials so as to give to the whole an appearance of unity, and certainly would not justify the assumption of a new and national title for the book. Whether, in the Dispensatories which have been published in the United States, these requisites have been satisfactorily fulfilled, it rests with the public to determine. That valuable treatises on Materia Medica and Pharmacy have been issued in this country, no candid person, acquainted with our medical literature, will be disposed to deny. In offering a new work to the medical and pharmaceutical professions, the authors do not wish to be considered as undervaluing the labours of their predecessors. They simply conceive that the field has not been so fully occupied as to exclude all competition. The pharmacy of continental Europe is ground which has been almost untouched; and much information in relation to the natural history, commerce, and management of our own drugs, has lain ungathered in the possession of individuals, or scattered in separate treatises and periodicals not generally known and read. Since the publication of the last edition of our National Pharmacopœia, no general explanation of its processes has appeared, though required in justice both to that work and to the public. The hope of being able to supply these deficiencies may, perhaps, be considered a sufficient justification for the present undertaking.

The Pharmacopœia of the United States has been adopted as the basis of this Dispensatory. It is followed both in its general division of medicines, and in its alphabetical arrangement of them under each division. Precedence is, in every instance, given to the names which it recognises, while the explanations by which it fixes the signification of these names, are inserted in immediate connexion with the titles to which they severally belong. Every article which it designates is more or less fully described; and all its processes, after being literally copied, are commented on and explained whenever comment and explanation appeared necessary. Nothing, in fine, has been omitted, which, in the estimation of the authors, could serve to illustrate its meaning, or

promote the ends which it was intended to subserve. This course of proceeding appeared to be due to the national character of the Pharmacopœia, and to the important object of establishing, as far as possible, throughout the United States, uniformity both in the nomenclature and preparation of medicines. In one particular, convenience required that the plan of the Pharmacopœia should be departed from. The medicines belonging to the department of MATERIA MEDICA, instead of being arranged in two divisions, corresponding with the *Primary* and *Secondary Catalogues* of that work, have been treated of indiscriminately in alphabetical succession; and the place which they respectively hold in the Pharmacopœia is indicated by the employment of the term *Secondary*, in connexion with the name of each of the medicines included in the latter catalogue.

But, though precedence has thus been given to the Pharmacopœia of the United States, those of Great Britain have not been neglected. The nomenclature adopted by the different British Colleges, and their formulæ for the preparation of medicines, have been so extensively followed throughout the United States, that a work intended to represent the present state of pharmacy in this country would be imperfect without them; and the fact that the writings of British physicians and surgeons, in which their own officinal terms and preparations are exclusively employed and referred to, have an extensive circulation among us, renders some commentary necessary in order to prevent serious mistakes. The Pharmacopœias of London, Edinburgh, and Dublin have, therefore, been incorporated, in all their essential parts, into the present work. Their officinal titles are uniformly given, always in subordination to those of the United States Pharmacopœia, when they express the same object; but in chief, when, as often happens, no corresponding medicine or preparation is recognised by our national standard. In the latter case, if different names are applied by different British Colleges to the same object, that one is generally preferred which is most in accordance with our own system of nomenclature, and the others are given as synonymes. The medicines directed by the British Colleges are all described, and their processes either copied at length, or so far explained as to be intelligible in all essential particulars.

Besides the medicinal substances recognised as officinal by the Pharmacopœias alluded to, some others have been described, which, either from the lingering remains of former reputation, from recent reports in their favour, or from their important relation to medicines in general use, appear to have claims upon the attention of the physician and

apothecary. Opportunity has, moreover, been taken to introduce incidentally brief accounts of substances used in other countries or in former times, and occasionally noticed in medical books; and, that the reader may be able to refer to them when desirous of information, their names have been placed with those of the standard remedies in the Index.

In the description of each medicine, if derived immediately from the animal, vegetable, or mineral kingdom, the attention of the authors has been directed to its natural history, the place of its growth or production, the method of collecting and preparing it for market, its commercial history, the state in which it reaches us, its sensible properties, its chemical composition and relations, the changes which it undergoes by time and exposure, its accidental or fraudulent adulterations, its medical properties and application, its economical uses, and the pharmaceutical treatment to which it is subjected. If a chemical preparation, the mode and principles of its manufacture are indicated in addition to the other particulars. If a poison, and likely to be accidentally taken, or purposely employed as such, its peculiar toxicological effects, together with the mode of counteracting them, are indicated; and the best means of detecting its presence by reagents are explained.

The authors have followed the example of Dr. A. T. Thomson, in giving botanical descriptions of the plants from which the medicines treated of are derived. In relation to all indigenous medicinal plants, and those naturalized or cultivated in this country, the advantages of such descriptions are obvious. The physician may often be placed in situations, in which it may be highly important that he should be able to recognise the vegetable which yields a particular medicine; and the apothecary is constantly liable to imposition from the collectors of herbs, unless possessed of the means of distinguishing, by infallible marks, the various products presented to him. A knowledge of foreign medicinal plants, though of less importance, will be found useful in various ways, independently of the gratification afforded by the indulgence of a liberal curiosity in relation to objects so closely connected with our daily pursuits. The introduction of these botanical notices into a Dispensatory appears to be peculiarly appropriate; as they are to be considered rather as objects for occasional reference than for regular study or continuous perusal, and therefore coincide with the general design of the work, which is to collect into a convenient form for consultation all that is practically important in relation to medicines. The authors have endeavoured to preserve a due proportion between the minuteness of the descriptions, and their value as means of information

to the student; and, in pursuance of this plan, have generally dwelt more at length upon our native plants, than upon those of foreign growth: but, in all instances in which they have deemed any botanical description necessary, they have taken care to include in it the essential scientific character of the genus and species, with a reference to the position of the plant in the artificial and natural systems of classification; so that a person acquainted with the elements of botany may be able to recognise it when it comes under his observation.

In preparing the Dispensatory, the authors have consulted, in addition to many of the older works of authority, the greater number of the treatises and dissertations which have recently appeared upon the various subjects connected with Pharmacy, and especially those of the French writers, who stand at present at the head of this department of medical science. They have also endeavoured to collect such detached facts, scattered through the various scientific, medical, and pharmaceutical journals, as they conceived to be important in themselves, and applicable to the subjects under consideration; and have had frequent recourse to the reports of travellers in relation to the natural and commercial history of foreign drugs. The occasional references in the body of the work will indicate the sources from which they have most largely drawn, and the authorities upon which they have most relied. In relation to our own commerce in drugs, and to the operations of our chemical laboratories, they are indebted for information chiefly to the kindness of gentlemen engaged in these branches of business, who have always evinced, in answering their numerous inquiries, a promptitude and politeness which merit their warm thanks, and which they are pleased to have this opportunity of acknowledging.*

It has not been deemed necessary to follow the example of the British Dispensatories, by inserting into the work a treatise upon Chemistry, under the name of Elements of Pharmacy. Such a treatise must necessarily be very meagre and imperfect; and, as systems of chemistry are in the hands of every physician and apothecary, would uselessly occupy the place of valuable matter of less easy access.

The authors may, perhaps, be permitted to observe, in relation to themselves, that they have expended much time and labour in the pre-

* The authors deem it proper to state that they are peculiarly indebted for assistance to Mr. Daniel B. Smith, president of the Philadelphia College of Pharmacy, to whom, besides much important information in relation to the various branches of the apothecary's business, they owe the prefatory remarks on Pharmacy which are placed at the commencement of the second part of the work, and the several articles, in the Materia Medica, upon *Leeches*, *Carbonate of Magnesia*, and *Sulphate of Magnesia*.

paration of the work; have sought diligently for facts from every readily accessible source; have endeavoured, by a comparison of authorities, and a close scrutiny of evidence, to ascertain the truth whenever practicable; and have exerted themselves to the extent of their abilities to render the Dispensatory worthy of public approbation, both for the quality and quantity of its contents, and the general accuracy of its statements. They are conscious, nevertheless, that, in so great a multiplicity of details, numerous errors and deficiencies may exist, and that the faults of undue brevity in some cases, and prolixity in others, may not have been entirely avoided; but they venture to hope that a candid public will make all due allowances; and they take the liberty to invite from all those who may feel interested in the diffusion of sound pharmaceutical knowledge, the communication of friendly suggestions or criticisms in relation to the objects and execution of the work.

Philadelphia, January, 1833.

PREFACE TO THE TENTH EDITION.

In the foregoing preface to the first edition of this work, sufficient has been said of its objects, the plan upon which it was written, and the sources whence the materials composing it were originally derived. A modification of its arrangement was made in the second edition, by the introduction of an Appendix, containing an account of drugs not recognised by the American or British Pharmacopœias, yet possessing some interest from their former or existing relations to Medicine and Pharmacy. This Appendix has been so much enlarged by the numerous additions subsequently made to it, that it might well be considered as a third part of the Dispensatory; so that the work may be said to consist of three divisions, the first treating exclusively of the medicines included in the Materia Medica catalogues of the Pharmacopœias, the second of the Preparations, and the last of substances not strictly officinal. A precision has thus been given to its arrangement which was at first wanting. In the several editions which have followed, it has been the aim of the authors to keep pace with the progress of Materia Medica and Pharmacy, making changes corresponding with those of the officinal codes acknowledged by them as authoritative, and introducing more or less in detail all the new facts, views, and processes, as they came to public notice. In the last edition, that, namely, of 1851, it was necessary to make a thorough revision of the whole work, and in a considerable degree to rearrange the materials, in consequence of the then recent appearance of new and greatly altered editions of our national Pharmacopœia, and of those of the London and Dublin Colleges. We refer to these changes now, in order to call attention to the new division of weights adopted by the Dublin College, which, though the same in terms as those in general use, differ from them materially in value, and, therefore, required much caution, on the

part of the authors, to guard against serious mistakes. It will be seen, by consulting the formulas of the several Pharmacopœias, that care has been taken, in all cases in which the result would be affected by a misunderstanding of the denominations of weight employed, to refer within brackets to their proper signification. Thus, the pound and ounce of the Dublin processes are designated as belonging to the *avoirdupois* weight, and the subdivisions of drachms and scruples to the *Dublin weights*, the value of which is indicated by a table in the Appendix. The measures now employed by all the British Colleges are the Imperial gallon and its subdivisions, differing more or less in value from the similar denominations of the wine measure used in the U. S. Pharmacopœia; and it has been necessary, on this point also, to guard against error by a particular reference to the fact, in every formula in which entire accuracy is essential.

In regard to the present edition, the authors have only to say that they have exercised no less vigilance than on former occasions, to let nothing escape them which could add to the value of the work, and make it, what it aims to be, a representative of the existing state of Pharmacy, and a safe guide for the student and practitioner. Within the three years which have elapsed since the publication of the last edition, the improvements in Materia Medica and Pharmacy have kept pace with the general progress in other departments of science and art; and it has been necessary to make many additions and modifications in the Dispensatory in accordance with these improvements. The great difficulty of the authors has been to prevent the work from swelling beyond the limits of a single volume, and thus becoming inconvenient for reference. By discarding, however, whatever seemed to them to have become useless through the advance of knowledge or change of opinion, by aiming at the greatest conciseness of expression consistent with clearness in regard both to the old and the new matter, and by care to avoid any waste of space in the method of arranging the materials for the press, they trust that they have succeeded in accomplishing this object without impairing the usefulness of the work; but they have, nevertheless, found it necessary somewhat to increase the number of pages, as well as slightly to enlarge the dimensions of the page, by

which means considerable space has been gained. With these few preliminary explanations, they offer the Dispensatory for the tenth time to the public, hoping that it may meet with that approval from the medical and pharmaceutical professions, of which it has always been their aim to render it deserving.

Philadelphia, July, 1854.

ABBREVIATIONS EMPLOYED IN THE WORK.

U. S.—"The Pharmacopœia of the United States of America. By authority of the National Medical Convention, held at Washington, A. D. 1850."

Lond.—London Pharmacopœia, A. D. 1851.

Ed.—Edinburgh Pharmacopœia, A. D. 1841.

Dub.—Dublin Pharmacopœia, A. D. 1850.

Off. Syn.—Officinal Synonymes, or the titles employed by the Pharmacopœias with the accompanying explanations, when these titles are not given in chief.

Sex. Syst.—The Sexual System, or the artificial system of Linnæus, founded on the sexual organization of plants.

Nat. Ord.—The Natural Order to which any particular genus of plants belongs. When not otherwise stated, it is to be understood that the natural orders referred to are those recognised by Professor Lindley, of the University of London, in his "Introduction to the Natural System of Botany."

Gen. Ch.—The Generic Character, or scientific description of any particular genus of plants under consideration.

Off. Prep.—Officinal Preparations; including all the preparations into which any particular medicine directed by the U. S. Pharmacopœia or the British Colleges enters. When the same preparation has received different names in the different Pharmacopœias, only one of these names is mentioned, and precedence is always given to that of the U. S. Pharmacopœia.

Sp. Gr.—Specific Gravity.

Equiv., or *Eq.*—Chemical Equivalent, or the number representing the smallest quantity in which one body usually combines with others.

Linn., Linnæus.—*Juss.*, Jussieu.—*De Cand.*, De Candolle.—*Willd. Sp. Plant.*, Willdenow's edition of the species plantarum of Linnæus.—*Woodv. Med. Bot.*, Woodville's Medical Botany, 2d edition.—*B.*, Baumés Hydrometer.

Fr., French.—*Germ.*, German.—*Ital.*, Italian.—*Span.*, Spanish.—*Arab.*, Arabic.

THE

DISPENSATORY

OF

THE UNITED STATES.

PART I.

MATERIA MEDICA.

The Materia Medica, in its most comprehensive sense, embraces all those substances which are capable of making sanative impressions on the human system; but, as the term is employed in this work, it has a more restricted signification. The Pharmacopœias of the United States and Great Britain very appropriately arrange medicines in two distinct divisions, one including all those which are furnished immediately by nature, or thrown into commerce by the manufacturer; the other, those which are prepared by the apothecary, and are the objects of officinal directions. The former are enumerated under the title of "Materia Medica;" the latter, under that of "Preparations," or "Preparations and Compositions." In Dispensatories, which may be considered as commentaries on the Pharmacopœias, the same arrangement is usually followed; and the authors of the present work adopt it the more willingly, as, independently of the weight of authority in its favour, it has the recommendation of being the most convenient. By this plan, all the directions which relate to the practical operations of the apothecary are collected in one place, and are thus more easily referred to than if mixed indiscriminately with other matters, as they must be by any mode of arrangement which makes no distinction between the original medicinal substances and their preparations. Under the head of Materia Medica, therefore, in this Dispensatory, we treat of medicines in the state only in which they are produced by nature, or come into the hands of the apothecary. Of these medicines, such as are recognised by our National Pharmacopœia are most minutely described; but we consider also all that are included in the officinal catalogues of the British Colleges.

Another point in which we accord with the Pharmacopœias is the alphabetical arrangement of the objects of the Materia Medica. As a Dispensatory is intended rather for reference than for regular perusal, it is important that its contents should be so disposed as to facilitate consultation. Medicines, in a work of this kind, are considered as independent objects, to be studied

separately, and without any reference to community of source, or similarity of character. Their scientific classification belongs to works which treat of them rather in their relations than their essential properties; and different systems have been adopted, according to the set of relations towards which the mind of the author has been especially directed. Thus, the naturalist classifies them according to the affinities of the several objects in nature from which they are derived; the chemist, according to their composition; the practitioner of medicine, according to their effects upon the system in a state of health and disease. But none of these classifications is without imperfections; and a simple alphabetical arrangement is decidedly preferable, in every case in which the medicines are considered solely in their individual capacity. Yet, as it comes within the scope of this work to treat of their physiological and therapeutical effects, and as the terms by which these effects are expressed are also the titles of classes to which the medicines belong, it will not be amiss to present the reader with the outlines of a system of classification, by consulting which he will be enabled to ascertain the precise meaning we attach to the terms employed to designate the peculiar action of different medicinal substances.

Remedies are divided into general and local, the former acting on the whole system, the latter on particular parts or organs.

I. GENERAL REMEDIES include 1. ARTERIAL STIMULANTS, sometimes called INCITANTS, which, while they raise the actions of the system above the standard of health, exhibit their influence chiefly upon the heart and arteries; 2. NARCOTICS, which especially affect the cerebral functions, and are either *stimulant* or *sedative* according as they increase or diminish action; 3. ANTISPASMODICS, which, with a general stimulant power, exert a peculiar influence over the nervous system, exhibited in the relaxation of spasm, the calming of nervous irritation, &c., without any special and decided tendency to the brain; 4. TONICS, which moderately and permanently exalt the energies of all parts of the frame, without necessarily producing any apparent increase of the healthy actions; and 5. ASTRINGENTS, which have the property of producing contraction in the living tissues with which they may come in contact.

II. LOCAL REMEDIES may be divided into four sections: *a. Those affecting the function of a part,* namely, 1. EMETICS, which act on the stomach, producing vomiting; 2. CATHARTICS, which act on the bowels, producing a purgative effect; 3. DIURETICS, which act on the kidneys, producing an increased flow of urine; 4. ANTILITHICS, which act on the same organs, preventing the formation of calculous matter; 5. DIAPHORETICS, which increase the cutaneous discharge; 6. EXPECTORANTS, which augment the secretion from the pulmonary mucous membrane, or promote the discharge of the secreted matter; 7. EMMENAGOGUES, which excite the menstrual secretion; 8. SIALAGOGUES, which increase the flow of saliva; and 9. ERRHINES, which increase the discharge from the mucous membrane of the nostrils: *b. Those affecting the organization of a part,* including 1. RUBEFACIENTS, which produce redness and inflammation of the skin; 2. EPISPASTICS or VESICATORIES, which produce a serous discharge beneath the cuticle, forming a blister; and 3. ESCHAROTICS or CAUSTICS, which destroy the life of the part upon which they act: *c. Those operating by a mechanical agency,* consisting of 1. DEMULCENTS, which lubricate the surface to which they are applied, and prevent the contact of irritating substances, or mingle with these and diminish their acrimony; and 2. EMOLLIENTS, which serve as vehicles for the application of warmth and moisture, at the same time excluding the air: *d. Those which act on extraneous matters contained within*

the organs, including 1. ANTHELMINTICS, which destroy worms, or expel them from the bowels; and 2. ANTACIDS, which neutralize acid, whether existing in the alimentary canal, or circulating with the blood.

It is believed that all substances employed as medicines, with the exception of a very few which are so peculiar in their action as scarcely to admit of classification, may be distributed without violence among the above classes. Some substances, however, in addition to the properties of the classes to which they are severally attached, possess others in common, which give them practical value, and authorize their association in distinct groups, not recognised in the system of classification, but constantly referred to in medical language. Thus, we have REFRIGERANTS, which, when internally administered, diminish animal temperature; ALTERATIVES, which change, in some inexplicable and insensible manner, certain morbid actions of the system; and CARMINATIVES, which, by promoting contraction in the muscular coat of the stomach and bowels, cause the expulsion of flatus. It is common, moreover, to attach distinct names to groups of remedies, with reference to certain effects which are incident to the properties that serve to arrange them in some more comprehensive class. Thus, NARCOTICS frequently promote sleep and relieve pain, and, in relation to these properties, are called SOPORIFICS and ANODYNES; and various medicines, which, by diversified modes of action, serve to remove chronic inflammation and enlargements of the glands, or viscera, are called DEOBSTRUENTS. These terms are occasionally employed in the following pages, and are here explained, in order that the sense in which we use them may be accurately understood. W.

ABSINTHIUM. *U. S., Lond., Ed.*

Wormwood.

The tops and leaves of Artemisia Absinthium. *U. S.* The herb in flower. *Lond.* The herb. *Ed.*

Absinthe, *Fr.*; Gemeiner Wermuth, *Germ.*; Assenzio, *Ital.*; Artemisio Axenjo, *Span.*

Artemisia. *Sex. Syst.* Syngenesia Superflua.—*Nat. Ord.* Compositæ Senecionideæ. *De Cand.* Asteraceæ. *Lindley.*

Gen. Ch. Receptacle sub-villous, or nearly naked. *Seed-down* none. *Calyx* imbricate, with roundish, converging scales. *Corollas of the ray* none. *Willd.*

Several species of Artemisia have enjoyed some reputation as medicines. The leaves of *A. Abrotanum*, or *southernwood*, have a fragrant odour, and a warm, bitter, nauseous taste; and were formerly employed as a tonic, deobstruent, and anthelmintic. Similar virtues have been ascribed to *A. Santonica*. *A. pontica* has been occasionally substituted for common wormwood, but is weaker. *A. vulgaris*, or *mugwort*, formerly enjoyed considerable reputation as an emmenagogue, and a few years since came into notice, in consequence of the recommendation of its root in epilepsy by Dr. Burdach of Germany. For this purpose, it should be collected in autumn or early in the spring, and the side roots only dried for use. These should be powdered as they are wanted, the ligneous portion being rejected. The dose is about a drachm, to be administered in some warm vehicle in anticipation of the paroxysm, and to be repeated once or twice, at intervals of half an hour, till perspiration is produced, the patient being confined to bed. In the intervals, it may be given every second day. This is merely the revival of an old practice in Germany. Dr. Neumeister, of Arneburg, has recently used mugwort, in connexion with assafetida, successfully in chorea. He adds a pound of the tops to a gallon of water, digests for three days, then strains, adds three ounces of assafetida, and gives a teacupful for a dose. The proportion of assafetida might be reduced to one-third, if well mixed. (See *Ed. Month. Journ. of Med. Sci.* xiii. 482.) *A. vulgaris* of this country is thought by Nuttall to be a distinct species, and may not possess similar properties. In China, *moxa* is said to be prepared from the leaves of *Artemisia Chinensis*, and *A. Indica*. The medicine known in Europe by the name of wormseed, is probably the product of different species of Artemisia. (See *Wormseed* in the Appendix.) The only species which requires particular description here is *A. Absinthium*.

Artemisia Absinthium. Willd. *Sp. Plant.* iii. 1844; Woodv. *Med. Bot.* p. 54, t. 22. Wormwood is a perennial plant, with branching, round, and striated or furrowed stems, which rise two or three feet in height, and are panicled at their summit. The lower portion of the stem lives several years, and annually sends up herbaceous shoots, which perish in the winter. The radical leaves are triply pinnatifid, with lanceolate, obtuse, dentate divisions; those of the stem, doubly or simply pinnatifid, with lanceolate, somewhat acute divisions; the floral leaves are lanceolate; all are hoary. The flowers are of a brownish-yellow colour, hemispherical, pedicelled, nodding, and in erect racemes. The florets of the disk are numerous, those of the ray few.

This plant is a native of Europe, where it is also cultivated for medical use. It is among our garden herbs, and has been naturalized in the mountainous districts of New England. The leaves and flowering summits are the parts employed, the larger parts of the stalk being rejected. They should be

gathered in July or August, when the plant is in flower. They preserve their peculiar sensible properties long when dried.

Wormwood has a strong odour, and an intensely bitter, nauseous taste, which it imparts to water and alcohol. It yields by distillation a volatile oil (*oleum absinthii*), usually of a dark-green colour, sometimes yellow or brownish, having a strong odour of the plant, an acrid peculiar taste, and the sp. gr. 0.972. It is sometimes adulterated with alcohol, oil of turpentine, &c., which lessen its specific gravity. The other constituents, according to Braconnot, are a very bitter, and an almost insipid azotized matter, an excessively bitter resinous substance, chlorophylle, albumen, starch, saline matters, and lignin. The cold infusion becomes olive-green and turbid on the addition of sesquichloride of iron, indicating the probable existence of a small proportion of tannic acid. (*Pereira.*) Among the saline substances, Braconnot found one consisting of potassa, and an acid which he supposed to be peculiar, and denominated *absinthic acid*, but which is said to be identical with the succinic. This acid may be recognised among the products of the dry distillation of wormwood. (*Annal. der Chem. und Pharm.*, xlviii. 122.) The substance formerly called *salt of wormwood* (*sal absinthii*) is impure carbonate of potassa, obtained by lixiviating the ashes of the plant. By precipitating an infusion of wormwood with acetate of lead, separating the excess of lead by sulphuretted hydrogen, evaporating the liquor to dryness, digesting the residue in a mixture of alcohol and ether, and submitting the resulting tincture to slow evaporation, Caventou obtained a very bitter, imperfectly crystalline substance, which he considered as the active principle, and for which the name of *absinthin* has been proposed. Dr. E. Luck has obtained pure absinthin by a process which may be seen in the *Am. Journ. of Pharm.*, (xxiii. 358.)

Medical Properties and Uses. Wormwood was known to the ancients. It is highly tonic; and its active principles probably enter the circulation, as it is said to render the flesh and milk of animals fed with it bitter. It formerly enjoyed great reputation in numerous complaints, attended with a debilitated condition of the digestive organs, or of the system generally. Before the introduction of Peruvian bark, it was much used in the treatment of intermittents. It has also been supposed to possess anthelmintic virtues. At present, however, it is little used in regular practice on this side of the Atlantic. A narcotic property has been ascribed to it by some writers, in consequence of its tendency to occasion headache, and, when long continued, to produce disorder of the nervous system. This property is supposed to depend on the volatile oil, and, therefore, to be less obvious in the decoction than in the powder or infusion. In large doses, wormwood irritates the stomach, and excites the circulation. The herb is sometimes applied externally, by way of fomentation, as an antiseptic and discutient. The dose in substance is from one to two scruples; of the infusion, made by macerating an ounce in a pint of boiling water, from one to two fluidounces. W.

ACACIA. *U. S., Lond., Dub.*

Gum Arabic.

The concrete juice of Acacia vera and other species of Acacia. *U. S., Lond.* The gum of Acacia vera. *Dub.*

Off. Syn. GUMMI ACACIÆ. Gum of various species of Acacia. *Ed.* Gomme Arabique, *Fr.*; Arabisches Gummi, *Germ.*; Gomma Arabica, *Ital.*; Goma Arabiga, *Span.*; Samagh Arabee, *Arab.*

ACACIA. *Sex. Syst.* Polygamia Monœcia.—*Nat. Ord.* Leguminosæ. *Trib.* Mimoseæ.

This genus is one of those into which the old genus Mimosa of Linnæus was divided by Willdenow. The name of *Acacia* was employed by the ancient Greeks to designate the gum-tree of Egypt, and has been appropriately applied to the new genus in which that plant is included.

Gen. Ch. HERMAPHRODITE. *Calyx* five-toothed. *Corolla* five-cleft, or formed of five petals. *Stamens* 4–100. *Pistil* one. *Legume* bivalve. MALE. *Calyx* five-toothed. *Corolla* five-cleft, or formed of five petals. *Stamens* 4–100. *Willd.*

Several species of Acacia contribute to furnish the gum Arabic of the shops. Among the most important are *A. vera* and *A. Arabica*, confounded together by Linnæus under the title of *Mimosa Nilotica*.

Acacia vera. Willd. *Sp. Plant.* iv. 1805; Hayne, *Darstel. und Beschreib. &c.* x. 34. This is a tree of middling size, with numerous scattered branches, of which the younger are much bent, and covered with a reddish-brown bark. The leaves are alternate and bipinnate, with two pairs of pinnæ, of which the lower are usually furnished with ten pairs of leaflets, the upper with eight. The leaflets are very small, oblong-linear, smooth, and supported upon very short footstalks. On the common petiole is a gland between each pair of pinnæ. Both the common and partial petiole are smooth. Two sharp spines, from a quarter to half an inch long, of the colour of the smaller branches, and joined together at their base, are found at the insertion of each leaf. The flowers are yellow, inodorous, small, and collected in globular heads supported upon slender peduncles, which rise from the axils of the leaves, in number from two to five together. The fruit is a smooth, flat, two-valved legume, divided by contractions, occurring at regular intervals, into several roundish portions, each containing a single seed. This species flourishes in Upper Egypt and Senegal, and is probably scattered over the whole intervening portions of the African continent.

A. Arabica. Willd. *Sp. Plant.* iv. 1805; Hayne, *Darstel. und Beschreib.* x. 32; Carson, *Illust. of Med. Bot.* i. 31.—*Acacia Nilotica*, Delille, *Illust. Flor. de l'Egypt.* p. 79. This species, though often little more than a shrub, attains in favourable situations the magnitude of a considerable tree, being sometimes forty feet high, with a trunk a foot or more in diameter. The leaves are alternate and doubly pinnate, having from four to six pairs of pinnæ, each of which is furnished with from ten to twenty pairs of minute, smooth, oblong-linear leaflets. The common petiole has a gland between the lowest pair of pinnæ, and often also between the uppermost pair. Both the common and partial petioles, as well as the young branches, are downy. The thorns are straight, and disposed as in the former species. The flowers are also arranged as in A. vera, and the fruit is of a similar shape. A. Arabica is perhaps the most widely diffused of the gum-bearing species. It grows in Upper and Lower Egypt, Senegal, and other parts of Africa, flourishes also in Arabia, and is abundant in Hindostan, where its gum is used for food by the natives.

Besides the two species above described, the following afford considerable quantities of gum:—*A. Karroo*, of the Cape of Good Hope, formerly considered by some as identical with A. vera; *A. Senegal*, a small tree, inhabiting the hottest regions of Africa, and said to form vast forests in Senegambia; *A. gummifera*, seen by Broussonet in Morocco near Mogador; *A. Ehrenbergiana*, a shrub six or eight feet high, named in honour of the German traveller Ehrenberg, who observed it in the deserts of Libya, Nubia, and Dongola; *A. Seyal*, growing in the same countries with the last-mentioned species, and also in Upper Egypt and Senegambia; *A. Adansonii* of the

Flore de Sénégambie, which is said to contribute a portion of the Senegal gum; and *A. tortilis*, which sometimes attains the height of sixty-feet, and inhabits Arabia Felix, Nubia, Dongola, and the Libyan desert. It is highly probable that gum is obtained also from other species not hitherto described, growing in the hot latitudes of Africa. *A. decurrens* and *A. floribunda* are said to yield it in New Holland. Other trees, moreover, not belonging to the genus, afford a similar product, especially *Feronia elephantum* of Hindostan, the gum of which, according to Ainslie, is used for medical purposes by all the practitioners of Lower India.

The gum-bearing Acacias are all thorny or prickly trees or shrubs, calculated by nature for a dry and sandy soil, and flourishing in deserts where few other trees will grow. We are told that camels, attached to the caravans, derive from them their chief sustenance in many parts of those desolate regions in which Africa abounds. In these situations, they have a stunted growth, and present a bare, withered, and uninviting aspect; but in favourable situations, as on the banks of rivers, they are often luxuriant and beautiful.

Their bark and unripe fruit contain tannic and gallic acids, and are sometimes used in tanning. An extract was formerly obtained from the immature pods of *A. Arabica* and *A. vera*, by expression and inspissation. It was known to the ancients by the name of *acaciæ veræ succus*, and was highly lauded by some of the Greek medical writers; but is at present little used. It is a solid, heavy, shining, reddish-brown substance, of a sweetish, acidulous, styptic taste, and soluble in water. Its virtues are probably those of a mild astringent. On the continent of Europe, a preparation is said to be substituted for it called *acacia nostras*, obtained by expression and inspissation from the unripe fruit of the *Prunus spinosa*, or wild plum tree.

The gum of the Acacias exudes spontaneously from the bark, and hardens on exposure; but incisions are sometimes made in order to facilitate the exudation. This is supposed to be favoured by disease; and it is stated by Jackson that, in Morocco, the greatest product is obtained in the driest and hottest weather, and from the most sickly trees. An elevated temperature appears to be essential; for in cooler climates, though the tree may flourish, it yields no gum. According to Ehrenberg, the varieties in the characters of the gum do not depend upon difference in the species of the plant. Thus, from the same tree, it will exude frothy or thick, and clear or dark-coloured, and will assume, upon hardening, different shapes and sizes; so that the pieces, when collected, require to be assorted before being delivered into commerce.

Commercial History and Varieties. The most common varieties of this drug are the *Turkey*, the *Barbary*, the *Senegal*, and the *India Gum;* to which may be added the *Cape* and the *Australian Gum.*

1. Turkey Gum. Gum Arabic was formerly procured, chiefly if not exclusively, from Egypt and the neighbouring countries; and much is still obtained from the same sources. It is collected in Upper Egypt, Nubia, Kordofan, and Darfur, whence it is taken down the Nile to Alexandria. We obtain it in this country through Smyrna, Trieste, Marseilles, or some other entrepot of the Mediterranean commerce. Two varieties have long been noticed, one more or less coloured, the other white, which were formerly distinguished by the titles of *gum gedda* and *gum turic*, derived from the ports of the Red Sea, Jidda and Tor, from which the varieties were erroneously supposed to be respectively exported. The gum from Egypt is commonly known to our druggists by the name of *Turkey gum*, and is the kind with which apothecaries are usually supplied. Though interspersed with roundish pieces of various sizes, it consists chiefly of small, irregular fragments,

commonly whitish, or slightly tinged with yellow or reddish-yellow. It is, on the whole, lighter coloured, more brittle, more readily soluble, and freer from impurities than the other commercial varieties, and contains much of that form of gum Arabic, which is characterized by innumerable minute fissures pervading its substance, and impairing its transparency.

2. Barbary Gum. Much gum Arabic is obtained from Barbary; and Mogador, a port of Morocco, is the chief entrepot of the trade. It is probably derived, in part at least, from *Acacia gummifera*. According to Jackson, the natives call the tree which affords it *attaleh*. They gather it in July and August, when the weather is hot and very dry. Two kinds are brought to Mogador, one from the neighbouring provinces, the other by caravans from Timbuctoo. This may account for the fact, that Barbary gum in part resembles the Turkey, in part the Senegal. When first deposited in the warehouses, it has a faint smell, and makes a crackling noise, occasioned by the rupture of the small masses as they become more dry. Barbary gum is exported in casks, and reaches the United States through English commerce.

3. Senegal Gum. This variety was introduced into Europe by the Dutch. The French afterwards planted a colony on the western coast of Africa, and took possession of the trade; but since the last great European war, it has been largely shared by the English. St. Louis, at the mouth of the Senegal, and Portendic, considerably further north, are the ports in which the commerce in gum has chiefly centred. Immense forests of Acacia exist at some distance in the interior. These are composed chiefly of two trees, called by the natives *vereck* or *nereck*, and *nebuel* or *nebued*, the former yielding a white gum, the latter a red. These are probably distinct species, the vereck being, according to M. Rain, *A. vera*, and the nebuel, *A. Senegal*. According to Adanson, there are several other species in the neighbourhood which yield gum. The juice begins to exude in November. The dry winds, which prevail after the rainy season, cause the bark to crack; the juice flows out, and hardens in masses, which are often as large as a pigeon's egg, and sometimes, according to M. Rain, as the egg of the ostrich. At this period, the Moors and negroes proceed to the forests in caravans, collect the gum in leather sacks, and convey it to the coast. Senegal gum is imported into the United States chiefly from Bordeaux. It is usually in roundish or oval unbroken pieces, of various sizes, sometimes whitish, but generally yellowish, reddish, or brownish-red, larger than those of Turkey gum, less brittle and pulverizable, and breaking with a more conchoidal fracture. The French give the name of *Gum Galam* (*Gomme de Galam*) to a variety consisting of pieces more irregular in shape, often angular and broken, and mixed with small fragments, so as to resemble Turkey gum.

4. India Gum. Considerable quantities of gum are imported into this country from India. Ainslie states that it is derived from *A. Arabica*. Most of it is taken to Bombay in Arab vessels from Cape Gardafui and Berbera on the north-eastern coast of Africa, where it is collected, or from the ports of the Red Sea. It is in pieces of various size, colour, and quality, some resembling the broken fragments of Turkey gum, though much less chinky; others large, roundish and tenacious, like the Senegal. Its taste is sweeter than that of the other varieties. It is usually much contaminated, containing, besides genuine gum Arabic, portions of a different product, having the characteristic properties of Bassora gum. This is distinguished by its insolubility in water, with which, however, it unites, swelling up, and forming a soft viscid mass. It owes its properties to the presence of *bassorin*. The pieces of this gum bear a considerable resemblance to those of the genuine article, and may easily escape detection. Their want of solubility, however,

is a ready test. Besides this impurity in the India gum, there are often others more readily detected. Among these, we have observed a yellowish-white resinous substance, which has the sensible properties of the turpentines. If care be used in assorting this commercial variety, it may be employed for all the purposes of good gum Arabic. India gum is brought into this country, partly from Calcutta or Bombay, and partly by way of England. It usually comes in large cases. We have seen a parcel said to have come directly from the Red Sea, enclosed in large sacks made of a kind of matting, and bearing a close resemblance to the gum from Calcutta, except that it was more impure, and contained numerous large, irregular, very brittle masses, not much less than the fist in size.

5. Cape Gum. Pereira mentions that gum has recently been imported into Great Britain from the Cape of Good Hope, where it is collected probably from *Acacia Karroo*, which grows abundantly on the banks of the Gariep and in other parts. Dr. Pappe, of Cape Town, refers it to *Acacia horrida* of Willdenow. (*Flor. Capens.* 8.) It is of a pale-yellow colour, in tears or fragments, and is considered an inferior variety.

6. Australian Gum. Considerable quantities of gum have been imported into England from South Australia. It is in pieces elongated or globular, rough and even wrinkled upon the surface, and of a violaceous tint, which distinguishes it from other varieties. It is not entirely soluble in water, to which it imparts less viscidity than ordinary gum Arabic.

General Properties. Gum Arabic is in roundish or amorphous pieces, or irregular fragments of various sizes, more or less transparent, hard, brittle, pulverizable, and breaking with a shining fracture. It is usually white, or yellowish-white; but frequently presents various shades of red, and is sometimes of a deep orange or brownish colour. It is bleached by exposure to the light of the sun. In powder it is always more or less purely white. It is inodorous, has a very feeble, slightly sweetish taste, and when pure dissolves wholly away in the mouth. The sp. gr. varies from 1·31 to 1·48. Gum Arabic consists essentially of a peculiar proximate principle usually called *gum*, but for which the name of *arabin*,* originally proposed by Chevreul,

* Much confusion has existed in the use of the word *gum*, which has been employed to express various concrete vegetable juices, and, at the same time, a peculiar proximate principle of plants. It is now proposed to restrict the term to the former of these applications, and to designate the principle alluded to by a distinct name. The subject of the gums was investigated by M. Guérin, who repeated and corrected the experiments of former chemists, and threw new light upon the nature of these substances. Several of the facts mentioned in the text were derived from his memoir, published in the *Ann. de Chim. et de Phys.*, t. xlix. p. 248. M. Guérin considers as characteristic of gums, the property of affording mucic acid, when acted on by nitric acid. He recognises in the different gums three distinct proximate principles; namely, 1. *arabin*, or the pure gum of chemical writers, which is the essential constituent of gum Arabic; 2. *bassorin*, which enters largely into the composition of Bassora gum and tragacanth; and 3. *cerasin*, which constitutes the portion of cherry gum insoluble in cold water. Of arabin sufficient is said in the text. Bassorin will be treated of under the head of Bassora gum. (See *Appendix.*) Of *cerasin* it may be proper to say a few words in this place. The gums which exude from the cherry, apricot, peach, and plum trees, and which the French call *gomme du pays*, appear to be identical in composition, consisting of a portion soluble in cold water, which is arabin, and a portion insoluble, which was formerly thought to be bassorin, but has been proved by M. Guérin to be different, and is appropriately denominated cerasin. This principle is colourless, semi-transparent, tasteless, inodorous, uncrystallizable, insoluble in alcohol, insoluble in cold water, in which it softens and swells a little, and convertible by the action of boiling water into arabin, with which it appears to be isomeric. In this last property it differs from bassorin, which is not changed by boiling water. M. Guérin suggests that the natural heat of the climate, in tropical countries, produces the same effect upon the

has been adopted. In describing its chemical relations, therefore, we describe those of the principle alluded to. Water, either cold or hot, dissolves it, and forms a viscid solution called mucilage, which, when evaporated, yields the gum unchanged. (See *Mucilago Acaciæ.*) It is insoluble in alcohol, ether, and the oils; and alcohol precipitates it from its aqueous solution. Diluted acids dissolve it, but not more freely than water. The concentrated acids decompose it. Triturated with sulphuric acid at ordinary temperatures, it is converted into a substance similar to the gummy product which results from the action of the same acid on linen rags and sawdust. Heated with concentrated sulphuric acid, it is decomposed with the evolution of carbon. The diluted acid, when boiled with it, gives rise to the formation of a saccharine substance. Strong nitric acid converts it into mucic acid, and at the same time produces oxalic and malic acids. It combines with several salifiable bases. With the alkalies and earths it forms soluble compounds. By the subacetate of lead it is precipitated from its solution, in the form of a white insoluble compound of gum and protoxide of lead; and a delicate test of its presence in any liquid is thus afforded. It enters into combination with several salts. A solution of borax coagulates it. When added to a solution of silicate of potassa, it precipitates a compound of gum, potassa, and silica, while a compound of gum and potassa remains dissolved. Its solution yields a precipitate with nitrate of mercury, and forms a brown, semi-transparent jelly, with a strong solution of sesquichloride of iron. In solution it unites with sugar; and the liquid, when evaporated, yields a transparent, solid substance, insusceptible of crystallization.

Gum Arabic undergoes no change by time, when kept in a dry place. Its aqueous solution, if strong, remains for a considerable time unaltered, but ultimately becomes sour, from the production of acetic acid. The tendency to become sour is increased by employing hot water to dissolve it. Between 300° and 400°, the gum softens, and may be drawn into threads. At a red heat it is decomposed, yielding, among other substances, a minute proportion of ammonia. When burnt, it leaves about three per cent. of ashes, consisting, according to Guérin, of carbonates of potassa and lime, a little phosphate of lime, chloride of potassium, oxide of iron, alumina, magnesia, and silica. The lime exists in the gum combined with an excess of malic acid, which gives to its solution the property of reddening litmus paper. In consequence of the presence of lime, oxalate of ammonia occasions a precipitate with the solution. Besides pure gum, or arabin, gum Arabic contains a very small proportion of an azotized body, which is thought to occasion a slight opalescence in its solution, several saline substances, and 16 or 17 per cent. of uncombined water. (*Guérin.*) Pure gum may be obtained by treating the compound of gum and protoxide of lead with sulphuretted hydrogen. Its ultimate constituents are carbon, hydrogen, and oxygen. Its formula has been variously given, $C_{13}H_{13}O_{12}$; $C_{12}H_{10}O_{10}$; and $C_{12}H_{11}O_{11}$.

The properties above enumerated belong to gum Arabic generally. There are, however, pharmaceutic varieties with differences which deserve notice. 1. *Gum that is transparent and readily soluble.* This constitutes by far the greater portion of the commercial varieties distinguished by the names of Turkey and Senegal gum. It is characterized by its transparency, ready

exuded gums as artificial heat in colder regions, and that consequently the acacia gum consists chiefly of arabin.—*Note to the third edition.*

From the observations of Dr. Kützing, it would appear that the spontaneously exuded gum of the plum, cherry, &c. is sometimes at least the product of a diseased cell-action, and contains remains of the cells, probably analogous to the epithelial constituent of animal mucus. (See *Am. Journ. of Pharm.*, xxv. 39.)—*Note to the tenth edition.*

solubility, and the comparatively slight degree of thickness and viscidity of its solution. Under this head may be included the *gomme blanche fendillée* of Guibourt. It is distinguished by the whiteness and deficient transparency of the pieces, attributable to the minute cracks or fissures with which they abound, and which render them very brittle and easily pulverizable. This peculiar structure is generally ascribed to the influence of solar heat and light; but is conjectured by Hayne to arise from the exudation of the juice in the frothy state noticed by Ehrenberg. Though the unbroken pieces are somewhat opaque, each minute fragment is perfectly transparent and homogeneous. This variety, in consequence of its prompt and entire solubility, is usually preferred for medical use, and for most purposes in pharmacy. 2. *Gum less transparent and less soluble.* Guibourt has proposed for portions of this gum the name of *gomme pelliculée*, from the circumstance that the masses are always apparently covered, on some part of their surface, by a yellowish opaque pellicle. Other portions of it have a mammillary appearance on the surface. It is less transparent than the former variety, is less freely and completely dissolved by water, and forms a more viscid solution. It melts with difficulty in the mouth, and adheres tenaciously to the teeth. It is found in all the commercial varieties of gum, but least in that from Egypt. Its peculiarities may be ascribed to variable proportions of *bassorin* associated with the soluble *arabin*. Between these two varieties of gum there are insensible gradations, so that it is not always easy to classify specimens.

Impurities and Adulterations. In parcels of gum Arabic there are sometimes pieces of a dark colour, opaque, and incorporated with ligneous, earthy, or other impurities. The inferior are often mixed with or substituted for the better kinds, especially in powder; and portions of insoluble gum, bdellium, and other concrete juices of unknown origin, are found among the genuine. Flour or starch is sometimes fraudulently added to the powder, but is easily detected by the blue colour which it produces with tincture of iodine. In consequence of the impurities, and difference in quality, gum Arabic should generally be assorted for pharmaceutical use. A foreign substance sometimes adheres to its surface, giving it a bitter taste, from which it may be freed by washing in water.* *Dextrin* broken into small fragments has been mingled with parcels of gum. It may be known by yielding in solution, a reddish-purple colour with solution of iodine. It does not, like gum, produce a yellowish or brownish jelly with solutions of the sesquisalts of iron.

Medical Properties and Uses. This gum is used in medicine chiefly as a demulcent. By the viscidity of its solution, it serves to cover and sheathe inflamed surfaces; and, by blending with and diluting irritating matters, blunts their acrimony. Hence, it is advantageously employed in catarrhal affections and irritation of the fauces, by being held in the mouth and allowed slowly to dissolve. Internally administered, it has been found useful in inflammations of the gastric and intestinal mucous membrane; and its employment has even been extended to similar affections of the lungs and urinary organs. Whether it is beneficial, in the latter cases, in any other manner than by the dilution resulting from its watery vehicle is doubtful. By some physicians it is thought to possess a positively sedative influence over inflamed surfaces to which it may be applied in the state of solution. As an article of diet in febrile cases, and others requiring a very rigid regimen, it

* M. Picciotto proposes to purify coloured gum by dissolving it in six or eight parts of a strong and pure solution of sulphurous acid, heating the solution, treating it with carbonate of baryta in excess, then filtering, and evaporating at a moderate heat. (*Pharm. Journ. and Trans.*, ix. 16.)—*Note to the ninth edition.*

is perhaps superior to almost any other substance. If not positively sedative, it is certainly not in the least irritating; while it is sufficiently nourishing to prevent the injurious action of the organs upon themselves. Its nutritive properties have been denied; but the fact of their existence rests on incontrovertible evidence. The Moors and negroes live on it almost exclusively during the period of its collection and conveyance to market; the Bushman Hottentots, in times of scarcity, support themselves upon it for days together; and we are told that the apes of South Africa are very fond of it. Six ounces a day are said to be sufficient to sustain life in a healthy adult. In many cases of disease, its solution may constitute, for a time, the exclusive drink and food of the patient. It is best prepared by dissolving an ounce of the gum in a pint of boiling water, and allowing the solution to cool. An excellent demulcent, called *gum pectoral*, is made by dissolving equal parts of gum Arabic and sugar in water, and evaporating by means of a water-bath. It is held in the mouth, and allowed slowly to dissolve. In pharmacy, gum Arabic is extensively used for the suspension of insoluble substances in water, and for the formation of pills and troches.

Off. Prep. Confectio Amygdalæ; Mistura Amygdalæ; Mistura Cretæ; Mistura Glycyrrhizæ Composita; Mistura Guaiaci; Mucilago Acaciæ; Pulvis Cretæ Compositus; Pulvis Tragacanthæ Comp.; Syrupus Acaciæ; Trochisci Acaciæ. W.

ACETUM. *U. S., Lond.*

Vinegar.

Impure dilute acetic acid prepared by fermentation. *U. S.* British vinegar, prepared by fermentation, of the sp. gr. 1·019. *Lond.*

Off. Syn. ACETUM BRITANNICUM. *British vinegar. Ed.* ACETUM GALLICUM. *French vinegar. Ed., Dub.*

Vinaigre, *Fr.*; Essig, *Germ.*; Aceto, *Ital.*; Vinagre, *Span.*

Vinegar is a sour liquid, the product of the acetous fermentation. Viewed chemically, it is a very dilute solution of acetic acid, containing foreign matters. (See *Acidum Aceticum.*)

The acetous fermentation may be induced in all liquors which have undergone or are susceptible of the vinous fermentation. Thus sugar and water, saccharine vegetable juices, infusion of malt, cider, and wine, may be converted into vinegar, if subjected to the action of a ferment, and exposed, with access of air, to a temperature between 75° and 90°. Sea-weeds, covered with water, and heated sufficiently, will undergo the acetous fermentation, and may thus be made a source of vinegar. (Stenhouse, *Phil. Mag.*, 4th series, i. 24.) During the acetous fermentation, a microscopic fungus, called *torula aceti*, is developed.

Vinegar is generally made by the *German process*, by which the time consumed in its formation is greatly abridged. A mixture is prepared of one part of alcohol of 80 per cent., four or six parts of water, and one-thousandth of honey or extract of malt, to act as a ferment. This mixture is allowed to trickle through a mass of beech shavings, previously steeped in vinegar, and contained in a deep oaken tub, called a *vinegar generator*. The tub is furnished, near the top, with a wooden diaphragm perforated with numerous small holes, which are loosely filled with packthread about six inches long, prevented from slipping through by a knot at one end. The alcoholic mixture, heated to between 75° and 83°, is placed on the diaphragm, and slowly percolates the beech shavings, whereby it becomes minutely divided. It is

essential to the success of the process that a current of air should pass through the tub. In order to establish this current, eight equidistant holes are pierced near the bottom of the tub, forming a horizontal row, and four glass tubes are inserted vertically in the diaphragm, of sufficient length to project above and below it. The air enters by the holes below, and passes out by the tubes. The contact of the air with the minutely divided liquid rapidly promotes the acetification, which consists, essentially, in the oxidation of the alcohol. During the process, the temperature rises to 100° or 104°, and remains nearly stationary while the process is going on favourably. The liquid is drawn off by a discharge pipe near the bottom, and must be passed three or four times through the tub, before the acetification is completed, which generally occupies from twenty-four to thirty-six hours. According to Wimmer, pieces of charcoal, about the size of a walnut, may be substituted for the beech shavings in the process, with the effect of expediting the acetification. The charcoal must be deprived of saline matter by diluted muriatic acid, and afterwards washed with water.

In England, vinegar is at present made from the infusion of malt by the German process, which is said to have originated with Mr. Ham, of Bristol, England, as early as 1822. The fermented wort is made to fall in a shower upon a mass of faggots of birch twigs, occupying the upper part of a large vat, and, after trickling down to the bottom, is pumped up repeatedly to the top, to be again allowed to fall, until the acetification is completed. This mode of oxidizing the alcohol in the fermented wort, has the advantage of rendering insoluble certain glutinous and albuminous principles, which, if not removed, would cause a muddiness in the vinegar, and make it liable to spoil.

In the United States, vinegar is often prepared from cider. When it is made on a large scale, the cider is placed in barrels with their bung-holes open, which are exposed during the summer to the heat of the sun. The acetification is completed in the course of about two years. The progress of the fermentation, however, must be watched; and, as soon as perfect vinegar is formed, it should be racked off into clean barrels. Without this precaution, the acetous fermentation would run into the putrefactive, and the whole of the vinegar be spoiled.

Vinegar may be clarified, without impairing its aroma, by throwing about a tumbler full of boiling milk into from fifty to sixty gallons of the liquid, and stirring the mixture. This operation has the effect, at the same time, of rendering red vinegar pale.

The series of changes which occur during the acetous fermentation is called *acetification*. During its progress, there is a disengagement of heat; the liquor absorbs oxygen and becomes turbid; and filaments form, which are observed to move in various directions, until, finally, upon the completion of the fermentation, they are deposited in a mass of a pultaceous consistence. The liquor now becomes transparent, its alcohol has disappeared, and acetic acid has been formed in its place. How then is this change of alcohol into acetic acid effected? Liebig supposes that it takes place in consequence of the formation of a new substance, called aldehyd, into which the alcohol is changed by the loss of a part of its hydrogen. The alcohol, consisting of four eqs. of carbon, six of hydrogen, and two of oxygen, loses two eqs. of hydrogen through the influence of the atmosphere, and becomes aldehyd, composed of four eqs. of carbon, four of hydrogen, and two of oxygen. This, by the absorption of two eqs. of oxygen, becomes four eqs. of carbon, four of hydrogen, and four of oxygen; that is, hydrated acetic acid. Thus the conversion of alcohol into acetic acid consists in, first, the removal of two eqs. of

hydrogen, and afterwards the addition of two eqs. of oxygen. *Aldehyd* is a colourless, very inflammable, ethereal liquid, having a pungent taste and smell. Its density is 0·79. It absorbs oxygen with avidity, and is thus converted into acetic acid, as just stated. Its name alludes to its relation to alcohol, *al*cohol *dehyd*rogenated. Its aqueous solution is decomposed by caustic potassa, with formation of *aldehyd resin*. This is a soft light-brown mass, which, when heated to 212°, gives off a very nauseous soapy smell.

Properties. Vinegar, when good, is of an agreeable penetrating odour, and pleasant acid taste. The better sorts have a grateful aroma, which is probably due to the presence of an ethereal substance, perhaps acetic ether. The colour of vinegar varies from pale yellow to deep red. When long kept, particularly if exposed to the air, it becomes muddy and ropy, acquires an unpleasant smell, putrefies, and loses its acidity.

The essential ingredients of vinegar are acetic acid and water; but besides these it contains various other substances, derived from the particular vinous liquor from which it may have been prepared. Among these may be mentioned, colouring matter, gum, starch, gluten, sugar, a little alcohol, and frequently malic and tartaric acids, with a minute proportion of alkaline and earthy salts. According to the U. S. Pharmacopœia, vinegar should be devoid of free sulphuric acid, as shown by its yielding no precipitate when boiled with a solution of chloride of calcium, and of such a strength that a fluidounce would require, for saturation, about thirty-five grains of crystallized bicarbonate of potassa.

In the Edinburgh Pharmacopœia, two kinds of vinegar are officinal, malt vinegar and wine vinegar, under the names of *British vinegar* and *French vinegar*. The former is stated to vary in density from 1·006 to 1·019, the latter from 1·014 to 1·022. Specific gravity, however, is not an accurate index of the strength of vinegar. The London Pharmacopœia recognises only British vinegar; the Dublin, only the French.

Malt vinegar (Acetum Britannicum) has a yellowish-red colour. The strongest kind, called *proof vinegar*, contains from 4·6 to 5 per cent. of acetic acid. That of British manufacture usually contains sulphuric acid, which the manufacturer is allowed by law to add in a proportion not exceeding one-thousandth part. This addition was at one time thought necessary to preserve the vinegar; but it is now admitted that, if the vinegar is properly manufactured, it does not require to be protected by sulphuric acid. The Edinburgh College does not recognise this impurity, although sanctioned by the British laws, and, therefore, rejects the vinegar if it gives evidence of the presence of free sulphuric acid. On the contrary, the London College admits the vinegar, if, after the addition of ten minims of solution of chloride of barium to a fluidounce of it, and the separation of the precipitate by filtration, it deposits nothing on the further addition of the solution.

Wine vinegar (Acetum Gallicum) is nearly one-sixth stronger than pure malt vinegar. It is of two sorts, the white and the red, according as it is prepared from white or red wine. *White wine vinegar* is usually preferred, and that made at Orleans is the best. *Red wine vinegar* may be deprived of its colour and rendered limpid, by being passed through animal charcoal. According to the Edinburgh Pharmacopœia, wine vinegar may be distinguished from malt vinegar by the addition of ammonia in slight excess, which causes in the former "a purplish muddiness, and slowly a purplish precipitate," and in the latter, either no effect, or a dirty brownish precipitate.

Adulterations. The principal foreign substances which vinegar is liable to contain, are sulphuric and sulphurous acids, certain acrid substances, and copper and lead, derived from improper vessels used in its manufacture. Muri-

atic and nitric acids are but rarely present. Chloride of calcium will detect free sulphuric acid, when boiled with the vinegar, without causing the least precipitate with the minute quantity of sulphates, almost always present in the liquid. (*Boettger.*) Chloride of barium is not a suitable test here; as it will cause a precipitate with these sulphates, when no free sulphuric acid is present. Sulphurous acid may be detected and estimated, by first precipitating the sulphates and free sulphuric acid by baryta water, next acting on the vinegar with arsenic acid, which converts sulphurous into sulphuric acid, and finally precipitating the newly formed sulphuric acid by chloride of barium. From the sulphuric acid in the last precipitate, its equivalent of sulphurous acid is easily calculated. (*Laroque.*) Muriatic acid may be discovered by adding to a distilled portion of the suspected vinegar, a solution of nitrate of silver, which will throw down a curdy white precipitate. If nitric acid be present, an improbable impurity, it may be detected by producing a yellow colour, when the suspected vinegar is boiled with indigo. The acrid substances usually introduced into vinegar are red pepper, long pepper, pellitory, grains of paradise, and mustard seed. These may be detected by evaporating to an extract, which will have an acrid, biting taste, if any one of these substances be present. By far the most dangerous impurities in vinegar are copper and lead. The former may be detected by a brownish precipitate on the addition of ferrocyanuret of potassium to the concentrated vinegar; the latter, by a blackish precipitate with sulphuretted hydrogen, and a yellow one with iodide of potassium. Pure vinegar is not discoloured by sulphuretted hydrogen. According to Chevallier, wine vinegar, which has been strengthened with acetic acid from wood, sometimes contains a minute proportion of arsenic. In this case the deleterious metal is probably derived from arseniferous sulphuric acid, employed in preparing the acetic acid.

Medical Properties. Vinegar acts as a refrigerant and diuretic. With this view it is added to diluent drinks in inflammatory fevers. It is sometimes used as a clyster, diluted with twice or thrice its bulk of water. It has been supposed to be a powerful antidote to the narcotic poisons, but this is a mistake. In the case of opium, the best authorities unite in considering it worse than useless; as it gives activity to the poison rather than neutralizes it. Externally it is employed as a fomentation or lotion in bruises and sprains. Diluted with water, it forms the best means of clearing the eye from small particles of lime. Its vapour is inhaled in certain states of sore throat; and it is diffused through sick rooms under the impression that it destroys unwholesome effluvia, though, in fact, it has no other effect than to cover unpleasant smells. The dose is from one to four fluidrachms; as a clyster, the quantity used is one to two fluidounces.

Off. Prep. Acetum Destillatum; Ceratum Saponis Compositum; Linimentum Æruginis; Syrupus Aceti; Tinctura Opii Acetata. B.

ACIDUM ACETICUM. *U. S., Lond.*

Acetic Acid.

Acetic acid of the sp. gr. 1·041. *U. S.*, 1·048. *Lond.*

Off. Syn. ACIDUM PYROLIGNEUM. *Pyroligneous Acid.* Diluted acetic acid, obtained by the destructive distillation of wood. Density at least 1·034. *Ed.* ACIDUM ACETICUM E LIGNO VENALE. *Acetic Acid of commerce. Purified Pyroligneous Acid.* Sp. gr. 1·044. *Dub.*

ACIDUM ACETICUM GLACIALE. *Dub.*

Glacial Acetic Acid.

The sp. gr. of this acid is 1·065. *Dub.*

Off. Syn. ACIDUM ACETICUM. The density is commonly from 1·063 to 1·065, but must not exceed 1·0685. *Ed.*

ACIDUM ACETICUM FORTE. *Dub.*

Strong Acetic Acid.

The sp. gr. of this acid is 1·066. *Dub.*

Exclusive of *Acidum Aceticum Dilutum*, which will be noticed in the second part of this work, three strengths of acetic acid are now officinal in the U. S. and British Pharmacopœias, assuming those acids to be identical which approach most nearly to equality in specific gravity. The following table presents a view of the names and densities of the several acids.

ACETIC ACID.	*U. S.*	*Lond.*	*Ed.*	*Dub.*
Highest off. strength.	———	———	Acidum Aceticum. Sp. gr. 1·063 to 1·065.	Acidum Aceticum Glaciale. Sp. gr. 1·065.
Intermediate strength.	———	———	———	Acidum Aceticum Forte. Sp. gr. 1·066.
Lowest strength.	Acidum Aceticum. Sp. gr. 1·041.	Acidum Aceticum. Sp. gr. 1·048.	Acidum Pyroligneum. Sp. gr. 1·034.	Acidum Aceticum e Ligno Venale. Sp. gr. 1·044.

We shall take up the three grades of acid separately, in the order in which they are mentioned in the table.

ACIDUM ACETICUM GLACIALE, sp. gr. 1·065. *Dub.* *Acidum Aceticum*, sp. gr. 1·063–5. *Ed.* The following are the processes of the Dub. and Ed. Colleges for these acids.

"Take of Acetate of Lead, any convenient quantity: place it in an oven at about the temperature of 300°, until it ceases to lose weight, and, having then brought it by trituration to a fine powder, let it be introduced into a flask or retort, and exposed to an atmosphere of dry muriatic acid gas, until very nearly the whole of it exhibits a damped appearance. The flask or retort being now connected in the usual manner with a Liebig's condenser, let heat be applied by means of a chloride of zinc bath, until the entire of the acetic acid shall have distilled over.

"The muriatic acid gas should be *slowly* disengaged from the materials directed in the formula for *Acidum Muriaticum* [*Purum*, Dub.], using eight ounces of salt for every pound of anhydrous acetate of lead [avoirdupois weight]; and, to render it quite dry, it should, before being conducted into the vessel containing the sugar of lead, be made to bubble through oil of vitriol, and then pass through a long tube packed with small fragments of fused chloride of calcium." *Dub.*

"Take of Acetate of Lead *any convenient quantity;* heat it gradually in a porcelain basin, by means of a bath of oil or fusible metal (8 tin, 4 lead, 3 bismuth), to 320° F.; and stir till the fused mass concretes again: pulverize this when cold, and heat the powder again to 320°, with frequent stirring, till the particles cease to accrete. Add *six ounces* of the powder to *nine fluidrachms and a half* of pure Sulphuric Acid, contained in a glass matrass; attach a proper tube and refrigeratory, and distil from a fusible metal bath with a heat of 320° to complete dryness. Agitate the distilled liquid with a *few grains* of Red Oxide of Lead to remove a little sulphurous acid, allow the vessel to rest a few minutes, pour off the clear liquor, and redistil it." *Ed.*

These processes, when carefully conducted, furnish an acid of the maximum strength, consisting of one eq. of dry acid, and one of water. The acetate of lead is first freed from water of crystallization by heat, and then decomposed. The agent of decomposition is dry muriatic acid gas in the Dublin formula, and sulphuric acid in the Edinburgh. When muriatic acid is used, water and chloride of lead are formed, and monohydrated acetic acid distils over; when sulphuric acid is employed, sulphate of protoxide of lead is formed. As a boiling temperature is not sufficient for decomposing the acetate of lead, a chloride of zinc bath is used in the Dublin process, and one of oil or fusible metal in the Edinburgh. On the other hand, the use of a sand-bath would incur the risk of too high a temperature, which would give rise to a portion of acetone. The red oxide of lead, used in the Edinburgh formula, removes the sulphurous acid, by combining with it in such a way as to form sulphate of protoxide of lead, by a transfer of oxygen from the oxide to the acid.

Acetic acid of maximum strength may likewise be obtained by distilling binacetate of potassa, at a heat between 390° and 570°. One eq. of monohydrated acetic acid distils over, and neutral acetate of potassa is left. The binacetate may be formed by distilling the neutral acetate with an excess of watery acetic acid. In this process, the same acetate of potassa serves repeatedly for conversion into binacetate, and subsequent decomposition.

Acidum Aceticum Forte, sp. gr. 1·066, *Dub.* This acid, introduced for the first time into the Dublin Pharmacopœia of 1850, is prepared according to the following formula.

"Take of Glacial Acetic Acid *six fluidounces;* Distilled Water *four ounces.* Mix." *Dub.*

The only use made by the Dublin College of glacial acetic acid is to form the Acidum Aceticum Forte, as above; and the latter acid enters into two preparations only, namely, Acetum Cantharidis and Acidum Aceticum Camphoratum. The reasons which induced the Dublin and Edinburgh Colleges to introduce glacial acetic acid into their officinal lists are not very obvious. The acid is too strong even for external use.

Acidum Aceticum, *U. S., Lond.* (sp. gr. 1·041 *U. S.*, 1·048 *Lond.*) *Acidum Pyroligneum* (sp. gr. 1·034), *Ed. Acidum Aceticum e Ligno Venale* (sp. gr. 1·044), *Dub.* This is the acid resulting from the purification of the crude acetic acid, obtained by the destructive distillation of wood. It is the acid most useful to the apothecary, and which forms the heading of this article. The corresponding acid of the former U. S. and London Pharmacopœias was placed among the preparations, being obtained from the acetate of soda by the action of sulphuric acid; but in the new editions of those works, it has been placed in the materia medica list. As this grade of acid has its source in the impure acetic acid, resulting from the destructive distillation of wood, it will be proper to premise some account of the crude acid, called *crude pyroligneous acid.*

Wood, when charred, yields many volatile products, among which are an acid liquor, an empyreumatic oil, and tar containing creasote and some other proximate principles. When the carbonization is performed in close vessels, these products, which are lost in the ordinary process of charring, may be collected, and, at the same time, a large amount of charcoal is obtained.

The carbonization of wood in close vessels, with a view to preserve the condensible products, was first put in practice by Mollerat in France. The apparatus employed at Choisy, near Paris, is thus described by Thenard. It consists of, 1st, a furnace with a movable top; 2d, a strong sheet-iron cylinder, standing upright, sufficiently capacious to contain a cord of wood, and furnished with a sheet-iron cover; 3d, a sheet-iron tube, proceeding horizontally from the upper and lateral part of the cylinder to the distance of about a foot; 4th, a copper tube connected with the last, which is bent in such a manner as to plunge successively to the bottom of two casks filled with water, and, after rising out of the second, is bent back, and made to terminate in the furnace. At the bottom of each cask, the tube dilates into a ball, from the under part of which another tube proceeds, which, passing water-tight through the cask, terminates above a vessel, intended to receive the condensible products.

The sheet-iron cylinder, being filled with wood, and closed by luting on its cover with fire clay, is let down into the furnace by the help of a crane. The fire is then applied; and, when the process is completed, the cylinder is removed by the same means, to be replaced by another. During the carbonization, the volatile products are received by the tube; and those which are condensible, being an acid liquor and tar, are condensed by the water in the casks, and collect in the lower bends of the tubes, from which they run into the several recipients; while the incondensible products, being inflammable gases, are discharged into the furnace, where, by their combustion, they assist in maintaining the heat. Eight hundred pounds of wood afford, on an average, thirty-five gallons of acid liquor, weighing about three hundred pounds.

This is the crude pyroligneous acid, sometimes called *pyroligneous vinegar*. It is a dark-brown liquid, having a strong smoky smell, and consists of acetic acid, diluted with more or less water, and holding in solution chiefly tar and empyreumatic oil, with pyroxylic spirit, and probably a small proportion of creasote. It is from this crude acid that the U. S. and London acetic acid, corresponding to the acetic acid of commerce, is obtained. The purification is effected as follows. The acid is saturated with cream of lime, whereby acetate of lime is formed in solution, and a good deal of the tarry matter precipitated. The solution of acetate of lime is then mixed with a concentrated solution of sulphate of soda, and, by double decomposition, acetate of soda is formed in solution, and sulphate of lime precipitated. The solution of the acetate is next to be subjected to evaporation, during which further impurities that separate on the surface are to be skimmed off. The solution, being duly concentrated, is set aside to crystallize; and the impure salt, thus obtained, after having been partially purified by solution and recrystallization, is fused in an iron vessel, stirred until it dries, and, the heat being carefully raised, subjected to incipient carbonization, whereby remaining empyreumatic matters are carbonized, with little damage to the salt. The mass is then dissolved in water, and the solution, being strained and recrystallized, furnishes pure acetate of soda. (See *Sodæ Acetas.*) Finally, this salt is distilled with from 34 to 35 per cent. of its weight of sulphuric acid, when it yields the acetic acid of commerce, the residue being sulphate of soda, which is reserved for decomposing fresh portions of acetate of lime. The acid has still an empyreumatic flavour, which is removed by filtering it through animal charcoal.

Sometimes the acetate of lime is distilled with sulphuric acid directly, without having been previously converted into acetate of soda, by which mode of proceeding a step in the process is saved. But this decomposition is attended with many inconveniences, and the acetic acid obtained is apt to be contaminated with sulphuric acid. The same step is saved, but without this risk, by distilling the acetate of lime with hydrochloric acid, as recommended by Christl; and if the acid be not used in excess, the acetic acid obtained scarcely contains a trace of chlorine.

The sp. gr. of the different acetic acids increases with their strength up to the density of 1·0735 (maximum), after which it decreases until it reaches 1·063, the density of the strongest acid (*glacial acid*). The following table, condensed from one given by Pereira on the authority of Mohr, exhibits the sp. gr. of acetic acid of different strengths, including the officinal Acidum Aceticum Dilutum. The officinal and commercial acids are noted opposite to their several densities, and the corresponding number in the column on the left gives the per centage of *monohydrated* acid in each.

Per cent. of Acid.	Specific Gravity.		Per cent. of Acid.	Specific Gravity.	
100	1·063	Acetic acid, *Ed.**	37	1·048	Acetic acid, *Lond.*
99	1·065	Glacial acetic acid, *Dub.*	33	1·044	Acetic acid of commerce, *Dub.*
97	1·068				
90	1·073		32	1·042	Scotch acid of commerce (strongest).
80	1·0735	Maximum density.			
70	1·070		31	1·041	Acetic acid, *U. S.*
60	1·067		30	1·040	
59	1·066	Strong acetic acid, *Dub.*	25	1·034	Pyroligneous acid, *Ed.*
54	1.063	Acid corresponding in sp. gr. to the strongest.	20	1·027	
			10	1·015	
52	1·062		6	1·008	Diluted acetic acid, *Lond.*
50	1·060		5	1·006	Diluted acetic acid, *Dub.*
40	1·051		4	1·0055	
39	1·050	English acid of commerce.	3	1·004	Diluted acetic acid, *U. S.*

Up to the specific gravity 1·062, the density of acetic acid is a pretty accurate index of its strength; but, above that specific gravity, two acids of different strengths may coincide in density. Thus, by the table, it is seen that an acid weighing 1·063 may be either the strongest possible liquid acid, or an acid containing only 54 per cent. of such acid. The ambiguity may be removed by diluting the acid with a portion of water, when, if the density be increased, the given specimen is the stronger acid of the two having the same density. The density of the English and Scotch acetic acid of commerce is given on the authority of Dr. Christison.

It is shown by the table that the Dublin "strong acetic acid" is an acid of intermediate strength, containing 59 per cent. of monohydrated acid; while the officinal acid of commerce contains variously from 25 to 37 per cent. of the same acid; the Edinburgh acid being the weakest, and the London the strongest.

Properties of the Glacial Acid (Acidum Aceticum Glaciale, *Dub.*). This acid, sometimes called *radical vinegar*, is a colourless, volatile, inflammable liquid, possessing a corrosive taste, and an acid, pungent, and refreshing smell. At the temperature of about 40° it becomes a crystalline solid. Its

* Varies to 1·065.

sp. gr. is 1·063. The anomaly of its having first an increasing and then a decreasing density, upon dilution with water, has been already noticed. It possesses the property of dissolving a number of substances, such as volatile oils, camphor, resins and gum-resins, fibrin, albumen, &c. As it attracts humidity from the atmosphere, it should be preserved in well stopped bottles. Its combinations with salifiable bases are called acetates. It consists of one eq. of dry acid 51, and one of water 9=60. The dry acid has been isolated by C. Gerhardt, who finds it to be a limpid liquid, heavier than water, and having a constant boiling point of 279°. (*Chem. Gaz.*, June 15, 1852.) Its formula is $C_4H_3O_3$.

Properties of the Acid of Commerce (Acidum Aceticum, *U. S.*, *Lond.*). This acid has similar properties to those of the glacial, but milder in degree. It is a colourless, volatile liquid, having a sharp taste and pungent smell. It unites in all proportions with water, and to a certain extent with alcohol. It is incompatible with the alkalies and alkaline earths, both pure and carbonated, with metallic oxides, and with most substances acted on by other acids. It is wholly volatilized by heat, and yields no precipitate with chloride of barium or nitrate of silver. Any fixed residue is impurity; and precipitates by the tests mentioned show the presence of sulphuric and muriatic acids. Sulphohydrate of ammonia does not discolour it. If sulphuretted hydrogen produces a milkiness, sulphurous acid is present. When saturated with ammonia, it gives no precipitate with iodide or ferrocyanuret of potassium, which proves the absence of lead and copper. If silver be digested in it, and chlorohydric acid afterwards added, no precipitate will be produced. The negative indication of this test shows the absence of nitric acid. Of the U. S. acid "100 grains saturate 60 grains of crystallized bicarbonate of potassa, and contain 36 grains of monohydrated acetic acid." This statement does not agree with that contained in the foregoing table, which gives 31 as the per centage of monohydrated acid, contained in an acid of the sp. gr. 1·041. Taking the results of Mohr, as given in the table, the acids, included under this head, contain the following per centages of monohydrated acid. *Ed.* 25; *U. S.* 31; *Dub.* 33; and *Lond.* 37. Thus it is seen that, of the acids here classed as the acetic acids of commerce, the Edinburgh is the weakest. It is also somewhat different in properties. The Ed. acid has a pale straw colour, and a strong acetic odour, scarcely empyreumatic, if the acid be well prepared. One hundred minims of it neutralize fifty-three grains of carbonate of soda. When acid of this strength is diluted with three parts of water, it forms the *wood vinegar* of the shops, containing 6·25 per cent. of monohydrated acid. As tests of its freedom from copper, lead, and sulphuric acid, the Edinburgh College directs that it should be "unaffected by sulphuretted hydrogen or solution of nitrate of baryta." This acid is used by the College as a chemical agent in preparing iodide of lead.

Uses of Crude Pyroligneous Acid. This acid having been incidentally mentioned and described as the source of the acetic acid of commerce, it may be proper in this place to notice its uses. It has been employed as an application to gangrene and ill-conditioned ulcers. It acts on the principle of an antiseptic and stimulant; the former property being probably chiefly due to the presence of creasote. Several cases in which it was successfully employed are reported in a paper by Dr. T. Y. Simons, of Charleston, S. C. (*Am. Journ. of Med. Sci.*, O. S., v. 310.)

The crude acid is advantageously applied to the preservation of animal food. Mr. William Ramsey (*Edin. Phil. Journ.*, iii. 21) made some interesting experiments with it for that purpose. Herrings and other fish, simply dipped in the acid and afterwards dried in the shade, were effectually pre-

served, and, when eaten, were found very agreeable to the taste. Herrings, slightly cured with salt by being sprinkled with it for six hours, then drained, next immersed in pyroligneous acid for a few seconds, and afterwards dried in the shade for two months, were found by Mr. Ramsey to be of fine quality and flavour. Fresh beef, dipped in the acid in summer for the space of a minute, was perfectly sweet in the following spring. Professor Silliman states that one quart of the acid, added to the common pickle for a barrel of hams, at the time they are laid down, will impart to them the smoked flavour as perfectly as if they had undergone the ordinary process of smoking.

Medical Properties of Acetic Acid of Commerce (Acidum Aceticum, *U. S., Lond.*). Acetic acid of about this strength acts as a stimulant and tonic. When diluted sufficiently, it is refrigerant, diaphoretic, and diuretic. Owing to its volatility and pungency, its vapour is frequently applied to the nostrils as an excitant in syncope, asphyxia, and headache. When employed in this manner, it is generally added to a small portion of sulphate of potassa, so as to moisten the salt, and the mixture is put into small glass bottles with ground stoppers.

Medical Properties of the Glacial Acid. This acid is only used externally, and acts as a rubefacient, vesicant, or caustic, according to the length of time it is applied. Its application requires caution. It is sometimes employed as a substitute for cantharides, when a speedy blister is desired; as, for example, in croup, sorethroat, and other cases of internal inflammation. It may be applied by means of blotting paper or cambric moistened with the acid. It is a good corrosive for destroying warts and corns, and is also a valuable remedy in scaldhead.

Off. Prep. of Acetic Acid of Commerce. Acetum Cantharidis; Acetum Colchici; Acetum Scillæ; Acidum Aceticum Dilutum; Extractum Colchici Aceticum; Morphiæ Acetas; Oxymel; Plumbi Acetas; Potassæ Acetas; Sodæ Acetas.

Off. Prep. of Glacial Acetic Acid, Dub., Ed. Acetum Cantharidis, *Ed.;* Acidum Aceticum Camphoratum, *Ed.;* Acidum Aceticum Forte; Mistura Creasoti.

Off. Prep. of Strong Acetic Acid, Dub. Acetum Cantharidis; Acidum Aceticum Camphoratum. B.

ACIDUM ARSENIOSUM. *U. S., Lond.*

Arsenious Acid.

Sublimed arsenious acid in masses. *U. S., Lond.*

Off. Syn. ARSENICUM ALBUM. *Ed.* ARSENICI OXYDUM ALBUM VENALE. *White Oxide of Arsenic of Commerce. Dub.*

White arsenic; Acide arsenieux, Arsenic blanc, *Fr.;* Arsenichte Säure, Weisser Arsenik, *Germ.;* Arsenik, *Dan., Swed., Polish;* Acido arsenioso, Arsenico, *Ital.;* Arsenico blanco, *Span.*

Arsenious acid is prepared chiefly in Bohemia and Saxony, where it is procured on a large scale, as a collateral product, during the smelting of cobalt ores, which are almost invariably accompanied by arsenic. These ores are roasted in reverberatory furnaces, with long horizontal flues. The arsenic is converted by combustion into arsenious acid, which rises in vapour, and condenses on the sides of the flues. In this state it is not pure, and requires a second sublimation, which is performed in cast iron vessels, fitted with conical heads of the same material, having an opening at the summit. The vessels are placed over a furnace, and brought to a red heat, when a portion of the impure arsenious acid is thrown in through the opening,

which is immediately stopped. This portion being sublimed, a second portion is introduced in a similar manner. Finally, the vessels are allowed to cool; and, upon removing the heads, the purified acid is found attached to them in vitreous layers, at first as transparent as glass, but gradually becoming, by contact with the air, opaque at their surface. These are broken into fragments of a convenient size, and thrown into commerce. The arsenious acid which reaches this country is generally packed in casks, containing from two to five hundred pounds, and is shipped principally from the ports of Hamburg and Bremen.

Properties. Arsenious acid, as it occurs in commerce, is in masses, exhibiting a vitreous fracture. It is of a milk-white colour exteriorly, but, internally, often perfectly transparent. As first sublimed, the whole mass is transparent; but it gradually becomes white and opaque, the change proceeding progressively from the surface inwards. This change has not been well explained; but it probably depends upon the absorption of moisture, causing a gradual passage of the acid from the amorphous to the crystalline state. (*Pereira.*) According to Guibourt, the sp. gr. of the transparent variety is 3·73, of the opaque 3·69. The experiments, however, of Dr. J. K. Mitchell and Mr. Durand make the density of the former variety from 3·208 to 3·333. As it occurs in the shops for medical use, it is often in the form of a white powder, almost as fine as flour. In this state it is sometimes adulterated with powdered chalk, or sulphate of lime, a fraud which is easily detected by exposing the powder to a heat sufficient to evaporate the arsenious acid, when these impurities will be left behind. In consequence of the liability of the acid to contain impurities when in powder, it is directed in the U. S. Pharmacopœia to be kept in masses. When pure, it is completely dissolved by boiling water. It has been erroneously stated to have an acrid taste. Dr. Christison asserts that it possesses hardly any taste; inasmuch as it produces merely a faint sweetish impression on the palate. In strong, hot solution, it has an austere taste, most nearly resembling that of sulphate of zinc. (*Mitchell and Durand.*) It has no smell, even in the state of vapour. The garlicky odour, sometimes attributed to it, belongs only to the vapour of the metal, and, when apparently arising from the acid itself, is, in fact, owing to its reduction. Its point of sublimation, according to Berzelius, is at an incipient red heat; but, according to Mitchell and Durand, it is lower than that of metallic arsenic, being only 425° of Fahr. When slowly sublimed, it condenses in regular octohedral crystals, exhibiting a sparkling lustre. It consists of one equivalent of arsenic 75, and three of oxygen 24=99.

Arsenious acid is soluble in water. According to Bussy, at the temperature of 55°, a pint of water dissolves 293 grains of the transparent variety, and only about 92 grains of the opaque. Thus the transparent acid, so far from being less, as heretofore supposed, is much more soluble than the opaque variety. The following particulars are given on the same authority. The transparent acid dissolves much more rapidly than the opaque. By prolonged ebullition with water, the opaque variety attains the same solubility as the transparent, and may be supposed to be converted into the latter. Thus, at the boiling temperature, a pint of water dissolves 807 grains of both varieties. The transparent variety, in cold saturated solution, gradually lessens in solubility, until it reaches the solubility of the opaque, no doubt in consequence of being changed into the latter. Pulverization lessens the solubility of the transparent variety, without affecting that of the opaque. The mixture of the two varieties of the acid in the same solution serves to explain the anomalies heretofore observed in its solubility. (*Journ. de Pharm.*, Nov. 1847.)

In relation to some of these results, Bussy has been anticipated by Taylor. (See *Lond. and Ed. Philos. Mag.* for Nov. 1837.)

Medical Properties. Internally, the action of the preparations of arsenic is alterative and febrifuge; externally, for the most part, violently irritant. They have been considered as peculiarly applicable to the treatment of diseases of a periodical character. At the commencement of their exhibition, the dose should be small, and afterwards gradually increased, the operation being carefully watched. When the specific effects of the medicine are produced, it must be immediately laid aside. These are, a general disposition to œdema, especially of the face and eyelids, a feeling of stiffness in these parts, itching of the skin, tenderness of the mouth, loss of appetite, and uneasiness and sickness of the stomach. The peculiar swelling produced is called *œdema arsenicalis.* Sometimes salivation is produced, and occasionally the hair and nails fall off. The principal preparations now in use are the arsenious acid, the substance under consideration, and the solution of arsenite of potassa, or Fowler's solution. The arseniates of potassa and soda are also occasionally employed. One grain of arseniate of soda, dissolved in a fluidounce of water, forms the *arsenical solution of Pearson.*

It may be questioned whether the different arsenical preparations, when exhibited internally, act precisely in the same way. It is supposed by some that the selection need only be regulated by the convenience of exhibition. The late Dr. Physick held a different opinion; for, with regard to the arsenious acid and the solution of arsenite of potassa (Fowler's solution), the result of his experience was that they act differently, and cannot be substituted for each other. Cases of the efficacy of the metal, in the form of Fowler's solution, will be noticed under the head of *Liquor Potassæ Arsenitis.* For a complete list of the diseases in which arsenic has been tried, the reader is referred to Mr. Hill's paper in the *Ed. Med. Journ.*, vols. v. and vi.

Some writers have entirely proscribed the use of the arsenical preparations in medicine, and have deprecated their introduction into the Pharmacopœias as a great evil, on the ground of the facilities afforded, by legalizing the medicinal use of the poison, for its employment in poisonous doses by mistake or design. We confess that we do not share these opinions. Arsenic is a virulent poison, and is frequently resorted to for criminal purposes; but, when it is considered how extensively it is used in the arts, it is questionable whether its exclusion from the Materia Medica would materially lessen the facility of obtaining it. On the other hand it may be asked, are poisons more dangerous as medicines than other medicinal substances, if given in their appropriate doses? We think not; though we admit that dangerous mistakes are more apt to occur from their use.

Arsenious acid has been exhibited in a great variety of diseases, the principal of which are scirrhus and cancer, especially cancer of the lip; anomalous ulcers; intermittent fever; chronic rheumatism, particularly that form of it attended with pains in the bones; diseases of the bones, especially nodes, and firm swellings of the small joints of the hands; frontal neuralgia; and different painful affections of the head, known under the names of hemicrania and periodical headache. In some trials made with it, in 1850, by Andral, in intermittent fever, its ancient reputation in the cure of that disease was fully confirmed. It was usually given by him daily, or every second day, in the large dose of between four and five-tenths of a grain in solution, administered in wine, about five hours before the occurrence of the fit. Usually, nausea was produced for several hours, and sometimes vomiting. Mr. Henry Hunt, of Dartmouth, England, found it useful in mitigating the pain of ulcerated cancer of the uterus, and in menorrhagia; also in irritable uterus,

attended with pain and bearing down in the erect posture. He gave it in pill, in the dose of a twentieth of a grain three times a day. In this dose the remedy seldom produces unpleasant feelings, and may be continued for three or four months, for which period it must sometimes be employed, in order to produce the desired effect on the uterus. Arsenious acid has been extolled as a remedy in certain cutaneous affections, particularly lepra. Dr. Pereira says that he has seen it used in a large number of cases of this disease without a single failure. It is thought highly of by some in the treatment of lupus, and of ill-looking sores of the face, lips, and tongue, and sometimes effects a cure.

The external application of arsenic has been principally restricted to cancer, and anomalous and malignant ulcers, especially of the kind denominated *noli me tangere.* Dupuytren was in the habit of using with advantage a powder, composed of one part of arsenious acid and twenty-four parts of calomel, as a topical application to herpes exedens, and to the foul ulcers occurring in those who have undergone repeated courses of mercury.

Arsenic is the chief ingredient in nearly all the empirical remedies for the cure of cancer by external application. *Plunket's caustic* was a remedy of this kind, of great celebrity, and consisted of the Ranunculus acris and Ranunculus Flammula, each an ounce, bruised, and mixed with a drachm of arsenious acid, and five scruples of sulphur. The whole was beaten into a paste, formed into balls, and dried in the sun. When used, these balls are rubbed up with yolk of egg, and spread on pig's bladder. The use of the vegetable matter is to destroy the cuticle; for, unless this is done, the arsenic will not act. Mr. Samuel Cooper thinks that this caustic was never of any permanent benefit in genuine cancer, but has effected perfect cures in some examples of lupus, and malignant ulcers of the lips and roots of the nails. In onychia maligna, Mr. Luke, of London, regards an ointment composed of two grains of arsenious acid and an ounce of spermaceti ointment as almost a specific. (Pereira, *Mat. Med.*)

At Paris, an *arsenical paste* of the following composition is used as an application to malignant ulcers:—Red sulphuret of mercury 70 parts; dragon's blood 22 parts; arsenious acid 8 parts. It is applied, made up into a paste with saliva. The pain produced by this composition is very severe, and its application dangerous. The practice of sprinkling unmixed arsenious acid on ulcers is properly reprobated, as fraught with the greatest danger. Mr. S. Cooper characterizes it as a murderous practice. The acid may, however, be used either in solution, or reduced by some mild ointment. A lotion may be formed of eight grains of arsenious acid and the same quantity of carbonate of potassa, dissolved in four fluidounces of distilled water; and a cerate, of half a drachm of arsenious acid and six drachms of simple cerate. The cerate is sometimes formed of half this strength. The lotion is in effect a solution of arsenite of potassa.

Febure's remedy for cancer consisted of ten grains of arsenious acid, dissolved in a pint of distilled water, to which were added an ounce of extract of conium, three fluidounces of solution of subacetate of lead, and a fluidrachm of tincture of opium. With this the cancer was washed every morning. Febure's formula for internal exhibition was, arsenious acid two grains, rhubarb half an ounce, syrup of chicory, q. s., distilled water, a pint. Of this mixture, a tablespoonful, which contained about the sixteenth of a grain of the acid, was given every night and morning, with half a fluidrachm of the syrup of poppies. The dose was gradually increased to six tablespoonfuls.

The average dose of arsenious acid is the tenth of a grain, three times a day, given in the form of pill. It is sometimes combined with opium, which

enables the stomach to bear the medicine better. A convenient formula is to mix one grain of the acid with ten grains of sugar, and to beat the mixture thoroughly with crumb of bread, so as to form a pilular mass, to be divided into ten pills. The *Asiatic pills*, so called, consist of arsenious acid and black pepper, in the proportion of 1 part of the former to 80 of the latter.

Properties of Arsenious Acid as a Poison. Arsenious acid, in an overdose, administered internally, or applied externally, acts with very great energy, and generally destroys life in a short time; but, in some rare cases, no well marked symptoms are developed until eight or nine hours after the ingestion of the poison. The symptoms it produces are an austere taste; fetid state of the mouth; frequent ptyalism; continual hawking; constriction of the pharynx and œsophagus; the sensation of the teeth being on edge; hickup; nausea; anxiety; frequent sinkings; burning pain at the præcordia; inflammation of the lips, tongue, palate, throat, bronchi, and œsophagus; irritable stomach, so as not to be able to support the blandest drinks; vomiting of matters, sometimes brown, at other times bloody; black, horribly fetid stools; small, frequent, concentrated, and irregular pulse, but occasionally slow and unequal; palpitations; syncope; insatiable thirst; burning heat over the whole body, or a sensation of icy coldness; difficult respiration; cold sweats; suppression of urine; scanty, red, bloody, and sometimes albuminous urine; change in the countenance; a livid circle round the eyelids; swelling and itching of the body; livid spots over the surface, and occasionally a miliary eruption; prostration of strength; loss of feeling, especially in the feet and hands; delirium; convulsions, often accompanied with insupportable priapism; falling off of the hair, detachment of the cuticle, &c. Sometimes there exist inflammation and burning pain in the urino-genital organs. It is very rare to observe all these symptoms in the same individual. Sometimes, indeed, they are nearly all wanting, death taking place without any pain or prominent symptom. Occasionally the symptoms have a perfect resemblance to those of Asiatic cholera, in the stage of collapse. After death, the morbid appearances are various. In some cases, no vestige of lesion can be discovered. The appearances, however, in the generality of cases, are the following. The mouth, stomach, and intestines are inflamed; the stomach and duodenum exhibit spots resembling eschars, and perforations of all their coats; and the villous coat of the former is in a manner destroyed, and reduced to the consistence of a reddish-brown pulp. In cases of recovery, it has been a question how long it takes for the poison to be eliminated from the system. In a case, reported by Dr. D. Maclagan, in which about two drachms of the poison were swallowed, and in which magnesia was used successfully as an antidote, arsenic was detected in the urine by Marsh's test as late as the twentieth day. (*Ed. Monthly Journ. of Med. Sci.* for Feb. 1852.)

In view of the numerous accidents and crimes, caused by the use of arsenious acid, its sale should be regulated by law in all the States of the Union. In 1851, an act for this purpose was passed by the British Parliament.

Dr. Christison divides the poisonous effects of arsenious acid into three orders of cases, according to the character and violence of the symptoms. In the first order, the poison produces symptoms of irritation and inflammation along the course of the alimentary canal, and commonly kills in from one to three days. In the second, the signs of inflammation are moderate, or even altogether wanting, and death occurs in five or six hours, at a period too early for inflammation to be always fully developed. In the third order of cases, two stages occur, one in which inflammatory symptoms are developed, as in the first order; the other, marked by symptoms referable to nervous irritation,

such as imperfect palsy of the arms or legs, epilepsy, tetanus, hysterical affections, mania, and coma. It is a general character of this poison to induce inflammation of the stomach in almost all instances, provided death does not take place immediately, whatever be the part to which it is applied. Thus the poison, when applied to a fresh wound, will give rise to the same morbid appearances in the stomach and intestines, as when it is swallowed. In some cases, observed by Drs. Mall and Bailie, the rectum was much inflamed, while the colon and small intestines escaped.

The precise rank which should be assigned, in the scale of poisons, to arsenious acid when applied externally, is still undetermined. One set of observers contend that its external application is not attended with great danger; while another party conceives that it acts as a virulent poison. Hunter, Sir Everard Home, Jœger, Brodie, Dr. Campbell, of Edinburgh, Smith, and Orfila, have all adduced experiments on the inferior animals, which prove that arsenious acid, inserted into a recent wound, causes death after a longer or shorter period. Indeed, some observations go to prove that its poisonous effects are developed by a smaller amount, used in this way, than when taken into the stomach. Nor are there wanting many well authenticated facts of its deleterious effects, externally applied, on the human constitution. Roux reports the case of a young woman under his care, whose death was caused, after agonizing sufferings, by the application of an arsenical paste to a cancerous breast. A case is related of death from the application of an arsenical paste to a soft tumour of the temple; the poisonous effects on the system at large being the cause of the fatal result. (*Archives Générales*, ii. 230.) Sir Astley Cooper, in his lectures, bears testimony to the dangerous effects of arsenic, externally applied. On the other hand, some writers assert the safety of the external application of this poison. Mr. Blackadder applied it in large quantities to sores, and never witnessed a single instance in which it acted constitutionally. The late Dr. Randolph, of this city, stated that Dr. Physick frequently and successfully employed arsenic by external application, without its being productive of the injurious consequences which have been attributed to it. (*North Amer. Med. and Surg. Journ.*, v. 257.) In weighing such conflicting testimony, we are constrained to believe that the circumstances of the different experiments and observations must have been different; and we think that the observations of Blackadder and Harles show in what this difference consists. It seems to depend entirely on the circumstances of the application, as being favourable or otherwise to absorption. Blackadder attributes his very success to the large quantities of the arsenic which he employs, and which, he contends, kills the part without being absorbed; and this is probably the fact. Harles's observations may be explained on the same principle. He contended that the outward application of arsenic is comparatively safe to ulcers, either common or malignant; but is dangerous to parts recently wounded and pouring out blood. Here the difference would seem to consist in the greater liability to absorption in the latter than in the former case. The very dilution caused by the blood may be an efficient promoter of absorption; for the experiments of Dr. Campbell show that arsenic acts with more energy when dissolved in water, than when in the solid state. The case in which Dr. Randolph employed this mineral, by the advice of Dr. Physick, was one of ulcerated scrotum, in which it acted by producing the death of the diseased part, a state evidently unfavourable to absorption. The formula employed was one part of arsenious acid to five of sublimed sulphur.

Arsenious acid, when it produces the death of a part, does not act, strictly speaking, as an escharotic. According to Liebig and other physiologists,

it destroys the vitality of the organized structure, by entering into combination with it. The true escharotic produces the decomposition of the part to which it is applied, a state incompatible with life.

Upon the whole, new facts are wanting to clear up this difficult subject. Judging from the lights we possess, the external application of arsenious acid, in case it is absorbed, is attended with very great danger; and the conditions of a part, and of the system at large, favourable or otherwise to absorption, are too little understood, to make it warrantable to use this poison externally without the greatest caution.

Treatment of Poisoning by Arsenious Acid. Before the antidote, to be mentioned presently, can be obtained, the poison should be dislodged as far as possible by free vomiting, induced by the finger, the feather part of a quill, and the administration of an emetic of sulphate of copper, or sulphate of zinc. The same object is promoted by the use of the stomach-pump. Demulcent drinks should at the same time be freely given, such as milk, white of eggs and water, or flour and water, which serve to encourage the vomiting and envelope the poison.

The antidote above referred to is the hydrated sesquioxide (peroxide) of iron in the *moist* or *pulpy* state. As soon as it is ready, it must be given in doses of a tablespoonful to an adult, of a dessertspoonful to children, every five or ten minutes, until the urgent symptoms are relieved. It is calculated that the quantity taken should be at least twelve times the supposed amount of the poison swallowed; but, as the antidote is perfectly innocent, it is prudent to give it in larger quantities. According to the experiments of E. Riegel, one part of arsenious acid in solution is so fully precipitated by ten of the dry oxide, that, after its action, not a trace of the poison can be detected, even by Marsh's test. (*Chem. Gaz.*, Aug. 1, 1847.) Its efficacy is of course greater, the sooner it is administered after the ingestion of the poison; but, even after delay, its use will prove advantageous, so long as there is reason to believe that a portion of the poison still remains in the stomach. The antidote acts by producing with the poison, by a transfer of oxygen from the oxide to the acid, an insoluble, and therefore inert, subarseniate of protoxide of iron ($2Fe_2O_3 \text{and} AsO_3 = 4FeO, AsO_5$). The manner of preparing the antidote will be given under another head. (See *Ferri Oxidum Hydratum*, U. S.) It should be kept by all apothecaries ready for use.

This antidote for arsenious acid was discovered by Drs. Bunsen and Berthold, of Göttingen, in 1834; and its efficacy has been abundantly confirmed by experiments on inferior animals, and by its successful application to numerous cases of poisoning in the human subject. Among others, the reader is referred to the following:—1. The case of M. Blondel, in which two drachms of arsenic had been swallowed. (*Amer. Journ. of Pharm., new series*, i. 350, from the *Journ. de Chim. Méd.*) 2. Two cases treated by Dr. Buzorini. (*French Lancet*, Nov. 17, 1835.) 3. A case reported by Mr. John Robson, in which more than a drachm and a half of the poison had been swallowed, and the antidote was not administered until two hours after the poison had been taken. In the last-mentioned case, about an hour after the ingestion of the poison, the stomach-pump was used, but unsuccessfully, on account of the instrument becoming choked with the remains of food. (*Amer. Journ. of the Med. Sci.*, xx. 522, from the *London Med. Gazette*, Nov. 5, 1836.) 4. Case related by Dr. Thomas, of Baltimore, in which twenty grains of the poison had been swallowed. (*Amer. Med. Library and Intelligencer*, ii. 205.) 5. Case of Dr. Macdonald in the *New York Journ. of Medicine and Surgery*, ii. 205. 6. Case reported by Dr. Gerhard. (*Med. Exam.*, iii. 250.) 7. Cases related

by Drs. Smiley and Wallace, of this city. Eight persons in one family were poisoned, of whom six recovered and two died. In the fatal cases, the patients could not retain the antidote. (*Med. Exam.*, iii. 679.)

Several valuable observations have been latterly made in relation to the antidotal powers of the different oxides of iron, and the circumstances which influence their efficacy. The forms of oxide experimented with are the anhydrous sesquioxide (colcothar), the dry hydrated sesquioxide (rust of iron, and the subcarbonate of iron of the U. S. Pharmacopœia, which are both essentially hydrated oxides), the hydrated oxide in the state of pulp or magma, and the same oxide kept under a stratum of water. Orfila has shown that *colcothar* is without effect, because it does not combine with the arsenious acid. Dr. Von Specz, of Vienna, has proved that *rust of iron* acts as an antidote to arsenious acid; but, as it is much less powerful than the pulpy hydrate, it should be used only in the absence of the latter, and until it can be procured. Orfila agrees with Von Specz as to the degree of efficacy of the rust, and attributes its inferior power to its inability *completely* to neutralize the arsenious acid. According to the French toxicologist, it forms with the acid a subsalt which is poisonous, though much less so than the free arsenious acid. All the best authorities unite in considering the *hydrated oxide* in the state of *pulp* or *magma* to be the best form of the antidote; but opinions are divided as to the necessity of its being *freshly* prepared as well as moist, and as to the relative advantage of much or little water, to maintain it in the moist state. An able paper, published by Prof. William Procter, jun., of this city, appears to have settled these disputed points. (*Amer. Journ. of Pharmacy*, xiv. 29, April, 1842.) He has proved that the moist oxide gradually decreases in its power of neutralizing arsenious acid, the longer it is kept; and that this decrease in power is more rapid in the oxide, when mixed with much water, than when in the form of a thick magma. The cause of this diminution of neutralizing power, on the part of the moist oxide by being kept, is explained by the experiments of G. C. Wittstein. This chemist finds that the hydrated oxide of iron, recently precipitated, dissolves readily in acetic and other vegetable acids in the cold, but becomes nearly insoluble when kept for some time under water. This change in solubility is attributed by Wittstein to two causes, the gradual change of the oxide from the amorphous to the crystalline state, and its partial dehydration; for, after being kept a long time, the oxide loses half its water. From these considerations, Wittstein prefers the more recent oxide as an antidote for arsenic, and recommends that the preparation should be re-made every six months or year, by dissolving the old oxide in muriatic acid, and re-precipitating with ammonia. (*Journ. de Pharm.*, Fév. 1847, from *Buchner's Repert.*, xliii. 366.) In the latter remarks, Wittstein has only confirmed what had been previously observed by Procter.

It follows from the above facts and observations, that the forms of sesquioxide of iron are efficacious as antidotes to arsenic in the following order, beginning with the one having the least power:—1, dry hydrated oxide; 2, hydrated oxide, long kept and mixed with much water; 3, the same, long kept, and in the form of a thick magma; 4, the same just precipitated and still pulpy. The form of antidote which can be obtained first must be used first, although not the best, and may be replaced by a better as soon as it can be procured. The apothecary should, therefore, always keep the oxide in the form of thick magma, and be prepared, at a moment's warning, to make the antidote. When applied to for it, he must instantly furnish the magma, or, if unprovided with this, the rust or precipitated subcarbonate, and immediately proceed to prepare the antidote, which may be done in ten

or fifteen minutes, if the proper solutions are always kept ready for effecting the precipitation. (See *Ferri Oxidum Hydratum.*)

The antidote having been faithfully applied, the subsequent treatment consists in the administration of mucilaginous drinks. Should the patient survive long enough for inflammatory symptoms to arise, these must be combated on general principles. Accordingly, venesection and leeches may become necessary; and, in the course of the treatment, emollient enemata, antispasmodics, and narcotics will often prove useful in mitigating pain and allaying nervous irritation. Convalescence is generally long and distressing; and hence it is of the greatest importance to attend to the diet, which should consist exclusively of milk, gruel, cream, rice, and similar bland articles.

Bussy has proposed light magnesia, or the kind which has not been too strongly calcined, as well as recently precipitated gelatinous magnesia, as an antidote for arsenious acid; and a case is given by him in which it proved efficacious. (*Journ. de Pharm.*, x. 81.) The dense kind has very little efficacy. Dr. Christison also saw a case in which this antidote seemed very serviceable. A successful case is also reported by Cadet-de-Gassicourt (*Journ. de Pharm.*, Mars, 1848); and another by Dr. E. Bissel, of Norwalk, Conn. (*Am. Journ. of Med. Sci.* for July, 1848.) For the full precipitation of arsenious acid, eighteen times its weight of anhydrous magnesia are required. (*E. Riegel.*) Like the sesquioxide of iron, the magnesian antidote is conveniently kept, in a pulpy state, in stoppered bottles under water. M. Schroff has made some experiments on rabbits, to determine the comparative efficacy, as antidotes, of the sesquioxide and magnesia, and gives the preference to the latter. For the salts of the acids of arsenic, the subacetate of the sesquioxide of iron has been suggested as an antidote by Duflos. In poisoning by these salts, the sesquioxide is said to be without effect.

Reagents for detecting Arsenious Acid. As arsenic is so frequently employed for criminal purposes, it becomes important to detect its presence in medico-legal investigations. The tests for it may be divided into, 1st, those which indicate indirectly its presence; and 2d, those which demonstrate its presence incontestably, by bringing it to the metallic state. The former embrace all the liquid reagents, so called; the latter, the different processes for metallization.

The most characteristic reagents, according to Dr. Christison, are *sulphuretted hydrogen, ammoniacal nitrate of silver, and ammoniacal sulphate of copper.* In the opinion of that writer, the concurrent indications of these three tests are all-sufficient for detecting, in an infallible manner, the presence of arsenious acid; but we think that, in questions involving life, the metallization of the poison should never be omitted.

In using sulphuretted hydrogen, the solution must be neutral. An excess of alkali may be neutralized with acetic acid; and an excess of nitric or sulphuric acid by potassa. A slight excess of acetic acid is not hurtful, but rather favours the subsidence of the precipitate, which is the tersulphuret of arsenic. According to Dr. Christison, this test is so exceedingly delicate, that it detects the poison when dissolved in one hundred thousand parts of water. The colour it produces is lemon or sulphur-yellow; but the presence of vegetable or animal matter commonly gives it a whitish or brownish tint. Some medical jurists recommend the use of sulphuretted hydrogen water; but the gas is far preferable. It can be applied with much convenience by using one of Dr. Hare's self-regulating gas generators.

The ammoniacal sulphate of copper is a test of very great delicacy. The precipitate occasioned by it is the arsenite of copper, of an apple-green or

grass-green colour. Its operation is prevented by muriatic, nitric, sulphuric, acetic, citric, and tartaric acids in excess; as also by ammonia.

Of the three tests mentioned, perhaps sulphuretted hydrogen is the most delicate; and it has the advantage of yielding a precipitate eligible for subsequent reduction. But they are all liable to the objection of being obscured in their indications, where the amount of poison is minute, by the presence of organic principles; a complication constituting the most difficult problem that can be presented to the attention of the medical jurist. As this case includes all others of more easy solution, we shall suppose it to occur, and shall indicate the steps which are to be pursued.

Having obtained general indications of the presence of arsenic, the first step will be to separate the organic matters; the second, to throw down the arsenic by means of sulphuretted hydrogen; and the third, to reduce the precipitate obtained to the metallic state.

The following are the directions given by Dr. Christison for separating the organic principles. Boil the suspected matter with distilled water for half an hour, and filter, first through gauze to separate the coarser particles, and afterwards through paper. To the transparent solution thus obtained, add acetic acid, which will coagulate some animal principles. To ascertain whether the solution has been sufficiently freed from animal matter by this measure, neutralize with ammonia, and test a small portion of it with the ammoniacal nitrate of silver. If this gives a characteristic precipitate, the solution is sufficiently deprived of animal matter; if not, another measure must be adopted to separate it. This consists in first rendering the solution neutral or slightly alkaline, next faintly acidulating with muriatic acid, and then adding an excess of nitrate of silver. This salt precipitates the animal matter in combination with oxide of silver. After this step, the excess of silver is thrown down by a slight excess of chloride of sodium, and the solution filtered.

The solution having in this manner been disembarrassed of organic matter, the free nitric acid is neutralized by potassa in slight excess, and the solution acidulated with acetic acid. A stream of sulphuretted hydrogen is then passed through it, which will throw down the arsenic as the tersulphuret. If the proportion of arsenic be very small, a yellowishness only will be produced, owing to the precipitate being soluble in an excess of the precipitant. In this case it is necessary to boil, to drive off the excess of sulphuretted hydrogen. The precipitate is then collected and dried. If it be very minute, it must be allowed to subside, and, the clear liquid having been withdrawn, the remainder is to be poured upon a filter. After filtration, the precipitate is washed down to the bottom of the filter, by means of the *pipette*, an instrument employed for washing scanty precipitates. The filter is then gently pressed between folds of bibulous paper, and the precipitate removed with the point of a knife before it dries, and then dried in little masses on a watch-glass. In this manner, Dr. Christison states that it is easy to collect a portion of the tersulphuret so small as the twenty-fifth part of a grain. When the precipitate is small and not easily separated, Devergie recommends to dissolve it in a small quantity of ammonia, to filter the solution, and then evaporate it in a watch-glass, when the tersulphuret will be left. The precipitate is then to be reduced by means of a flux, which this author recommends to consist of two parts of ignited carbonate of soda and one of charcoal, as preferable to black flux. The best flux for arsenious acid is freshly ignited charcoal.

Some years ago, it occurred to Dr. Clarke, of Aberdeen, that arsenic might be separated and detected by taking advantage of the volatility of its chloride.

Following up this idea, Dr. Andrew Fyfe, of Aberdeen, has applied it to the separation of arsenic when mixed with organic matter. For this purpose, he heats the arsenical liquid with sulphuric acid in a flask, to which a bent tube and cooled receiver are adapted. When the mixture is brought to the boiling point, a little dried sea-salt is added, the receiver is connected, and the distillation is continued for some time. Hydrochloric acid is evolved, which, by reacting with the arsenious acid, produces terchloride of arsenic, which distils over free from organic matter. The terchloride of arsenic is then to be precipitated by a stream of sulphuretted hydrogen, to obtain the yellow tersulphuret of arsenic. (*Philos. Mag.*, 4th series, ii. 487.)

The general formula for reduction is as follows. The operation is performed in a small glass tube. If the matter to be operated on is small, it is introduced to the bottom of the tube, and then a little of the flux is added to cover it, care being taken that the materials are conducted to the place they are to occupy, by means of a small glass funnel with a slender stem, without soiling the empty part of the tube. The heat is applied by means of a spirit lamp, the upper part of the material being first heated with a small flame, and afterwards the lower part with a larger flame. A little water, disengaged at first, should be removed by a roll of filtering paper, before sufficient heat has been applied to sublime the metal. When the dark crust begins to form, the tube should be held quite steady, and in the same part of the flame. This crust is the metallic arsenic, having the surface next the tube resplendent and polished, and the interior surface crystalline. Its characters are quite distinct, even when it does not amount to more than the three-hundredth part of a grain. If any doubt should be felt as to the nature of the crust, it may be driven up and down the tube, so as to convert it into sparkling octohedral crystals of arsenious acid, the triangular facets of which may be seen with a magnifying glass. Finally, the crystals may be dissolved in a drop or two of distilled water, and the solution will react characteristically with the liquid tests.

Another method of testing for arsenic has been proposed by Mr. Marsh. (*Edin. New. Phil. Journ.* for Oct. 1836.) It consists in taking advantage of the power, which nascent hydrogen possesses, of decomposing the acids of arsenic, with the result of forming water and arseniuretted hydrogen. The liquid from the stomach, or obtained from its contents by boiling water, is mixed with some dilute sulphuric acid, and placed in a self-regulating generator of hydrogen, in which a piece of zinc is suspended. The materials are here present for the production of hydrogen; but if the liquid from the stomach contain arsenic, the nascent hydrogen will combine with the metal, and the nature of the compound gas formed may be ascertained by burning a jet of it from a fine jet-pipe connected with the generator. The flame will have a characteristic blue colour, and, by holding a porcelain plate over it, a thin film of metallic arsenic will be deposited. Liebig and Mohr bear testimony to the delicacy of this test; but, to remove every source of fallacy, it is necessary to be sure of the purity of the apparatus by a preliminary trial of the hydrogen, before the suspected liquid is added; as zinc and sulphuric acid are both liable to contain a minute proportion of arsenic. The pieces of zinc employed should be changed after every experiment. A modification of Marsh's apparatus, which is praised by Berzelius for the certainty and distinctness of its results, is figured in the 54th No. of the *Chem. Gazette.*

Marsh's test has been objected to by Mr. L. Thompson, who alleges that antimony forms a compound with hydrogen, very similar to arseniuretted hydrogen, both in the colour of its flame, and in the metallic spot which it deposits during combustion on cold surfaces. Still, the two metals may be

discriminated by acting on the metallic spot with a drop or two of fuming nitric acid, with the aid of heat. Arsenic will thus be converted into soluble arsenic acid, precipitable brick-red by nitrate of silver; antimony, on the other hand, into insoluble antimonic acid. Another way of distinguishing them, is to apply to them a solution of hypochlorite of soda, which instantly dissolves the arsenical spots, without affecting those of antimony.

Another mode of discriminating between arsenical and antimonial crusts or spots, dependent on the difference of temperature at which the two metals are sublimed, has been recently proposed by Dr. D. Maclagan, of Edinburgh. It consists in subjecting the metallic spot to about the temperature of 500°, by means of a bath of olive oil; when it will be totally volatilized, if arsenic, but remain unchanged, if antimony. (*Ed. Month. Journ.*, Nov. 1848.)

Professor Reinsch has proposed a new method for detecting arsenic in organic liquids, which is praised by Dr. Christison as having the advantage of leaving none of the metal in the subject of analysis. It also has the merit of facility and celerity. It consists in acidulating the suspected liquid with muriatic acid, and boiling in it, for ten minutes, a slip of copper foil, on which the arsenic is deposited as a white alloy; and then separating it in the state of arsenious acid, by subjecting the copper, cut into small chips, to a low red heat in the bottom of a small glass tube. The peculiar crystalline appearance of arsenious acid, mentioned in the last page, is conclusive of its presence. The form of copper, preferred by Dr. Maclagan, is that of copper wire, No. 24, made bright by being rubbed with sand-paper, and rolled into a loose spiral, about an inch long, by being twisted round a small pencil. In this form, the copper is easily removed from the organic mixture, and affords an extensive surface for the deposition of the arsenic. The merit of Reinsch's test is not that it gives a characteristic deposit on the copper; for bismuth, tin, zinc, and antimony give a similar deposit; but that the copper collects all the arsenic from the organic liquid, and presents it in a convenient form for applying the liquid and subliming tests.

It has been shown by MM. Malaguti and Sarzeau that, for the detection of minute quantities of arsenic in the viscera of exhumed bodies, the best method of proceeding is to distil them with aqua regia, made by mixing one part of nitric with three of hydrochloric acid. The animal matter (the liver for example), cut into small pieces, is dried by a gentle heat, and mixed with a quantity of the aqua regia, equal to the weight of the matter before being dried. The mixture is distilled, and the arsenic, if present, comes over in the form of the volatile terchloride, which may be converted into the tersulphuret in the usual manner. (*Journ. de Pharm.*, xxiii. 27, Jan. 1853.)

Off. Prep. Acidum Arseniosum Purum; Arsenicum Purum; Liquor Arsenici Chloridi; Liquor Potassæ Arsenitis. B.

ACIDUM CITRICUM. *U. S., Lond., Ed., Dub.*

Citric Acid.

Acidum limonis, *Lat.*; Acide citrique, *Fr.*; Citronensäure, *Germ.*; Acido citrico, *Ital., Span.*

Citric acid is the peculiar acid to which limes and lemons owe their sourness. It is present also in the juice of other fruits; such as the cranberry, the red whortleberry, the berry of the bittersweet, the red gooseberry, the currant, the strawberry, the raspberry, the tamarind, and the red elderberry (fruit of Sambucus racemosa rubra). The latter berry contains citric acid so abundantly, that it has been proposed as a source of the acid by M. Thibierge, of Versailles.

The acid is extracted from lemon or lime juice by a very simple process, for which we are indebted to Scheele. The boiling juice is first completely saturated with carbonate of lime (chalk or whiting) in fine powder, and the citrate of lime formed is allowed to subside. This is then washed repeatedly with water, and decomposed by diluted sulphuric acid. An insoluble sulphate of lime is immediately formed, and the disengaged citric acid remains in the supernatant liquor. This is carefully concentrated in leaden boilers, until a pellicle begins to form, when it is transferred to other vessels in order to cool and crystallize.

Preparation on the Large Scale. The juice is placed in a large vat, closed at the top, and saturated with whiting (carbonate of lime). Carbonic acid gas is evolved, which passes out by an exit-pipe, and may be used in the manufacture of bicarbonate of soda; and citrate of lime precipitates. The supernatant liquor, containing much extractive matter, is drawn off; and the citrate of lime is decomposed by dilute sulphuric acid, liberating the citric acid, and precipitating the lime as a sulphate. The mixture of citric acid and sulphate of lime is run off into a wooden filter back, furnished with a perforated false bottom, and lined throughout with lead, covered with stout twilled flannel. The solution of citric acid passes off through a pipe, leading from the bottom of the back, to suitable reservoirs. The sulphate is washed, until it becomes tasteless, and the washings are run off into the same reservoirs. The filtered acid solution is then concentrated by evaporation in wooden vessels lined with lead, through which steam is made to pass by means of coiled lead pipes. As citric acid is liable to decomposition, if subjected to too high a temperature, the use of the vacuum pan is highly advantageous in concentrating the solution. When the liquor is sufficiently concentrated, it is transferred to cylindrical sheet-lead vessels, placed in a warm situation, to crystallize. The crystals, as first obtained, are coloured. In order to purify them, they are redissolved in a small quantity of water, with the assistance of heat, and the solution is digested with purified animal charcoal, filtered, and recrystallized. The crystals, after having been washed and drained, are dried on wooden trays, lined with sheet-lead, placed in a room heated by steam.

The citrate of lime of the above process should be decomposed without delay; for, if kept, it will undergo a true fermentation, with the effect of destroying the citric acid. According to Personne, the products of this fermentation are acetic and butyric acids, while carbonic acid and hydrogen are evolved.

According to the late Mr. Parkes, a gallon of good juice, if the process be well conducted, will yield eight ounces of white crystals. But the product depends very much on the proportion of citric acid in the juice, which is very variable. The more recent the juice the better the quality. That which is stale will sometimes be quite sour, without containing any citric acid, in consequence of its having undergone the acetous fermentation.

It is desirable to have a slight excess of sulphuric acid; as it rather favours than otherwise the crystallization of the citric acid. It is found necessary, also, to add occasionally a small proportion of sulphuric acid to the citric acid liquor, during the progress of its concentration.

Citric acid is properly placed in the Materia Medica list of the United States, London, and Dublin Pharmacopœias, as an article purchased from the manufacturing chemist. The Edinburgh College places it among the preparations, and makes it by a process of which the following is an outline. Boil eighty fluidounces of lemon juice, and allow it to rest, in order that the mucilage and other impurities may subside. Pour off the clear liquor, and,

having brought it to the boiling point, add by degrees four and a half ounces of prepared chalk, or as much as may be sufficient to saturate the acid. Collect the precipitate, and wash it with hot water until the water passes colourless. Then subject it to a powerful press, and, having mixed it uniformly with forty fluidounces of distilled water, add officinal diluted sulphuric acid by degrees, in the proportion of eight fluidounces for every ounce of chalk expended in the saturation, constantly stirring the mixture. Separate now the clear liquor by subsidence or filtration, wash the insoluble matter with cold water, add the washings to the liquor, concentrate it with a gentle heat until crystals form on the surface, and set it aside to cool and crystallize. The crystals are then to be subjected to repeated solution and crystallization until they are colourless.

If the citrate of lime be exactly decomposed by the sulphuric acid, without the latter being in excess, the citric acid set free will not be contaminated by sulphuric acid. In order to determine whether the acid liquor, remaining after the subsidence of the sulphate of lime, is all citric acid, the Edinburgh College directs that a small filtered portion of it should be tested with nitrate of baryta. If the acid liquor contain only citric acid, the precipitate will be citrate of baryta, and wholly soluble in nitric acid; but if sulphuric acid be present also, it will be a mixture of citrate and sulphate of baryta, and not wholly soluble in nitric acid, the sulphate not being soluble in that acid. Accordingly, if the precipitate be not wholly soluble in nitric acid, citrate of lime must be added to the acid liquor until the sulphuric acid is almost entirely removed.

The preliminary boiling of the lemon juice, directed by the Edinburgh College, is intended to render the mucilage and other impurities insoluble, whereby they are got rid of by subsidence. According to Dr. Christison, the juice may be advantageously clarified by albumen.

Properties. Citric acid is a white crystallized solid, often in large crystals, having the form of rhomboidal prisms with dihedral summits. It is permanent in a dry air, but becomes moist in a damp one. Its sp. gr. is 1·6. Its taste is strongly acid, and almost caustic. When heated, it dissolves in its water of crystallization, and, at a higher temperature, undergoes decomposition, becoming yellow or brown, and forming a very sour syrupy liquid, which is uncrystallizable. By destructive distillation, it gives rise to water, empyreumatic oil, acetic and carbonic acids, carburetted hydrogen, and a number of pyrogenous acids, among which is the *aconitic*. A voluminous coal is left.

Citric acid dissolves in three-fourths of its weight of cold, and half its weight of boiling water. It is also soluble in alcohol. A weak solution of it has an agreeable taste, but cannot be kept, as it undergoes spontaneous decomposition. It is incompatible with alkaline solutions, whether pure or carbonated, converting them into citrates; also with the earthy and metallic carbonates, most acetates, the alkaline sulphurets, and soaps. It is characterized by its taste, by the shape of its crystals, and by forming an insoluble salt with lime, and a deliquescent one with potassa. If sulphuric acid be present, the precipitate by acetate of lead will not be entirely soluble in nitric acid; the insoluble portion being sulphate of lead. Sometimes large crystals of tartaric acid are substituted for or mixed with the citric, a fraud which is readily detected by adding a solution of carbonate of potassa to one of the suspected acid; when, if tartaric acid be present, a crystalline precipitate of bitartrate of potassa (cream of tartar) will be formed. Lime or other fixed impurity is detected by incinerating the acid, either alone or with red oxide of mercury, when the fixed matter will be left. According to the U. S. Pharmacopœia, 100 grains of citric acid saturate 150 grains of bicarbonate of potassa.

Composition. The formula of this acid, considered dry, as it exists in the citrate of silver, is $C_{12}H_5O_{11}$. When crystallized from its solution by cooling, it contains four eqs. of water, three of which are basic.

Medical Properties. Citric acid is principally employed for making a substitute for lemonade, and in the composition of effervescing draughts. It is used also for preparing the neutral mixture. (See *Liquor Potassæ Citratis.*) When added in the quantity of nine drachms and a half to a pint of distilled water, it forms a solution of the average strength of lemon juice. Of this solution, or of lemon juice, a scruple of bicarbonate of potassa saturates three fluidrachms and a half; a scruple of carbonate of potassa, four fluidrachms; and a scruple of carbonate of ammonia, six fluidrachms. Half a fluidounce of lemon juice, or of an equivalent solution of citric acid, when saturated, is considered a dose. An agreeable substitute for lemonade may be made by dissolving from two to four parts of the acid, mixed with sugar and a little oil of lemons, in nine hundred parts of water; or a scruple of the acid may be dissolved in a pint of water, and sweetened to the taste with sugar which has been rubbed on fresh lemon peel.

Off. Prep. Ferri Ammonio-citras; Ferri Citras; Liquor Ammoniæ Citratis; Liquor Magnesiæ Citratis; Liquor Potassæ Citratis; Potassæ Citras; Pulveres Effervescentes Citrati; Syrupus Acidi Citrici. B.

ACIDUM MURIATICUM. *U. S.*

Muriatic Acid.

An aqueous solution of chlorohydric acid gas of the specific gravity 1·16. *U. S.*

Off. Syn. ACIDUM HYDROCHLORICUM. *Lond.* ACIDUM MURIATICUM PURUM. *Ed., Dub.* ACIDUM MURIATICUM. *Hydrochloric Acid of Commerce. Ed.* ACIDUM MURIATICUM VENALE. *Commercial Muriatic Acid. Dub.*

Spirit of sea-salt, Marine acid, Hydrochloric acid, Chlorohydric acid; Acide hydrochlorique, *Fr.*; Salzsäure, Kochsalzsäure, *Germ.*; Acido muriatico, *Ital., Span.*

The muriatic acid of pharmacy and the arts is a solution of muriatic acid *gas* in water. It is sometimes called *liquid* muriatic acid, but more properly *aqueous* muriatic acid. The acid is officinal in its pure form in the U. S. and London Pharmacopœias, and both in its pure and commercial forms in the Edinburgh and Dublin. The sp. gr. of the pure acid is directed to be 1·16 in the U. S. and London Pharmacopœias, 1·17 in the Edinburgh, and 1·176 in the Dublin. The Edinburgh and Dublin Colleges give processes for the preparation of the pure acid; while, in the United States and London Pharmacopœias, it is placed exclusively in the list of the Materia Medica, as an article to be procured from the manufacturing chemist.

Preparation. Muriatic acid is obtained by the action of sulphuric acid on chloride of sodium or common salt. The commercial acid is procured, on a large scale, by distilling the salt with an equal weight of sulphuric acid, somewhat diluted with water, from iron stills furnished with earthen heads, into earthenware receivers containing water. When thus obtained, it is contaminated with iron and other impurities, and is not fit for medicinal purposes.

Commercial muriatic acid is now procured in large quantities in England, during the decomposition of common salt for the purpose of making sulphate of soda, from which soda-ash and carbonate of soda are afterwards manufactured in immense quantities. When the object is to obtain sulphate of soda, the decomposition of the sea salt is performed in semi-cylindrical vessels, the

curved part, next the fire, being made of iron, and the upper or flat surface, of stone. If the acid be saved, it is conveyed by a pipe to a double-necked stoneware receiver, half filled with water, and connected with a row of similar receivers, likewise containing water.

The acid, when required to be pure, is generally prepared by saturating distilled water with the gas in a Woulfe's apparatus. A quantity of pure fused* common salt is introduced into a retort or matrass, placed on a sand-bath. The vessel is then furnished with an S tube, and connected with a series of bottles, each two-thirds full of water. A quantity of sulphuric acid is then gradually added, equal in weight to the common salt employed, and diluted with one-third of its weight of water. The materials ought not to occupy more than half the body of the retort. When the extrication of the gas slackens, heat is to be applied, and gradually increased until the water in the bottles refuses to absorb any more, or until no more gas is found to come over. As soon as the process is completed, boiling water should be added to the contents of the retort or matrass, in order to facilitate the removal of the residue. During the progress of the saturation, the water in the several bottles increases in temperature, which lessens its power of absorption. It is, therefore, expedient, in order to obtain a strong acid, to keep the bottles cool by means of water or ice. The connecting tubes need not plunge deeply into the acid.

The rationale of the process for obtaining this acid is very simple. Common salt is a compound of chlorine and sodium; muriatic acid, of chlorine and hydrogen; and liquid sulphuric acid, of dry sulphuric acid and water. The water is decomposed; its oxygen, combining with the sodium of the common salt, generates soda, which unites with the sulphuric acid to form sulphate of soda; while the hydrogen and chlorine, being both in the nascent state, combine and escape as muriatic acid gas. The residue of the process is consequently sulphate of soda, or Glauber's salt. It is reserved by the Edinburgh College to be dissolved and crystallized, in order to form the officinal sulphate of soda. (See *Sodæ Sulphas.*)

In making pure muriatic acid, the *Edinburgh* College directs equal weights of purified and well dried salt, *pure* sulphuric acid, and water. The following is the Dublin process, the ounces employed being *avoirdupois* ounces. Pour upon 48 ounces of dried salt, previously introduced into a globular flask having the capacity of at least a gallon (*Imp. meas.*), 44 fluidounces (equal to about 81¼ ounces) of sulphuric acid of commerce, diluted with 32 ounces of water, and allowed to cool before being added. Then, applying a gentle heat, conduct the muriatic acid gas into a bottle, containing 44 ounces of distilled water, by means of a bent tube dipping about half an inch beneath its surface, and continue to distil until 3 pints (*Imp. meas.*) of product are obtained. Throughout the operation, the temperature of the distilled water must be prevented from rising by the application of cold.

In the process for muriatic acid, theory calls for a little less than 82 parts of liquid sulphuric acid to 100 of common salt. Thus it appears that the Edinburgh College, directing 100 of acid to 100 of salt, uses a considerable excess of the former, which to this extent may, perhaps, be useful, to insure the complete decomposition of the salt; but the excess of acid, used by the Dublin College, is so great as to create a suspicion that the quantity prescribed is a misprint. The quantity of acid, directed by the College, is sufficient to decompose twice the quantity of common salt taken.

* According to Thenard, the fusion of the common salt will very much facilitate the conducting of the process.

The common salt is directed to be purified by the Edinburgh College by dissolving it in boiling water, concentrating the solution, skimming off the crystals as they form on the surface, draining from them the adhering solution, and subsequently washing them slightly with cold water. Dr. Christison states that the object of this treatment is to separate nitrate of soda, which is almost always present in the common salt of commerce. It will also separate nitrate of potassa if it happen to be present. The same College directs *pure* sulphuric acid, on the ground that the *commercial* usually contains nitrous acid. (See *Acidum Sulphuricum Purum.*)

Properties of the Pure Acid. Muriatic acid, when pure, is a transparent colourless liquid, of a suffocating odour and corrosive taste. Exposed to the air it emits white fumes, owing to the escape of the acid gas, and its union with the moisture of the atmosphere. When concentrated, it blackens organic substances like sulphuric acid. Its sp. gr. varies with its strength. When as highly concentrated as possible, its density is 1·21. The *medicinal acid* has the sp. gr. 1·16, and 100 grains of it saturate 132 grains of crystallized carbonate of soda. When of this strength, it contains rather more than 33·9 per cent. of muriatic acid gas. (*Phillips.*) It freezes at −60°. When exposed to heat, it continues to give off muriatic acid gas, with the appearance of ebullition, until its sp. gr. falls to 1·094, when it properly boils, and distils over unchanged.

As it is desirable to know, on many occasions, in chemical and pharmaceutical operations, the quantity of strong aqueous acid, of acid gas, and of chlorine, contained in samples of acid of different densities, we subjoin a table by Dr. Ure, containing this information.

Table of the quantity of Aqueous Muriatic Acid of sp. gr. 1·2, *of Muriatic Acid Gas, and of Chlorine, in* 100 *parts of Aqueous Acid of different densities.*

Sp. gr.	*Aqueous Acid of sp. gr.* 1·2	*Acid Gas.*	*Chlorine.*	*Sp. gr.*	*Aqueous Acid of sp. gr.* 1·2	*Acid Gas.*	*Chlorine.*
1·2000	100	40·777	39·675	1·1102	55	21·822	22·426
1·1910	95	38·738	37·692	1·1000	50	20·388	19·837
1·1822	90	36·700	35·707	1·0899	45	18·348	17·854
1·1721	85	34·660	33·724	1·0798	40	16·310	15·870
1·1701	84	34·252	33·328	1·0697	35	14·271	13·887
1·1620	80	32 621	31·746	1·0597	30	12·233	11·903
1·1599	79	32·213	31·343	1·0497	25	10·194	9·919
1·1515	75	30·582	29·757	1·0397	20	8·155	7·935
1·1410	70	28·544	27·772	1·0298	15	6·116	5·951
1·1308	65	26·504	25·789	1·0200	10	4·078	3·968
1·1206	60	24·466	23·805	1·0100	5	2·039	1·984

Muriatic acid is characterized by forming, on the addition of nitrate of silver, a white precipitate (chloride of silver), which is insoluble in nitric acid, but readily soluble in ammonia. It is incompatible with alkalies and most earths, with oxides and their carbonates, and with sulphuret of potassium, tartrate of potassa, tartar emetic, tartrate of iron and potassa, nitrate of silver, and solution of subacetate of lead.

Adulterations. This acid, when pure, will evaporate without residue in a platinum spoon. If sulphuric acid be present, a solution of chloride of barium will cause a precipitate of sulphate of baryta in the acid, previously diluted

with distilled water. Iron may be detected by saturating the dilute acid with carbonate of soda, and then adding ferrocyanuret of potassium, which will strike a blue colour if that metal be present. Free chlorine may be discovered by the acid having the power to dissolve gold-leaf. Any minute portion of the leaf which may be dissolved, is detected by adding a solution of protochloride of tin, which will give rise to a purplish tint. The free chlorine is derived from the reaction of nitric or nitrous acid on a small portion of the muriatic acid, which is thus deprived of its hydrogen. Hence it is that, when free chlorine is present, nitrous acid, or some other oxide of nitrogen is also present as an impurity. The nitric and nitrous acids are derived from nitrates in the common salt, and from nitrous acid in the commercial sulphuric acid, employed in the preparation of the muriatic acid.

Muriatic Acid of Commerce. This acid has the general properties of the pure aqueous acid. It has a yellow colour, owing to the presence of sesquichloride of iron, or of a minute proportion of organic matter, such as cork, wood, &c. It usually contains sulphuric acid, and sometimes free chlorine and nitrous acid. But the most injurious impurity, to those who consume it in the arts, is sulphurous acid. Mr. T. H. Savory analyzed three samples of commercial muriatic acid, each having a sp. gr. of between 1·16 and 1·17, and found them to contain from 7 to nearly 11 per cent. of sulphurous acid. To detect this acid, M. Girardin has proposed a very delicate test, namely, the protochloride of tin. The mode of using the test is to take about half an ounce of the acid to be tested, and to add to it two or three drachms of the protochloride. The mixture having been stirred two or three times, as much distilled water as of the protochloride is to be added. If sulphurous acid be present, the muriatic acid becomes turbid and yellow immediately upon the addition of the protochloride; and, upon the subsequent addition of the water, a slight evolution of sulphuretted hydrogen takes place, perceptible to the smell, and the liquid assumes a brown hue, depositing a powder of the same colour. The manner in which the test acts is as follows. By a transfer of chlorine, the test is converted into bichloride and metallic tin, the latter of which, by reacting with the sulphurous acid, gives rise to a precipitate of the deutoxide and protosulphuret of tin. In case the sulphurous acid forms but one-half of one per cent. of the commercial acid, the precipitate may not be perceptible. Under these circumstances, a solution of sulphate of copper must be added to the liquid previously warmed, when a brown precipitate of sulphuret of copper will be immediately formed. (*Heintz.*) M. Lembert has proposed the following, which he considers as a more delicate test of sulphurous acid. Saturate the suspected muriatic acid with carbonate of potassa. Then add successively a little weak solution of starch, one or two drops of a solution of iodate of potassa, and sulphuric acid, drop by drop. If sulphurous acid be present, it will be set free along with iodic acid, and these, by reacting on each other, will develope iodine, which will cause a blue colour with the starch.

Another impurity occasionally present in the commercial acid, as shown by Dupasquier, is arsenic. The immediate source of this impurity is the sulphuric acid used to prepare the muriatic acid. The sulphuric acid derives the arsenic from the sulphur used in its manufacture, and this last from pyrites containing a little of the poisonous metal. The arsenic, when present, is in the form of a chloride, and, from its volatility in this state of combination, is transferred to the muriatic acid, distilled from the commercial acid. This impurity is separated by diluting the acid with an equal volume of water, and passing through it sulphuretted hydrogen, which throws down the arsenic as a sulphuret. Where leaden vessels are used in preparing muriatic

acid, it is apt to contain chloride of lead, which may be detected by sulphuretted hydrogen. This impurity, being fixed, may be got rid of by distilling the acid. (*Dr. A. Vogel, Jr.*)

Muriatic acid of commerce is officinal only in the Edinburgh and Dublin Pharmacopœias. The density of the Edinburgh acid is directed to be at least 1·180. Dr. Christison states that it varies in this respect from 1·180 to 1·216. Thus the commercial is stronger than the pure acid of the Edinburgh Pharmacopœia, and consequently more fuming. Mr. Phillips states that he has never found the commercial acid nearly so strong, and suspects that, when of this specific gravity, it must contain a very large admixture of sulphuric acid. The commercial acid is defined by the Edinburgh College to be always yellow, and commonly to contain a little sulphuric acid, oxide of iron, and chlorine.

Properties of Muriatic Acid Gas. Muriatic acid gas is a colourless elastic fluid, possessing a pungent odour, and the property of irritating the organs of respiration. It destroys life and extinguishes flame. It reddens litmus powerfully, and has the other properties of a strong acid. Its sp. gr. is 1·269. Subjected to a pressure of 40 atmospheres, at the temperature of 50°, it is condensed into a transparent liquid, to which alone the name of *liquid muriatic acid* properly belongs. It absorbs water with the greatest avidity, and, according to the temperature and pressure, unites with a greater or less quantity of that liquid. Water, at the temperature of 69°, takes up 464 times its volume of the gas, increasing one-third in bulk, and about three-fourths in weight. Water thus saturated constitutes the strong aqueous acid already described.

Composition. Muriatic acid gas consists of one eq. of chlorine 35·42, and one of hydrogen 1 = 36·42; or of one volume of chlorine and one of hydrogen, united without condensation.

Medical Properties. Muriatic acid is tonic, refrigerant, and antiseptic. It is exhibited, largely diluted with water, in low fevers, some forms of syphilis, and to counteract phosphatic deposits in the urine. Dr. Paris has given it with success in malignant cases of typhus and scarlatina, administered in a strong infusion of quassia. It proves also a good adjunct to gargles in ulcerated sorethroat and scarlatina maligna. The dose for internal exhibition is from ten to twenty minims, in a sufficient quantity of some bland fluid, as barley water or gruel. In the composition of gargles, it may be used in the proportion of from half a fluidrachm to two fluidrachms, mixed with six fluidounces of the vehicle. (See *Acidum Muriaticum Dilutum.*)

Toxicological Properties. Muriatic acid, when swallowed, is highly irritating and corrosive, but less so than sulphuric and nitric acids. It produces blackness of the lips, fiery redness of the tongue, hiccough, violent efforts to vomit, and agonizing pain in the stomach. There is much thirst, with great restlessness, a dry and burning skin, and a small concentrated pulse. If the acid has been recently swallowed, white vapours of a pungent smell are emitted from the mouth. The best antidote is magnesia, which acts by saturating the acid. Soap is also useful for the same reason. In the course of the treatment, bland and mucilaginous drinks must be freely given. When inflammation supervenes, it must be treated on general principles.

Pharm. Uses. Muriatic acid is used as a chemical agent in the preparation of Acidum Tartaricum; Antimonii et Potassæ Tartras; Antimonii Oxidum; Calcis Phosphas Præcipitatum; Carbo Animalis Purificatus; Hydrargyrum Purum; Potassæ Bicarbonas; Quiniæ Sulphas; Sodæ Bicarbonas; Strychnia; Sulphur Præcipitatum; Veratria.

Off. Prep. of Muriatic Acid. Acidum Hydrocyanicum Dilutum; Acidum Muriaticum Dilutum; Acidum Nitromuriaticum; Barii Chloridum; Calcii Chloridum; Ferrum Ammoniatum; Liquor Arsenici Chloridi; Liquor Calcii Chloridi; Morphiæ Murias; Tinctura Ferri Chloridi; Zinci Chloridum.

Off. Prep. of Muriatic Acid of Commerce. Antimonii Terchloridi Liquor; Calcis Murias; Chlorinii Liquor; Ferri Muriatis Tinctura; Zinci Chloridi Liquor. B.

ACIDUM NITRICUM. *U. S., Lond.*

Nitric Acid.

Nitric acid of the specific gravity 1·42. *U. S., Lond.*

Off. Syn. ACIDUM NITRICUM. *Nitric Acid of Commerce*, sp. gr. 1·38 to 1·39. *Ed.;* ACIDUM NITRICUM VENALE. *Commercial Nitric Acid. Dub.*

Spirit of nitre; Aqua fortis; Acide nitrique, Acide azotique, *Fr.;* Salpetersäure, *Germ.;* Zalpeterzuur, Sterkwater, *Dutch;* Skedwatter, *Swed.;* Acido nitrico, *Ital., Span.*

Nitric acid is now officinal in four forms; the pure acid of the sp. gr. 1·5, the pure acid of the sp. gr. 1·42, the commercial acid, and the diluted. The acid of 1·42 and the commercial acid, being placed exclusively in the Materia Medica list, will be noticed here, and the other two, for which formulæ are given, will be described under the preparations. (See *Acidum Nitricum Purum* and *Acidum Nitricum Dilutum.*)

The usual process adopted in the laboratory for obtaining this acid, is to add to nitrate of potassa in coarse powder, contained in a retort, an equal weight of strong sulphuric acid, poured in by means of a tube or funnel, so as not to soil the neck. The materials should not occupy more than two-thirds of the capacity of the retort. A receiver being adapted, heat is applied by means of a spirit-lamp, the naked fire, or a sand-bath, moderately at first, but afterwards more strongly when the materials begin to thicken, in order to bring the whole into a state of perfect fusion. Red vapours will at first arise, and afterwards disappear in the progress of the distillation. Towards its close they will be reproduced, and their reappearance will indicate that the process is completed.

The proportion of equal weights, as above given, corresponding nearly to one eq. of nitrate of potassa, and two of monohydrated sulphuric acid, is the best for operations on a small scale in the laboratory. This proportion is preferred by Thenard. In operations on a large scale, where an iron vessel is used, a strong heat applied, and water placed in the receivers to condense the acid, less sulphuric acid may be advantageously employed.

Monohydrated Nitric Acid. Nitrate of Water. This is the strongest liquid nitric acid that can be procured, and may be supposed to be obtained by distilling one eq. of pure and dry nitre, with two eqs. of monohydrated sulphuric acid. One eq. of monohydrated nitric acid distils over, and one eq. of monohydrated bisulphate of potassa remains behind. KO,NO_5 and $2(HO,SO_3)=HO,NO_5$ and $KO,2SO_3+HO$. Acid of this strength is very difficult to get, and requires for its preparation the most elaborate attention to separate the superabundant water. According to Mr. Arthur Smith, of London, acid, dehydrated as far as possible, is perfectly colourless, boils at 184°, has the sp. gr. 1·517 at 60°, and nearly approaches, in composition, to a monohydrate. Acid of this strength, even at the boiling temperature, has not the slightest action on tin or iron. (*Phil. Mag.*, Dec. 1847.) According to Millon, the true monohydrate has a sp. gr. as high as 1·521.

Nitric Acid (*sp. gr.* 1·42). *Quadrihydrated Nitric Acid.* This is the acid, newly adopted in the U. S. and London Pharmacopœias, in the place of the acid weighing 1·5. Acid of the density 1·5 was not found in any of the shops, and much pains were required to get it of that strength. Besides, acid of the density 1·5 was not necessary for any process of the Pharmacopœia. Considerations of this kind induced the revisers of our national standard of 1850, to lower the strength of officinal nitric acid to 1·42, its purity in other respects remaining the same. To satisfy the tests given in the U. S. Pharmacopœia, it must be colourless, entirely volatilized by heat, and, when diluted with distilled water, not precipitable by nitrate of silver or chloride of barium. Acid of the density 1·42 is the most stable of the hydrated compounds of nitric acid, and boils at 250°. When either stronger or weaker than this, it distils over at a lower temperature; and, by losing more acid than water in the first case, and more water than acid in the second, constantly approaches to the sp. gr. 1·42, when its boiling point becomes stationary. These facts in relation to quadrihydrated nitric acid were first observed by Dalton, and have since been confirmed by Mr. Arthur Smith, of London. (*Phil. Mag.*, Dec. 1847.) This acid consists of one eq. of dry acid and four of water. ($4HO,NO_5$.) But, as only one of the eqs. of water is *basic*, the other three being *constitutional*, the true formula is HO,NO_5+3HO.

Commercial Nitric Acid, Ed., Dub. The Edinburgh commercial acid is stated to have a density varying from 1·38 to 1·39. It is colourless or nearly so, and, if diluted with distilled water, precipitates but slightly, or not at all, with solution of nitrate of baryta or of nitrate of silver. The Dublin commercial acid is not defined, either as to specific gravity or grade of purity. According to M. Lembert, the nitric acid of commerce sometimes contains iodine, probably derived from the native nitrate of soda, in which he found that element. It may be detected by saturating the suspected acid with a carbonated alkali, pouring in a little clear solution of starch, and then adding a few drops of sulphuric acid. If iodine be present, the sulphuric acid will set it free, and the starch solution will become blue.

Nitric Acid of the Arts. Two strengths of this acid occur in the arts;—*double aqua fortis* (sp. gr. 1·36), which is half the strength of concentrated nitric acid, and *single aqua fortis* (sp. gr. 1·22), which is half as strong as the double. Aqua fortis is sometimes obtained by distilling a mixture of nitre and calcined sulphate of iron. By an interchange of ingredients, sulphate of potassa and nitrate of iron are formed, the latter of which, at the distilling heat, readily abandons its nitric acid. The sulphate of potassa is washed out of the residue, and the sesquioxide of iron which is left, is sold, under the name of colcothar, to the polishers of metals. The distillation is performed in large cast-iron retorts, lined on the inside with a thick layer of red oxide of iron, to protect them from the action of the acid. The acid is received in large glass vessels containing water. A considerable portion of the acid is decomposed by the heat into reddish vapours, which subsequently dissolve in the water, and absorb the oxygen which had been disengaged. The acid thus obtained is red and tolerably strong, but is diluted with water before being thrown into commerce.

In France, nitric acid is manufactured on the large scale from nitre and sulphuric acid in cast-iron cylinders. The cylinders are disposed horizontally across a furnace, and are strewed internally throughout their whole length with nitre. Two circular cast-iron plates, each pierced with a hole, serve to close the ends. At one end, the sulphuric acid is poured in, and, by means of a stoneware tube connected with the other end, the nitric acid is conducted to receivers. The sulphate of potassa is removed after each operation. The iron cylinders are acted upon by the acid; yet, notwithstanding this disad-

vantage, the process, when conducted in such vessels, is attended with a great saving of expense.

In England, nitric acid is generally procured for the purposes of the arts, by distilling the materials in earthenware retorts, or cast-iron pots with earthen heads, connected with a series of glass or stoneware receivers containing water. The proportion of sulphuric acid, employed by the manufacturer, is between one and two equivalents to one of the salt; and hence the product has an orange-red colour, which is removed by heating the acid.

In the United States, nitric acid is made, on the large scale, in a distillatory apparatus, having the same general arrangement as in France and England. Sometimes a cast-iron cylinder is used as in France, and sometimes a thick cast-iron pot, with an earthenware head. The pot is set in brick-work over a fire-place, and the materials having been placed in it, the head is luted on with a fat lute, and made to communicate with two receivers, either of stoneware or glass, connected together by means of a tube. Large demijohns of glass answer the purpose of receivers very well. The incondensible products are made to pass by means of a tube into a portion of water. The quantity of sulphuric acid, employed in different establishments, varies from one-half to two-thirds of the weight of the nitre. Nitrate of soda (cubic nitre), imported into the United States from Peru, is used by some manufacturing chemists to obtain nitric acid. One objection to this salt is that it often contains much common salt. Supposing it pure, it yields ten per cent. more acid for a given weight than nitrate of potassa; but the residuum, sulphate of soda, is less valuable than sulphate of potassa. The latter salt, under the name of *sal enixum*, is sold to the alum makers.

Mallet, of Paris, has proposed to obtain nitric acid from nitrate of soda, by distilling it with dried boracic acid. In this case, biborate of soda or borax is the residue.

General Properties of Nitric Acid. Nitric acid, so called from nitre, is a liquid, extremely sour and corrosive. It was discovered by Raymond Lully, in the 13th century, and its constituents, by Cavendish, in 1784. When perfectly pure, it is colourless; but, as usually obtained, it has a straw colour, owing to the presence of nitrous acid. The concentrated acid, when exposed to the air, emits white fumes, possessing a disagreeable odour. By the action of light, it undergoes a slight decomposition, and becomes yellow. It acts powerfully on animal matter, causing its decomposition. On the living fibre it operates as a strong caustic. It stains the skin, and most animal substances of an indelible yellow colour. On vegetable fibre it acts peculiarly, abstracting hydrogen or water, and combining with its remaining elements. When diluted, nitric acid converts most animal and vegetable substances into oxalic, malic, and carbonic acids. The general character of its action is to impart oxygen to other bodies, which it is enabled to do in consequence of the large quantity of this element which it contains in a state of loose combination. It acidifies sulphur and phosphorus, and oxidizes all the metals, except chromium, tungsten, columbium, cerium, titanium, osmium, rhodium, gold, platinum, and iridium. In the liquid state, it always contains water, which is essential to its existence in that state. It combines with salifiable bases and forms nitrates. When it is mixed with muriatic acid, mutual decomposition takes place, and a liquid is formed, capable of dissolving gold, called nitromuriatic acid or aqua regia. (See *Acidum Nitromuriaticum.*)

As a nitric acid below the standard strength is necessarily employed in many chemical and pharmaceutical operations, it often becomes important to know the proportion of dry acid, and of acid of the strength of 1·5, contained in an acid of any given specific gravity. The following table, drawn up from experiments by Dr. Ure, gives information on these points.

Table showing the Quantity of Hydrated Nitric Acid (sp. gr. 1·5), *and of Dry Nitric Acid, contained in* 100 *parts of the Acid at Different Densities.*

Sp. Gr.	*Hyd. Acid in* 100	*Dry Acid in* 100	*Sp. Gr.*	*Hyd. Acid in* 100	*Dry Acid in* 100	*Sp. Gr.*	*Hyd. Acid in* 100	*Dry Acid in* 100	*Sp. Gr.*	*Hyd. Acid in* 100	*Dry Acid in* 100
1·500	100	79·700	1·4189	75	59·775	1·2947	50	39·850	1·1403	25	19·925
1·498	99	78·903	1·4147	74	58·978	1·2887	49	39·053	1·1345	24	19·128
1·4960	98	78·106	1·4107	73	58·181	1·2826	48	38·256	1·1286	23	18·331
1·4940	97	77·309	1·4065	72	57·384	1·2765	47	37·459	1·1227	22	17·534
1·4910	96	76·512	1·4023	71	56·587	1·2705	46	36·662	1·1168	21	16·737
1·4880	95	75·715	1·3978	70	55·790	1·2644	45	35·865	1·1109	20	15·940
1·4850	94	74·918	1·3945	69	54·993	1·2583	44	35·068	1·1051	19	15·143
1·4820	93	74·121	1·3882	68	54·196	1·2523	43	34·271	1·0993	18	14·346
1·4790	92	73·324	1·3833	67	53·399	1·2462	42	33·474	1·0935	17	13·549
1·4760	91	72·527	1·3783	66	52·602	1·2402	41	32·677	1·0878	16	12·752
1·4730	90	71·730	1·3732	65	51·805	1·2341	40	31·880	1·0821	15	11·955
1·4700	89	70·933	1·3681	64	51·068	1·2277	39	31·083	1·0764	14	11·158
1·4670	88	70·136	1·3630	63	50·211	1·2212	38	30·286	1·0708	13	10·361
1·4640	87	69·339	1·3579	62	49·414	1·2148	37	29·489	1·0651	12	9·564
1·4600	86	68·542	1·3529	61	48·617	1·2084	36	28·692	1·0595	11	8·767
1·4570	85	67·745	1·3477	60	47·820	1·2019	35	27·895	1·0540	10	7·970
1·4530	84	66·948	1·3427	59	47·023	1·1958	34	27·098	1·0485	9	7·173
1·4500	83	66·155	1·3377	58	46·226	1·1895	33	26·301	1·0430	8	6·376
1·4460	82	65·354	1·3323	57	45·429	1·1833	32	25·504	1·0375	7	5·579
1·4424	81	64·557	1·3270	56	44·632	1·1770	31	24·707	1·0320	6	4·782
1·4385	80	63·760	1·3216	55	43·835	1·1709	30	23·910	1·0267	5	3·985
1·4346	79	62·963	1·3163	54	43·038	1·1648	29	23·113	1·0212	4	3·188
1·4306	78	62·166	1·3110	53	42·241	1·1587	28	22·316	1·0159	3	2·391
1·4269	77	61·369	1·3056	52	41·444	1·1526	27	21·519	1·0106	2	1·594
1·4228	76	60·572	1·3001	51	40·647	1·1465	26	20·722	1·0053	1	0·797

Tests. Nitric acid, when uncombined, is recognised by its dissolving copper with the production of red vapours, and by its forming nitre when saturated with potassa. When in the form of a nitrate, it is detected by its action on gold-leaf, after the addition of muriatic acid, in consequence of the evolution of chlorine; or it may be discovered, according to Dr. O'Shaughnessy, by heating the supposed nitrate in a test tube with a drop of sulphuric acid, and then adding a crystal of morphia. If nitric acid be present, it will be set free by the sulphuric acid, and reddened by the morphia. The same effect is produced by brucia; as also by commercial strychnia, on account of its containing brucia. To prevent all ambiguity, arising from the accidental presence of nitric acid in the sulphuric acid employed, the operator should satisfy himself by a separate experiment, that the latter acid has no power to produce the characteristic colour with morphia. Another test for nitric acid, is to add *pure* sulphuric acid to the concentrated liquid, suspected to contain it, together with a little concentrated solution of the sulphate of protoxide of iron. The smallest trace of nitric acid affords, when the mixture is warmed, a pink-red colour; and, if it be present in considerable amount, the liquid becomes almost black.

The most common impurities in nitric acid are sulphuric acid and chlorine; the former derived from the acid used in the process, the latter from common salt, which is not an unfrequent impurity in nitre. They may be detected by adding a few drops of the solution of chloride of barium and of nitrate of silver to separate portions of the nitric acid, diluted with three or four parts of distilled water. If these reagents should produce a precipitate, the chloride will indicate sulphuric acid, and the nitrate, chlorine. These impurities may

be separated by adding nitrate of silver in slight excess, which will precipitate them as sulphate and chloride of silver, and then distilling nearly to dryness in very clean vessels. The sulphuric acid may also be got rid of by distilling from a fresh portion of nitre. The chlorine may be separated, without the use of nitrate of silver, by distilling the commercial acid, and rejecting the first eighth or fourth which comes over, according to the quality of the acid, and reserving that which passes subsequently, which is absolutely pure. (*Ch. Barreswil.*) These impurities, however, do not in the least affect the medicinal properties of the acid.

Composition. The composition of the officinal acid of the density 1·42 has already been given. It contains about 75 per cent. of nitric acid of the sp. gr. 1·5. The composition of the officinal commercial acid is necessarily variable. The Edinburgh commercial acid contains from 67 to 68 per cent. of nitric acid of the density of 1·5. The strength of the Dublin commercial acid is left indefinite; as no sp. gr. is assigned to it. Anhydrous nitric acid consists of one eq. of nitrogen 14, and five eqs. of oxygen 40=54; or, in volumes, of one volume of nitrogen and two and a half volumes of oxygen, supposed to be condensed, to form nitric acid vapour, into one volume. In 1849, the interesting discovery was made by M. Deville, of Besançon, of the means of isolating *anhydrous nitric acid.* The method pursued was to pass perfectly dry chlorine over nitrate of silver. The anhydrous acid is in the form of colourless, brilliant, limpid crystals, which melt at 85° and boil at 113°. In contact with water, they form a colourless solution with evolution of heat, without the disengagement of gas. (*Journ. de Pharm. et de Chim.*, March, 1849, p. 207.)

Medical Properties. Nitric acid is tonic and antiseptic. Largely diluted with water, it forms a good acid drink in febrile diseases, especially typhus. In syphilis, and in the chronic hepatitis of India, it is highly extolled by Dr. Scott, formerly of Bombay. It has occasionally excited ptyalism. It cannot be depended upon as a remedy in syphilis, but, in worn-out constitutions, is often an excellent adjuvant, either to prepare the system for the use of mercury, or to lessen the effects of that metal on the economy. Externally, it has been used with advantage as a lotion to ulcers, of the strength of about twelve minims to the pint of water. This practice originated with Sir Everard Home, and is particularly applicable to those ulcers which are superficial and not disposed to cicatrize. In sloughing phagedæna, strong nitric acid is one of the best remedies, applied by means of a piece of lint, tied round a small stick. As nitric acid dissolves both uric acid and the phosphates, it was supposed to be applicable to those cases of gravel in which the uric acid and the phosphates are mixed; but experience has not confirmed its efficacy in such cases. Nevertheless, when the sabulous deposit depends upon certain states of disordered digestion, this acid may prove serviceable by restoring the tone of the stomach. The dose is from five to twenty minims in three fluidounces or more of water, given three or four times a-day. The diluted acid is more convenient for prescribing. (See *Acidum Nitricum Dilutum.*)

Nitric acid, in the state of vapour, is considered useful for destroying contagion, and hence is employed for purifying gaols, hospitals, ships, and other infected places. It is prepared for use by the extemporaneous decomposition of nitre by sulphuric acid. Half an ounce of powdered nitre is put into a saucer, which is placed in an earthen dish containing heated sand. On the nitre, two drachms of sulphuric acid are then poured, and the nitric acid fumes are immediately disengaged. The quantities just indicated are considered to be sufficient for disinfecting a cubic space of ten feet. Fumigation in this manner was first introduced by an English physician, Dr. Car-

michael Smyth, who received from the British Parliament, for its discovery, a reward of five thousand pounds. It may be well doubted whether the nitric acid, as a disinfecter, is at all comparable to chlorine; and, since the introduction of chlorinated lime, and the solution of chlorinated soda as disinfecting agents, this gas has been brought into so manageable a form, that its use may very well supersede that of every other agent employed with similar intentions. (See *Calx Chlorinata* and *Liquor Sodæ Chlorinatæ.*)

Properties as a Poison. Nitric acid, in its concentrated state, is one of the mineral poisons most frequently taken for the purpose of self-destruction. Immediately after swallowing it, there are produced burning heat in the mouth, œsophagus, and stomach, acute pain, disengagement of gas, abundant eructations, nausea, and hiccough. These effects are soon followed by repeated and excessive vomiting of matter having a peculiar odour and taste, tumefaction of the abdomen with exquisite tenderness, a feeling of coldness on the surface, horripilations, icy coldness of the extremities, small depressed pulse, horrible anxieties, continual tossings and contortions, and extreme thirst. The breath becomes extremely fetid, and the countenance exhibits a complete picture of suffering. The cases are almost always fatal. The best remedies are repeated doses of magnesia as an antidote, mucilaginous drinks in large quantities, olive or almond oil in very large doses, emollient fomentations, and clysters. Until magnesia can be obtained, an immediate resort to a solution of soap in large amount will be proper.

Pharm. Uses. Nitric acid is used as a chemical agent to prepare Acidum Phosphoricum Dilutum; Antimonii et Potassæ Tartras; Ferri Ferrocyanuretum; Ferri Oxidum Hydratum; Hydrargyri Oxidum Rubrum; Zinci Chloridum.

Off. Prep. of Nitric Acid. Acidum Nitricum Dilutum; Acidum Nitromuriaticum; Argenti Nitras; Argenti Nitras Fusus; Bismuthi Subnitras; Liquor Ferri Nitratis; Spiritus Ætheris Nitrici; Unguentum Hydrargyri Nitratis.

Off. Prep. of Commercial Nitric Acid. Acidum Nitricum Dilutum; Bismuthum Album. The commercial acid is used chemically to prepare Ferrugo, *Ed.*, and Zinci Sulphas, *Dub.* B.

ACIDUM SULPHURICUM. *U. S., Lond.*

Sulphuric Acid.

Sulphuric Acid of the specific gravity 1·845. *U. S., Lond.*

Off. Syn. ACIDUM SULPHURICUM. *Sulphuric Acid of Commerce. Ed.;* ACIDUM SULPHURICUM VENALE. *Commercial Sulphuric Acid; Oil of Vitriol. Dub.*

Oil of vitriol; Acide sulfurique, *Fr.;* Vitriolöl, Schwefelsäure, *Germ.;* Acido solforico, *Ital.;* Acido sulfurico, *Span.*

Sulphuric acid is placed in the Materia Medica list of all the Pharmacopœias noticed in this work, as an acid to be obtained from the wholesale manufacturer. Its officinal sp. gr., as given in the U. S. and London Pharmacopœias, is 1·845; in the Edinburgh, 1·840 or near it. In the Dublin Pharmacopœia, no specific gravity is given for the commercial acid.

Preparation. Sulphuric acid is obtained by burning sulphur, mixed with one-eighth of its weight of nitre, over a stratum of water, contained in a chamber lined with sheet lead. If the sulphur were burned by itself, the product would be sulphurous acid, which contains only two-thirds as much oxygen as sulphuric acid. The object of the nitre is to furnish, by its decomposition, the requisite additional quantity of oxygen. To understand the

process, it is necessary to bear in mind that nitric acid contains five, sulphuric acid three, sulphurous acid two, nitric oxide two, hyponitrous acid three, and nitrous acid four equivalents of oxygen, combined with one eq. of their several radicals. One eq. of sulphur decomposes one eq. of nitric acid of the nitre, and becomes one eq. of sulphuric acid, which combines with the potassa of the nitre to form sulphate of potassa. In the mean time, the nitric acid, by furnishing three eqs. of oxygen to form the sulphuric acid, is converted into one eq. of nitric oxide, which is evolved. This gas, by combining with two eqs. of the oxygen of the air, immediately becomes nitrous acid vapour, which diffuses itself throughout the leaden chamber. While these changes are taking place, the remainder of the sulphur is undergoing combustion, and filling the chamber with sulphurous acid gas. One eq. of nitrous acid gas, and one eq. of sulphurous acid gas, being thus intermingled in the chamber, react on each other, by the aid of moisture, so as to form a crystalline compound, consisting of one eq. of sulphuric acid and one eq. of hyponitrous acid, united with a portion of water. This compound falls into the water of the chamber, and instantly undergoes decomposition. The sulphuric acid dissolves in the water, and the hyponitrous acid, resolved, at the moment of its extrication, into nitrous acid and nitric oxide, escapes with effervescence. The nitrous acid thus set free, and that reproduced by the nitric oxide uniting with the oxygen of the atmosphere, again react with sulphurous acid and humidity, and give rise to a second portion of the crystalline compound, which undergoes the same changes as the first. In this manner, the nitric oxide performs the part of a carrier of oxygen from the air of the chamber to the sulphurous acid, to convert the latter into sulphuric acid. The residue of the combustion of the sulphur and nitre, consisting of sulphate of potassa, is sold to the alum makers.

Preparation on the Large Scale. The leaden chambers vary in size, but are generally from thirty to thirty-two feet square, and from sixteen to twenty feet high. The floor is slightly inclined to facilitate the drawing off of the acid, and covered to the depth of several inches with water. There are several modes of burning the mixture of sulphur and nitre, and otherwise conducting the process; but that pursued in France is as follows. Near one of the sides of the chamber, and about a foot from its bottom, a cast-iron tray is placed over a furnace, resting on the ground, its mouth opening externally, and its chimney having no communication with the chamber. On this tray the mixture is placed, being introduced by a square opening, which may be shut by means of a sliding door, and the lower side of which is level with the surface of the tray. The door being shut, the fire is gradually raised in the furnace, whereby the sulphur is inflamed, and the products already spoken of are generated. When the combustion is over, the door is raised, and the sulphate of potassa removed. A fresh portion of the mixture is then placed on the tray, and the air of the chamber is renewed by opening a door and valve situated at its opposite side. Next, the several openings are closed, and the fire is renewed. These operations are repeated, with fresh portions of the mixture, every three or four hours, until the water at the bottom of the chamber has reached the sp. gr. of about 1·5. It is then drawn off and transferred to leaden boilers, where it is boiled down until it has attained the sp. gr. 1·7. At this density it begins to act on lead, and, therefore, its further concentration must be conducted in large glass or platinum retorts, where it is evaporated as long as water distils over. This water is slightly acid and is thrown back into the chamber. When the acid is fully concentrated, opaque grayish-white vapours arise, the appearance of which indicates the completion of the process. The acid is allowed to cool, and is then transferred to large demijohns of green glass, called carboys,

which, for greater security, are surrounded with straw or wicker-work, and packed in square boxes, enclosing all the carboy except the neck.

As, in the manufacture of sulphuric acid, the nitre is the most expensive material, many plans have been resorted to for the purpose of obtaining the necessary nitrous acid at a cheaper rate. One plan is to procure it by treating molasses or starch with common nitric acid. In this case, the manufacturer obtains oxalic acid as a collateral product, which serves to diminish his expenses.

In some manufactories of sulphuric acid, nitrate of soda is substituted for nitre. The advantages of the former salt are its greater cheapness, and the circumstance of its containing a larger proportional amount of nitric acid.

A new method is now practised by some manufacturers for making sulphuric acid. It consists in filling the leaden chamber with sulphurous acid by the ordinary combustion of sulphur, and afterwards admitting into it nitrous acid and steam. The nitrous acid is generated from a mixture of sulphuric acid with nitrate of potassa or nitrate of soda, placed in an iron pan, over the burning sulphur in the sulphur furnace, where the draught serves to conduct the nitrous acid fumes into the chamber. As, under these circumstances, sulphurous and nitrous acids, and the vapour of water are intermingled in the chamber, it follows that all the conditions necessary for generating the crystalline compound, already alluded to, are present. Of course, the rationale of this new process is the same as that already given.

Mr. Thomas Bell, of England, obtained a patent in Dec. 1852 for the use of ozonized air,* either produced by electricity or by the slow combustion of phosphorus, in order to cause the union of sulphurous acid with the requisite oxygen, without the use of nitre, in the leaden chamber, in manufacturing sulphuric acid. The specification of his patent is given in the *Pharmaceutical Journal* for March, 1853.

What is said above relates to the mode of preparing common sulphuric acid; but there is another kind known on the continent of Europe by the name of the *fuming sulphuric acid of Nordhausen*, so called from its properties, and a place in Saxony where it is largely manufactured. This acid is obtained by distilling dried sulphate of iron in large stoneware retorts, heated to redness, and connected with receivers of glass or stoneware. The acid distils over, and sesquioxide of iron is left in the form of *colcothar*.

The process for making sulphuric acid by the combustion of sulphur with nitre was first mentioned by Lemery, and afterwards put in practice by an English physician of the name of Ward. As practised by him the combustion was conducted in very large glass vessels. About the year 1746, the great improvement of leaden chambers was introduced by Dr. Roebuck, an eminent physician of Birmingham, where the first apparatus of this kind was erected. In consequence of this improvement, the acid immediately fell to one-fourth of its former price.

Properties. Sulphuric acid, or as it is commonly called, *oil of vitriol*, is a dense, colourless, inodorous liquid, of an oleaginous appearance, and possessing strong corrosive qualities. On the living fibre, it acts as a powerful caustic. In the liquid form, it always contains water, which is essential to its existence in that form. When pure and as highly concentrated as possible, as manu-

* Ozonized air is air containing Schönbein's ozone. *Ozone* is a peculiar form of matter, produced by electrical discharges in the air, by the electrolysis of water, and by the slow combustion of phosphorus, at common temperatures, in a confined portion of moist air. Its nature is not well made out; but it probably is an allotropic condition of oxygen, in which some of the properties of the latter are exalted, and others newly developed. Among the properties exalted, is the oxidizing property, which is much more active in ozone-oxygen than in ordinary oxygen.

factured in the leaden chambers, its sp. gr. is 1·845, a fluidounce weighing a small fraction over fourteen drachms. When of this specific gravity, it contains about 18 per cent. of water. Whenever its density exceeds this, the presence of sulphate of lead, or of some other impurity is indicated. The commercial acid is seldom of full strength. According to Mr. Phillips, it has generally a sp. gr. of only 1·8433, and contains 22 per cent. of water. The strong acid boils at 620°, and freezes at 15° below zero. When diluted, its boiling point is lowered. When of the sp. gr. 1·78, it deposits crystals of the bihydrated acid at about 28°; and hence it is hazardous for manufacturers to keep an acid of that strength in glass vessels in cold weather, as they are liable to burst. With salifiable bases, it forms a numerous class of salts, called sulphates. It acts powerfully on organic bodies, whether vegetable or animal, depriving them of the elements of water, developing charcoal, and turning them black. A small piece of cork or wood dropped into the acid, will, on this principle, render it of a dark colour. It absorbs water with avidity, and is used as a desiccating agent. It has been ascertained by Professors W. B. and R. E. Rogers to be capable of absorbing 94 per cent. of carbonic acid gas, an interesting fact having an important bearing on analytic operations. When diluted with distilled water, it ought to remain limpid, and, when heated sufficiently in a platinum spoon, the fixed residue should not exceed one part in four hundred of the acid employed. When present in small quantities in solution, it is detected unerringly by chloride of barium, which causes a precipitate of sulphate of baryta. The most usual impurities in it are the sulphates of potassa and lead, the former derived from the residue of the process, the latter from the leaden boilers in which the acid is concentrated. Occasionally nitre is added to render dark samples of acid colourless. This addition will give rise to the impurity of sulphate of potassa. These impurities often amount to three or four per cent. The commercial acid cannot be expected to be absolutely pure; but, when properly manufactured, it ought not to contain more than one-fourth of one per cent. of impurity. The fixed impurities are discoverable by evaporating a portion of the suspected acid, when they will remain. If sulphate of lead be present, the acid will become turbid on dilution with an equal bulk of water. This impurity is not detected by sulphuretted hydrogen, unless the sulphuric acid be saturated with an alkali. If only a scanty muddiness arises, the acid is of good commercial quality.

Other impurities occur in the commercial sulphuric acid. Nitrous acid is always present in more or less amount. It may be detected by gently pouring a solution of green vitriol over the commercial acid in a tube; when the solution, at the line of contact, will acquire a deep red colour, due to the sesquioxidation of the iron by the nitrous acid. The commercial acid is not to be rejected on account of the indications of this test, unless it shows the presence of nitrous acid in unusual quantity. For the mode of removing this impurity by means of sugar, see *Acidum Sulphuricum Purum.* When sulphate of potassa is fraudulently introduced into the acid to increase its density, it may be detected by saturating the acid with ammonia and heating to redness in a crucible; when sulphate of ammonia will be expelled, and sulphate of potassa left behind. The dangerous impurity of arsenic is sometimes present in sulphuric acid. In consequence of the high price of Sicilian sulphur in the market some years ago, several of the English manufacturers employed iron pyrites for the purpose of furnishing the necessary sulphurous acid in the manufacture of oil of vitriol. As the pyrites usually contained arsenic, it happened that the sulphurous acid fumes were accompanied by this metal, and thus the sulphuric acid became contaminated. From 22 to

35 grains of arsenious acid have been found in 20 fluidounces of oil of vitriol, of English manufacture, by Dr. G. O. Rees and Mr. Watson. To detect this impurity, the acid, previously diluted with distilled water, must be examined by Marsh's test. (See *Acidum Arseniosum.*) According to Dupasquier, the arsenic is present in sulphuric acid in the form of *arsenic* acid, and is not fully precipitated by sulphuretted hydrogen; but it may be completely separated by the sulphuret of potassium, of sodium, or of barium, and preferably by the last. The same chemist states that tin is sometimes present in commercial sulphuric acid, derived from the solderings of the leaden chambers. It may be discovered by sulphuretted hydrogen, which produces a precipitate of sulphuret of tin, convertible by nitric acid into the white insoluble deutoxide of tin. If the precipitate should be the mixed sulphurets of arsenic and tin, the former is converted by nitric acid into arsenic acid and dissolved, and the latter into insoluble deutoxide and left.

As sulphuric acid is often under the standard strength, it becomes important to know how much hydrated sulphuric acid of the standard specific gravity, and of dry acid, is contained in an acid of any given density. The following table, drawn up by Dr. Ure, gives this information.

Table of the Quantity of Hydrated Sulphuric Acid of Sp. Gr. 1·8485, *and of Dry Acid, in* 100 *parts of Dilute Acid at Different Densities.*

Sp. Gr.	*Hyd. Acid in* 100	*Dry Acid in* 100	*Sp. Gr.*	*Hyd. Acid in* 100	*Dry Acid in* 100	*Sp. Gr.*	*Hyd. Acid in* 100	*Dry Acid in* 100	*Sp. Gr.*	*Hyd. Acid in* 100	*Dry Acid in* 100
1·8485	100	81·54	1·6520	75	61·15	1·3884	50	40·77	1·1792	25	20·38
1·8475	99	80·72	1·6415	74	60·34	1·3788	49	39·95	1·1706	24	19·57
1·8460	98	79·90	1·6321	73	59·52	1·3697	48	39·14	1·1626	23	18·75
1·8439	97	79·09	1·6204	72	58·71	1·3612	47	38·32	1·1549	22	17·94
1·8410	96	78·28	1·6090	71	57·89	1·3530	46	37·51	1·1480	21	17·12
1·8376	95	77·46	1·5975	70	57·08	1·3440	45	36·69	1·1410	20	16·31
1·8336	94	76·65	1·5868	69	56·26	1·3345	44	35·88	1·1330	19	15·49
1·8290	93	75·83	1·5760	68	55·45	1·3255	43	35·06	1·1246	18	14·68
1·8233	92	75·02	1·5648	67	54·63	1·3165	42	34·25	1·1165	17	13·86
1·8179	91	74·20	1·5503	66	53·82	1·3080	41	33·43	1·1090	16	13·05
1·8115	90	73·39	1·5390	65	53·00	1·2999	40	32·61	1·1019	15	12·23
1·8043	89	72·57	1·5280	64	52·18	1·2913	39	31·80	1·0953	14	11·41
1·7962	88	71·75	1·5170	63	51·37	1·2826	38	30·98	1·0887	13	10·60
1·7870	87	70·94	1·5066	62	50·55	1·2740	37	30·17	1·0809	12	9·78
1·7774	86	70·12	1·4960	61	49·74	1·2654	36	29·35	1·0743	11	8·97
1·7673	85	69·31	1·4860	60	48·92	1·2572	35	28·54	1·0682	10	8·15
1·7570	84	68·49	1·4760	59	48·11	1·2490	34	27·72	1·0614	9	7·34
1·7465	83	67·68	1·4660	58	47·29	1·2409	33	26·91	1·0544	8	6·52
1·7360	82	66·86	1·4560	57	46·48	1·2334	32	26·09	1·0477	7	5·71
1·7245	81	66·05	1·4460	56	45·66	1·2260	31	25·28	1·0405	6	4·89
1·7120	80	65·23	1·4360	55	44·85	1·2184	30	24·46	1·0336	5	4·08
1·6993	79	64·42	1·4265	54	44·03	1·2108	29	23·65	1·0268	4	3·26
1·6870	78	63·60	1·4170	53	43·22	1·2032	28	22·83	1·0206	3	1·636
1·6750	77	62·78	1·4073	52	42·40	1·1956	27	22·01	1·0140	2	1·63
1·6630	76	61·97	1·3977	51	41·58	1·1876	26	21·20	1·0074	1	0·1854

The only way to obtain pure sulphuric acid is by distillation. Owing to the high boiling point of this acid, the operation is rather precarious, in consequence of the danger of the fracture of the retort, from the sudden concussions to which the boiling acid gives rise. Dr. Ure recommends that a retort of the capacity of from two to four quarts be used in distilling a pint of acid.

This is connected, by means of a wide glass tube three or four feet long, with a receiver surrounded with cold water. All the vessels must be perfectly clean, and no luting is employed. The retort is then to be cautiously heated by a small furnace of charcoal. It is useful to put into the retort a few sharp-pointed pieces of glass, or slips of platinum foil, with the view of diminishing the shocks produced by the acid vapour. The distilled product ought not to be collected until a dense grayish-white vapour is generated, the appearance of which is a sign that the pure concentrated acid is coming over. If this vapour should not immediately appear, it shows that the acid subjected to distillation is not of full strength; and the distilled product, until this point is attained, will be an acid water. In the distillation of sulphuric acid, M. Lembert uses fragments of the mineral called quartzite, which act by their asperities in breaking the shocks which the boiling vapour would otherwise occasion. After a time the fragments get worn, and must be changed. (*Journ. de Pharm.*, Sept. 1847.)

The Edinburgh and Dublin Colleges give formulæ for purifying the commercial acid. (See *Acidum Sulphuricum Purum.*) The strong acid is not convenient for medicinal use; and hence a formula for a diluted acid is given in the United States Pharmacopœia, following the example of the British Colleges. (See *Acidum Sulphuricum Dilutum.*)

Composition. The hydrated acid of the sp. gr. 1·845 consists of one eq. of dry acid 40, and one eq. of water 9=49; and the dry acid, of one eq. of sulphur 16, and three eqs. of oxygen 24=40. The ordinary commercial acid (sp gr. 1·8433) consists, according to Mr. Phillips, of one eq. of dry acid, and one and a quarter eqs. of water. The hydrated acid of Nordhausen has a density as high as 1·89 or 1·9, and consists of two eqs. of dry acid, and one eq. of water. This acid is particularly adapted to the purpose of dissolving indigo for dyeing the Saxon blue. When heated gently in a retort, connected with a dry and refrigerated receiver, dry or anhydrous sulphuric acid distils over, and the common protohydrated acid remains behind. The dry acid may also be obtained by the action of dry phosphoric acid on concentrated sulphuric acid according to the method of Ch. Barreswil. The mixture must be made in a refrigerated retort, and afterwards distilled by a gentle heat into a refrigerated receiver. Anhydrous sulphuric acid under 64° is in the form of small colourless crystals, resembling asbestos. It is tenacious, difficult to cut, and may be moulded in the fingers like wax, without acting on them. Exposed to the air, it emits a thick opaque vapour of an acid smell. Above 64° it is a liquid, very nearly of the density of 2.

Medical Properties. Sulphuric acid is tonic, antiseptic, and refrigerant. Internally it is always administered in a dilute state. For its medical properties in this form, the reader is referred to the title, *Acidum Sulphuricum Dilutum.* Externally it is sometimes employed as a caustic; but, from its liquid form, it is very inconvenient for that purpose. It is employed also as an ointment, mixed with lard, in the proportion of a drachm to an ounce, in swellings of the knee-joint and other affections. Charpie, corroded by it, forms a good application to gangrene. When mixed with saffron to the consistence of a ductile paste, Velpeau found this acid to form a convenient caustic, not liable to spread or to be absorbed, and giving rise to an eschar which is promptly detached.

Toxicological Properties. The symptoms of poisoning by this acid are the following:—Burning heat in the throat and stomach, extreme fetidness of the breath, nausea and excessive vomitings of black or reddish matter, excruciating pains in the bowels, difficulty of breathing, extreme anguish, a feeling of cold on the skin, great prostration, constant tossing, convulsions, and death. The intellectual faculties remain unimpaired. Frequently the

uvula, palate, tonsils, and other parts of the fauces are covered with black or white sloughs. The treatment consists in the administration of large quantities of magnesia, or, if this be not at hand, of a solution of soap. The safety of the patient depends upon the greatest promptitude in the application of the antidotes. After the poison has been neutralized, mucilaginous and other bland drinks must be taken in large quantities. After death, according to Dr. Geoghegan, the acid may be detected in the blood and parenchymatous viscera, especially in the liver. It is found, not as a sulphate, but combined severally with the colouring matter and tissues.

Uses in the Arts. Sulphuric acid is more used in the arts than any other acid. It is employed to obtain many of the other acids; to extract soda from common salt; to make alum and sulphate of iron, when these salts command a good price, and the acid is cheap; to dissolve indigo; to prepare skins for tanning; to prepare phosphorus, chlorinated lime or bleaching salt, sulphate of magnesia, &c. The arts of bleaching and dyeing cause its principal consumption.

Pharm. Uses. Sulphuric acid is used as a chemical agent, in one or more of the Pharmacopœias commented on in this work, for preparing the following officinals:—Acidum Gallicum; Acidum Hydrocyanicum Dilutum; Acidum Muriaticum Purum; Acidum Nitricum Purum; Æther; Ammoniæ Hydrosulphuretum; Antimonii Potassio-Tartras; Aqua Acidi Carbonici; Argenti Cyanuretum; Chlorinei Aqua; Collodium; Ferri Ferrocyanuretum; Ferri Oxidum Hydratum; Ferri Oxidum Nigrum; Hydrargyri Chloridum Corrosivum; Hydrargyri Chloridum Mite; Liquor Sodæ Chlorinatæ; Potassæ Bicarbonas; Quinæ Sulphas; Sodæ Bicarbonas; Sodæ Phosphas; Sodæ Valerianas; Spiritus Ætheris Nitrici; Strychnia; Veratria.

Off. Prep. Acidum Sulphuricum Aromaticum; Acidum Sulphuricum Dilutum; Acidum Sulphuricum Purum; Ferri Sulphas; Ferri Sulphas Granulatum; Hydrargyri Sulphas; Hydrargyri Sulphas Flavus; Oleum Ætherеum; Potassæ Bisulphas; Potassæ Sulphas; Quiniæ Sulphas; Spiritus Ætherеus Oleosus; Unguentum Sulphuris Compositum; Zinci Sulphas. B.

ACIDUM TARTARICUM. *U. S., Lond., Ed., Dub.*

Tartaric Acid.

Acide tartrique, *Fr.*; Weinsteinsäure, *Germ.*; Acido tartarico, *Ital., Span.*

Tartaric acid is placed among the preparations by the Edinburgh College; but stands more properly, in the London, Dublin, and United States Pharmacopœias, in the Materia Medica list, as an article to be purchased from the manufacturing chemist. It is extracted from *tartar*, a peculiar substance which concretes on the inside of wine-casks, being deposited there during the fermentation of the wine. Tartar, when purified and reduced to powder, is the cream of tartar of the shops, and is found to consist of two equivalents of tartaric acid united to one of potassa. (See *Potassæ Bitartras.*)

Tartaric acid was first obtained, in a separate state, by Scheele in 1770. The process consists in saturating the excess of acid in the bitartrate of potassa or cream of tartar with carbonate of lime, and decomposing the resulting insoluble tartrate of lime by sulphuric acid, which precipitates in combination with the lime, and liberates the tartaric acid. The equivalent quantities are one eq. of bitartrate, and one of carbonate of lime. The process, when thus conducted, furnishes the second equivalent, or excess of acid only of the bitartrate. The other equivalent may be procured by decomposing the neutral tartrate of potassa, remaining in the solution after the precipitation of the tartrate of lime, by chloride of calcium in excess. By double decomposition,

chloride of potassium will be formed in solution, and a second portion of tartrate of lime will precipitate, which may be decomposed by sulphuric acid in the same manner as the first portion. The process, when thus conducted, will, of course, furnish twice as much tartaric acid, as when the excess of acid only is saturated and set free.

Preparation on the Large Scale. The process pursued on the large scale is different from that above given. The decompositions are effected in a wooden vessel, closed at the top, called a generator, of the capacity of about 2000 gallons, and furnished with an exit-pipe for carbonic acid, and with pipes, entering the sides of the generator, for the admission of steam and of cold water respectively. Into the generator, about one-fourth filled with water, 1500 pounds of washed chalk (carbonate of lime) are introduced, and the whole is heated by a jet of steam, and thoroughly mixed by an agitator, until a uniform mass is obtained. About two tons of tartar are now introduced by degrees, and thoroughly mixed. The carbonate of lime is decomposed, the carbonic acid escapes by the exit-pipe, and the lime unites with the excess of tartaric acid to form tartrate of lime, which precipitates; while the neutral tartrate of potassa remains in solution. The next step is to decompose the tartrate of potassa, so as to convert its tartaric acid into tartrate of lime. This is effected by the addition of sulphate of lime in the state of paste, which, by double decomposition, forms a fresh portion of tartrate of lime, while sulphate of potassa remains in solution. The solution of sulphate of potassa, when clear, is drawn off into suitable reservoirs, and the remaining tartrate of lime is washed with several charges of cold water, the washings being preserved. The tartrate of lime, mixed with sufficient water, is now decomposed by the requisite quantity of sulphuric acid, with the effect of forming sulphate of lime, and liberating the tartaric acid, which remains in solution. The whole is now run off into a wooden back, lined with lead, furnished with a perforated false bottom, and covered throughout with stout twilled flannel. Through this the solution of tartaric acid filters, and the filtered liquor passes through a pipe, leading from the bottom of the back to suitable reservoirs. The sulphate of lime is then washed until it is tasteless, and the whole acid liquid is evaporated, in order to crystallize. The evaporation is effected in wooden vessels, lined with lead, by means of steam circulating in coils of lead-pipe, care being taken that the heat does not exceed 165°. The vacuum-pan is used with advantage in evaporating the acid solution; as it furnishes the means of concentration at a lower temperature. When the acid liquor has attained the sp. gr. of about 1500°, it is drawn off into sheet-lead, cylindrical, crystallizing vessels, capable of holding 500 pounds of the solution. These crystallizers are placed in a warm situation, and, in the course of three or four days, a crop of crystals is produced in each, averaging 200 pounds. These crystals, being somewhat coloured, are purified by redissolving them in hot water. The solution is then digested with purified animal charcoal, filtered, again concentrated, and crystallized. The crystals, having been washed and drained, are finally dried on wooden trays, lined with thin sheet-lead, placed in a room heated by steam. The mother liquors of the first crystallization are again concentrated, and the crystals obtained, purified by animal charcoal as before. When the residuary liquors are no longer crystallizable, they are saturated with chalk, and converted into tartrate of lime, to be added to the product of a new operation. In order to obtain fine crystals of tartaric acid, it is necessary to use a slight excess of sulphuric acid in decomposing the tartrate of lime. (*Pharm. Journ. and Trans.*, Feb. 1851.) The merit of the above process is the greater economy of sulphate of lime over chloride of calcium for decomposing the neutral tartrate of potassa.

Properties. Tartaric acid is a white crystallized solid, in the form of irregular six-sided prisms. Sometimes two opposite sides of the prism become very much enlarged, so as to cause the crystals to present the appearance of tables. As found in the shops, it is in the form of a fine white powder, prepared by pulverizing the crystals. It is unalterable in the air, and possesses a strong acid taste, which becomes agreeable when the acid is sufficiently diluted with water. It is soluble in a little less than its weight of cold water, and in half its weight of boiling water. It is also soluble in alcohol. A weak solution undergoes spontaneous decomposition by keeping, becoming covered with a mouldy pellicle. In the form of crystals, it always contains combined water, from which it cannot be separated without the substitution of a base. In uniting with bases, it has a remarkable tendency to form double salts, several of which constitute important medicines. It combines with several of the vegetable organic alkalies, so as to form salts. When subjected to heat it gives rise to three peculiar acids, described in systematic chemical works. It is distinguished from all other acids by forming a crystalline precipitate, consisting of bitartrate of potassa, when added to a neutral salt of that alkali. Its most usual impurity is sulphuric acid, which may be detected by the solution affording, with acetate of lead, a precipitate only partially soluble in nitric acid. It sometimes contains a minute quantity of lime. When incinerated with red oxide of mercury, it leaves no residuum, or a mere trace.

Tartaric acid is incompatible with salifiable bases and their carbonates; with salts of potassa, with which it produces a crystalline precipitate of bitartrate; and with the salts of lime and lead, with which it also forms precipitates. It consists, when dry, of four eqs. of carbon 24, two of hydrogen 2, and five of oxygen 40=66; and, when crystallized, of one eq. of dry acid 66, and one of water 9=75.

Racemic acid, otherwise called *paratartaric* or *uvic acid*, is isomeric with tartaric acid. It exists, naturally, in small proportion, in the juice of grapes, growing in particular localities, and was obtained artificially, in 1853, by M. Pasteur. By combination with certain organic alkalies, M. Pasteur has resolved racemic acid into two acids which form distinct salts with the alkali. The acids in these salts have the power of turning the plane of polarization of polarized light in contrary directions, one to the right, the other to the left, which has caused them to be distinguished as *dextro-* and *lævo-tartaric acids*. Ordinary tartaric acid is dextro-tartaric acid, which may be converted into racemic acid, by exposing it, in the form of tartrate of cinchonia, to a heat of 338° for several hours. At the same time, a portion of tartaric acid is formed, which has no action on polarized light, and which is, therefore, called *inactive tartaric acid*. This acid, like racemic acid, is resolvable into dextro- and lævo-tartaric acids. Accordingly, we have four isomeric tartaric acids—dextro-tartaric acid (ordinary tartaric acid); lævo-tartaric acid; racemic acid, consisting of dextro- and lævo-tartaric acids; and inactive tartaric acid. Racemic acid differs from ordinary tartaric acid in being much less soluble in water, and in its want of action on polarized light. When crystallized it contains one eq. more of water than tartaric acid. The *racemates* differ from the tartrates in their crystalline form, and in their less solubility in water.

Medical Properties. Tartaric acid, being cheaper than citric acid, forms, when dissolved in water and sweetened, a good substitute for lemonade. It is much used in medicine to form acid refrigerant drinks and effervescing draughts. It is also employed in making *soda powders*, a preparation which is officinal in the Edinburgh and Dublin Pharmacopœias. Tartaric acid is a

constituent in the gentle aperient called *Seidlitz powders.* These consist of a mixture of two drachms of tartrate of potassa and soda (Rochelle salt), and two scruples of bicarbonate of soda, put up in a blue paper, and thirty-five grains of tartaric acid contained in a white one. The contents of the blue paper are dissolved in about half a pint of water, to which those of the white paper are added; and the whole is taken in a state of effervescence. In these powders the tartaric acid is in excess, which renders the medicine more pleasant, without interfering with its aperient quality. Tartaric acid, dried by a gentle heat, and then mixed in due proportion with bicarbonate of soda, forms a good effervescing powder, a teaspoonful of which, stirred into a tumbler of water, forms the dose. The mixture must be kept in well-stopped vials. The neutralizing power of tartaric acid is about the same as that of citric acid. Tartaric acid, in an over-dose, acts as a poison. After death, it may be detected in the blood and liver, from which it should be extracted by absolute alcohol, to avoid the error of mistaking the tartrates for it.

Off. Prep. Pulveres Effervescentes; Trochisci Acidi Tartarici. B.

ACONITI FOLIA. *U. S.*

Aconite Leaves.

The leaves of Aconitum Napellus. *U. S.*

Off. Syn. ACONITI FOLIUM. Aconitum Napellus. Folium recens et exsiccatum. *Lond.;* ACONITUM. Leaves of Aconitum Napellus. *Ed.*

ACONITI RADIX. *U. S., Lond.*

Aconite Root.

The root of Aconitum Napellus. *U. S., Lond.*

Off. Syn. ACONITUM. Aconitum Napellus. The root. *Dub.*

Aconit, *Fr.;* Eisenhut, Mönchskappe, *Germ.;* Aconito, Napello, *Ital.;* Aconito, *Span.*

ACONITUM. *Sex. Syst.* Polyandria Trigynia.—*Nat. Ord.* Ranunculaceæ. *Gen. Ch. Calyx* none. *Petals* five, the highest arched. *Nectaries* two, peduncled, recurved. *Pods* three or five. *Willd.*

The plants belonging to this genus are herbaceous, with divided leaves, and violet or yellow flowers, disposed in spikes, racemes, or panicles. In the French Codex three species are recognised as officinal, *A. Anthora*, *A. Cammarum*, and *A. Napellus.* The U. S. and British Pharmacopœias unite at present in acknowledging only A. Napellus. There has been much difference of opinion as to the plant originally employed by Störck. Formerly thought to be *A. Napellus*, it was afterwards generally believed to be *A. neomontanum* of Willdenow, and by De Candolle was determined to be a variety of his *A. paniculatum*, designated as *Störckianum.* But, according to Geiger, *A. neomontanum* is possessed of little acrimony; and Dr. Christison states that *A. paniculatum*, raised at Edinburgh from seeds sent by De Candolle himself, was quite destitute of that property. Neither of these, therefore, could have been Störck's plant, which is represented as extraordinarily acrid. It is, however, of little consequence which was used by Störck; as many of the species possess similar virtues, and one is frequently substituted for another in the shops. Those are probably the best which are most acrid. Among these certainly is *A. Lycoctonum.* Dr. Christison found *A. Napellus*, *A. Sinense*, *A. Tauricum*, *A. uncinatum*, and *A. ferox* to have intense acrimony; and Geiger states that he has found none equal,

in this respect, to A. Napellus. *A. uncinatum* is the only species indigenous in this country. Most of the others are natives of the Alpine regions of Europe and Siberia. Those employed in medicine appear to be indiscriminately called by English writers *wolfsbane* or *monkshood*.

Aconitum Napellus. Linn. *Flor. Suec. ed.* 1755, p. 168.—*A. neubergense.* De Candolle, *Prodrom.* i. 62.—*A. variabile neubergense.* Hayne, *Darstel. und Beschreib.* &c., xii. 14. This is a perennial herbaceous plant, with a turnip-shaped or fusiform root, seldom exceeding at top the thickness of the finger, three or four inches or more in length, brownish externally, whitish and fleshy within, and sending forth numerous long, thick, fleshy fibres. When the plant is in full growth, there are usually two roots joined together, of which the older is dark-brown and supports the stem, while the younger is of a light yellowish-brown, and is destined to furnish the stem of the following year. The stem is erect, round, smooth, leafy, usually simple, and from two to six or even eight feet high. The leaves are alternate, petiolate, divided almost to the base, from two to four inches in diameter, deep green upon their upper surface, light green beneath, somewhat rigid, and more or less smooth and shining on both sides. Those on the lower part of the stem have long footstalks and five or seven divisions; the upper, short footstalks and three or five divisions. The divisions are wedge-form, with two or three lobes, which extend nearly or quite to the middle. The lobes are cleft or toothed, and the laciniæ or teeth are linear or linear-lanceolate and pointed. The flowers are of a dark violet-blue colour, large and beautiful, and are borne at the summit of the stem upon a thick, simple, straight, erect, spike-like raceme, beneath which, in the cultivated plant, several smaller racemes arise from the axils of the upper leaves. Though without calyx, they have two small calycinal stipules, situated on the peduncle within a few lines of the flower. The petals are five, the upper helmet-shaped and beaked, nearly hemispherical, open or closed, the two lateral roundish and internally hairy, the two lower oblong-oval. They enclose two pediceled nectaries, of which the spur is capitate, and the lip bifid and revolute. The fruit consists of three, four, or five podlike capsules.

The plant is abundant in the mountain forests of France, Switzerland, and Germany. It is also cultivated in the gardens of Europe, and has been introduced into this country as an ornamental flower. All parts of it are acrid and poisonous. The leaves and root are used. The leaves should be collected when the flowers begin to appear, or shortly before. After the fruit has formed, they are less efficacious. The root is more active. It should be gathered in the autumn after the leaves have fallen, or in the spring before they appear. It is not perfect until after the second year's growth. (*Pharm. Journ. and Trans.*, x. 171.) The seeds also are very acrid.

Properties. The *fresh leaves* have a faint narcotic odour, most sensible when they are rubbed. Their taste is at first bitterish and herbaceous, afterwards burning and acrid, with a feeling of numbness and tingling on the inside of the lips, tongue, and fauces, which is very durable, lasting sometimes many hours. When long chewed, they inflame the tongue. The *dried leaves* have a similar taste, but the acrid impression commences later. Their sensible properties and medicinal activity are impaired by long keeping. They should be of a green colour, and free from mustiness. The *root*, though sweetish at first, has afterwards the same effect as the leaves upon the mouth and fauces. It shrinks much in drying, and becomes darker, but does not lose its acrimony. Those parcels, whether of leaves or roots, should always be rejected, which are destitute of this property. The analysis of aconite, though attempted by several chemists, has not been satisfactorily accomplished. Bucholz obtained from the fresh herb of A. neomontanum,

resin, wax, gum, albumen, extractive, lignin, malate and citrate of lime and other saline matters, besides 83·33 per cent. of water. During the bruising of the herb, he experienced headache, vertigo, &c., though water distilled from it produced no poisonous effect. It has been rendered probable by Geiger and Hesse, that there are two active principles in aconite, one easily destructible, upon which the acrimony depends, the other less acrid, alkaline, and capable of exerting a powerful narcotic influence. For the latter the name of *aconitin* or *aconitia* has been proposed. Hesse obtained it from the dried leaves by a process similar to that employed in procuring atropia. (See *Belladonna.*) The U. S. Pharmacopœia gives a process for its preparation. (See *Aconitia*, in the second part of this work.) Peschier discovered a peculiar acid in aconite, which he called *aconitic acid.* Messrs. T. and H. Smith, of Edinburgh, have ascertained the existence of mannite in the root. (*Pharm. Journ. and Trans.*, x. 124.) It contains also a fatty matter soluble in alcohol.

Medical Properties and Uses. Aconite was well known to the ancients as a powerful poison, but was first employed as a medicine by Baron Störck, of Vienna, whose experiments with it were published in the year 1762. In moderate doses, it has been said to excite the circulation, and to increase the perspiratory and urinary discharges; but these effects are doubtful, and certainly not constant. According to Dr. Fleming, it is a powerful sedative to the nervous system, reducing also the force of the circulation. In moderate doses, it produces warmth in the stomach and sometimes nausea, general warmth of the body, numbness and tingling in the lips and fingers, muscular weakness, diminished force and frequency of the pulse, and diminished frequency of respiration. From larger doses, all these effects are experienced in an increased degree. The stomach is more nauseated; the numbness and tingling extend over the body; headache, vertigo, and dimness of vision occur; the patient complains occasionally of severe neuralgic pains; the pulse, respiration, and muscular strength are greatly reduced; and a state of general prostration may be induced, from which the patient may not quite recover in less than two or three days. The effects of remedial doses begin to be felt in twenty or thirty minutes, are at the height in an hour or two, and continue with little abatement from three to five hours. In poisonous doses, besides the characteristic tingling in the mouth and elsewhere, it occasions burning heat of the œsophagus and stomach, thirst, violent nausea, vomiting, purging, severe gastric and intestinal spasms, headache, dimness of vision with contracted or expanded pupil, numbness or paralysis of the limbs, diminished sensibility in general, stiffness or spasm of the muscles, great prostration of strength, pallid countenance, cold extremities, an extremely feeble pulse, and death in a few hours, sometimes preceded by delirium, stupor, or convulsions. All these effects are not experienced in every case; but there is no one of them which has not been recorded as having occurred in one or more instances. Dissection reveals inflammation of the stomach and bowels, and engorgement of the brain and lungs. Life may usually be saved by a timely and thorough evacuation of the stomach, and the use of stimulant remedies internally and externally; and it is wonderful how rapidly the patient passes from a state of imminent danger to perfect health. Pereira states that, when dogs are opened immediately after death from aconite, no pulsations of the heart are visible. Applied to the skin, aconite occasions a feeling of heat and prickling or tingling followed by numbness, and, if in contact with a wound, produces its peculiar constitutional effects. Applied to the eye, it causes contraction of the pupil. In relation to its mode of action, it appears to be locally irritant, and, at the same time, entering the system, to operate powerfully on the brain, spinal

marrow, and nerves, directly diminishing their power, and thus producing, to a greater or less extent, paralysis both of sensation and motion. The heart feels also this paralyzing influence, and hence proceeds the great depression of the pulse under the full action of the medicine.

Aconite has been employed in rheumatism, neuralgia, gout, anginose and catarrhal affections, scrofula, phthisis, metastatic abscess and other cases of purulent infection, secondary syphilis, carcinoma, certain cutaneous diseases, hooping-cough, amaurosis, paralysis, epilepsy, intermittent fever, dropsies, and hypertrophy of the heart. It has long enjoyed, in Germany, a high reputation as a remedy in rheumatism; and has recently come into great vogue elsewhere in the treatment of that disease, especially in its chronic and neuralgic forms. By some practitioners it is considered as one of the most effectual remedies in neuralgia, in which it is used both internally and as a local application. Dr. Fleming considers it highly useful as an antiphlogistic remedy, and especially applicable to cases of active cerebral congestion or inflammation; while it is contra-indicated in the headache of anæmia, and in all cases attended with a torpid or paralytic condition of the muscular system. Cazenave has found it very useful in cutaneous eruptions with excessive sensibility of the skin. It may be administered in powder, extract, or tincture. The dose of the powdered leaves is one or two grains, of the extract from half a grain to a grain, of the tincture of the leaves twenty or thirty drops, to be repeated twice or three times a-day, and gradually increased till the effects of the medicine are experienced. The preparation now most employed is probably the strong tincture of the root, a process for which is given in the U. S. Pharmacopœia, under the name of *Tinctura Aconiti Radicis.* Of this, from five to ten drops may be given three times a-day, and gradually increased till its effects become obvious. It is very important to distinguish between the tincture of the leaves and the strong tincture of the root just referred to.* Few patients will bear at first more than ten minims of the latter. Aconite may be used externally in the form of the saturated tincture of the root, of extract mixed with lard, of a plaster or liniment made with the extract, or of *aconitia.* (See *Extractum Aconiti*, *Extractum Aconiti Alcoholicum*, and *Aconitia.*) The tincture may be applied by means of a soft piece of sponge fastened to the end of a stick.

Off. Prep. of the Leaves. Extractum Aconiti; Extractum Aconiti Alcoholicum; Tinctura Aconiti Foliorum.

Off. Prep. of the Root. Aconitia; Tinctura Aconiti Radicis. W.

ADEPS. *U. S., Lond.*

Lard.

The prepared fat of Sus Scrofa, free from saline matter. *U. S., Lond.*

Off. Syn. AXUNGIA. Fat of Sus Scrofa. *Ed.;* AXUNGIA. ADEPS SUILLUS. The fat of Sus Scrofa. *Dub.*

Axonge, Graisse, Saindoux, *Fr.;* Schweineschmalz, *Germ.;* Grasso di porco, Lardo, *Ital.;* Manteca de puerco, Lardo, *Span.*

Lard is the prepared fat of the hog. The Dublin College gives a process for its preparation; but in this country it is purchased by the druggists

* Physicians should be very careful, when prescribing, to designate by name which of these tinctures they intend, whether that of the root, or that of the leaves; as serious mistakes may otherwise occur; and apothecaries should be scrupulous in putting up the preparation of the U. S. Pharmacopœia when the tincture of the root is prescribed, and not that of Dr. Fleming, which is stronger than the officinal. (*Note to the tenth edition.*)

already prepared. The adipose matter of the omentum and mesentery, and that around the kidneys, are usually employed; though the subcutaneous fat is said to afford lard of a firmer consistence. In the crude state it contains membranes and vessels, and is more or less contaminated with blood, from all which it must be freed before it can be fit for use. For this purpose, the fat, having been deprived as far as possible by the hand of membranous matter, is cut into pieces, washed with water till the liquor ceases to be coloured, and then melted, usually with a small portion of water, in a copper or iron vessel, over a slow fire. The heat is continued till all the moisture is evaporated, which may be known by the transparency of the melted fat, and the absence of crepitation when a small portion of it is thrown into the fire. Care should be taken that the heat is not too great; as otherwise the lard might be partially decomposed, acquire a yellow colour, and become acrid. The process is completed by straining the liquid through linen and pouring it into suitable vessels, in which it concretes upon cooling.

Lard, as offered for sale, often contains common salt, which renders it unfit for pharmaceutic purposes. To free it from this, it may be melted with twice its weight of boiling water, the mixture well agitated and set aside to cool, and the fat then separated. American lard is said to be adulterated, in England, with water, starch, and a small proportion of alum and quicklime, which render it whiter, but unfit it for medical use.

Properties. Lard is white, inodorous, with little taste, of a soft consistence at ordinary temperatures, fusible at about 100° F., insoluble in water, partially soluble in alcohol, more so in ether and the volatile oils, dissolved and decomposed by the stronger acids, and converted into soap by reaction with the alkalies. When melted, it readily unites with wax and resins. According to Braconnot, it contains, in 100 parts, 62 of *olëin* or the liquid principle of oils, and 38 of *stearin* or the concrete principle. But M. Le Canu ascertained that the stearin of Braconnot consists of two distinct substances, differing in fusibility and solubility. For the least fusible of these he retained the name of stearin, and to the other applied that of *margarin*, from its resemblance to the principle of the same name in vegetable oils. Most fats and oils of animal origin are composed of these ingredients, upon the relative proportion of which their consistence respectively depends. The liquid and concrete principles may be obtained separate by the action of boiling alcohol, which, on cooling, deposits the latter, and yields the former upon evaporation. Another method is to compress fat, or oil congealed by cold, between the folds of bibulous paper. The olëin is absorbed by the paper, and may be separated by compression under water; the stearin and margarin remain.

Olein, stearin, and margarin are now generally considered as compounds respectively of oleic, stearic, and margaric acids with glycerin and water.

Olëin, originally denominated *eläin*, resembles oil in appearance, is colourless when pure, congeals at 20° F., has little odour and a sweetish taste, is insoluble in water, but soluble in boiling alcohol, and consists of carbon, hydrogen, and oxygen. Its present received formula is one eq. of glycerin $C_6H_7O_5$ + two eqs. of oleic acid $C_{88}H_{78}O_8$ + two eqs. of water $H_2O_2 = C_{94}H_{87}O_{15}$. (*Kane's Chemistry.*) The olëin of lard has been introduced extensively into use for burning in lamps. Vast quantities of it are prepared in Cincinnati, Ohio, and much is exported. In France it is said to be largely used for adulterating olive oil. (*Pharm. Journ. and Trans.*, x. 132.)

Stearin is white, concrete, of a crystalline appearance like spermaceti, pulverizable, fusible at about 143°, soluble in alcohol and boiling ether, insoluble in cold ether and in water, and composed, like the former principle, of carbon, hydrogen, and oxygen. Its formula is one eq. of glycerin $C_6H_7O_5$

+two eqs. of stearic acid $C_{136}H_{132}O_{10}$+two eqs. of water H_2O_2=$C_{142}H_{141}O_{17}$. It may be separated from the concrete matter of lard by treating it with cold ether so long as any thing is dissolved. The stearin is left behind, and the ethereal solution yields margarin by evaporation.

The *margarin* of animal fats resembles stearin very closely, differing only in its melting point, which is about 118°, and in being soluble in cold ether. It is said to consist of one eq. of glycerin $C_6H_7O_5$+two eqs. of margaric acid $C_{68}H_{66}O_6$+one eq. of water HO=$C_{74}H_{74}O_{12}$. Dr. Heintz, of Berlin, infers from his experiments that margaric acid is a mixture of stearic and palmitic acids. If this view is correct, margarin must be a mixture of stearin and palmitin, the latter of which is the peculiar fatty principle of palm oil. (*Chem. Gaz.*, xi. 43.) Very good candles are now made out of the concrete constituents of lard.

Exposed to the air, lard absorbs oxygen and becomes rancid. It should, therefore, be kept in well closed vessels, or procured fresh when wanted for use. In the rancid state, it irritates the skin, and sometimes exercises an injurious reaction on substances mixed with it. Thus, the ointment of iodide of potassium, which is white when prepared with fresh lard, is said to be more or less yellow when the lard employed is rancid. Rancidity in lard and other fats is prevented by digesting them with benzoin or poplar buds.

Medical Properties and Uses. Lard is emollient, and is occasionally employed by itself in frictions, or in connexion with poultices to preserve their soft consistence; but its chief use is in pharmacy as an ingredient of ointments and cerates. It is frequently added to laxative enemata. W.

ALCOHOL. *U. S.*

Alcohol.

Rectified spirit of the specific gravity 0·835. *U. S.*

Off. Syn. SPIRITUS RECTIFICATUS. *Lond., Ed., Dub.*

Spirit of wine; Alcohol, Esprit de vin, *Fr.*; Rectificirter Weingeist, *Germ.*; Alcoole, Acquavite rettificata, *Ital.*; Alcohol, Espiritu rectificado de vino, *Span.*

The Pharmacopœias have recognised several pharmaceutical strengths of the liquid, which, in its anhydrous state, is named by the chemist *alcohol* or *absolute alcohol*. The Dublin Pharmacopœia has admitted four strengths of alcoholic liquid, the Edinburgh three, and the London and United States Pharmacopœias only two. The following table presents a view of the names and strengths of the alcohol according to these different authorities; assuming those spirits to be identical, the specific gravities of which approach to equality.

	U. S.	*Lond.*	*Ed.*	*Dub.*
Highest off. strength.	———	———	Alcohol. Sp. gr. 0·794–6.	Alcohol. Sp. gr. 0·795.
Second do.	———	———	———	Spiritus Fortior. Sp. gr. 0·818.
Third do.	Alcohol. Sp. gr. 0·835.	Spiritus Rectificatus. Sp. gr. 0·838.	Spiritus Rectificatus. Sp. gr. 0·838.	Spiritus Rectificatus. Sp. gr. 0·840.
Lowest do.	Alcohol Dilutum Sp. gr. 0·935.	Spiritus Tenuior. Sp. gr. 0·920.	Spiritus Tenuior. Sp. gr. 0·912.	Spiritus Tenuior. Sp. gr. 0·920.

By the table it is perceived that the officinal "Alcohol" of the United States Pharmacopœia is a rectified spirit of the sp. gr. 0·835; while the same name is applied by the Edinburgh and Dublin Colleges to absolute alcohol. It is certainly to be regretted that the same name is applied to spirit of such different strengths, as it leads to confusion. Our object, however, in this article, is to describe the *Alcohol* of the United States Pharmacopœia, corresponding to the British *Spiritus Rectificatus*. The *Spiritus Fortior* of the Dublin College, the *Alcohol* of the Edinburgh and Dublin Colleges, and the *Alcohol Dilutum* will be considered in their appropriate place in the second part of this work. (See *Preparations of Alcohol.*)

Alcohol, in the chemical sense, is a peculiar liquid, generated for the most part in vegetable juices and infusions by a *fermentation*, called the *vinous* or *alcoholic*. The liquids which have undergone it are called vinous liquors, and are of various kinds. Thus, the fermented juice of the grape is called wine; of the apple, cider; and the fermented infusion of malt, beer.

With regard to the nature of the liquids susceptible of the vinous fermentation, however various they may be in other respects, one general character prevails; that, namely, of containing sugar in some form or other. It is found, further, that, after they have undergone the vinous fermentation, the sugar they contained has either wholly or in part disappeared, and that the only new products are alcohol, which remains in the liquid, and carbonic acid, which escapes during the process; and these, when taken together, are found to be equal in weight to the sugar lost. It is hence inferred that sugar is the subject-matter of the changes that occur during the vinous fermentation, and that it is resolved into alcohol and carbonic acid. Additional facts in support of this view will be adduced under the head of the composition of absolute alcohol. (See *Alcohol, Ed., Dub.*, under the head of *Preparations of Alcohol*, in the second part of this work.)

Sugar, however, will not undergo the vinous fermentation by itself; but requires to be dissolved in water, subjected to the influence of a ferment, and kept at a certain temperature. Accordingly, sugar, water, the presence of a ferment, and the maintenance of an adequate temperature, may be deemed the pre-requisites of the vinous fermentation. The water acts by giving fluidity, and the ferment and temperature operate by commencing and maintaining the chemical changes. The precise manner in which the ferment operates in commencing the reaction is not known; but the fermentative change seems to be intimately connected with the multiplication of a microscopic vegetable, in the form of diaphanous globules, contained in the ferment, and called *torula cerevisiæ*. The ferment is generally considered to contain a peculiar nitrogenous principle, having a close analogy to albumen and casein, although it has not as yet been isolated. The proper temperature for conducting the vinous fermentation ranges from 60° to 90°.

Certain vegetable infusions, as those of potatoes and rice, though consisting almost entirely of starch, are, nevertheless, capable of undergoing the vinous fermentation, and form seeming exceptions to the rule, that sugar is the only substance susceptible of this fermentation. The apparent exception is explained by the circumstance, that starch is susceptible of a spontaneous change which converts it into sugar. How this change takes place is not well known, but it is designated by some authors as the *saccharine fermentation*. Thus, Kirchoff proved that, if a mixture of gluten from flour and starch from potatoes be put into hot water, the starch will be converted into sugar. When, therefore, starch is apparently converted into alcohol by fermentation, it is supposed that, during the change, it passes through the intermediate state of sugar.

Alcohol, being the product of the vinous fermentation, necessarily exists in all vinous liquors, and may be obtained from them by distillation. Formerly it was supposed that these liquors did not contain alcohol, but were merely capable of furnishing it, in consequence of a new arrangement of their ultimate constituents, the result of the heat applied. Brande, however, disproved this idea, by showing that alcohol may be obtained from all vinous liquors without the application of heat, and, therefore, must pre-exist in them. His method of separating it consists in precipitating the acid and colouring matter from each vinous liquor by subacetate of lead, and removing the water by carbonate of potassa. Gay-Lussac and Donovan have proved the same fact. According to the former, litharge, in fine powder, is the best agent for precipitating the colouring matter.

In vinous liquors, the alcohol is diluted with abundance of water, and associated with colouring matter, volatile oil, extractive, and various acids and salts. In purifying it, we take advantage of its volatility, which enables us to separate it by distillation, combined with some of the principles of the vinous liquor employed, and more or less water. The distilled product of vinous liquors forms the different *ardent spirits of commerce.* When obtained from wine, it is called brandy; from fermented molasses, rum; from cider, malted barley, or rye, whisky; from malted barley and rye-meal with hops, and rectified from juniper berries, Holland gin; from malted barley, rye, or potatoes, and rectified from turpentine, common gin; and from fermented rice, arrack. These spirits are of different strengths, that is, contain different proportions of alcohol, and have various peculiarities by which they are distinguished by the taste. Their strength is accurately judged of by the specific gravity, which is always less in proportion as their concentration is greater. When they have the sp. gr. 0·920 (0·91984, *Drinkwater*), they are designated in commerce by the term *proof spirit.* If lighter than this, they are said to be above proof; if heavier, below proof; and the per centage of water, or of spirit of 0·825, necessary to be added to any sample of spirit to bring it to the standard of proof spirit, indicates the number of degrees the given sample is above or below proof. Thus, if 100 volumes of a spirit require 10 volumes of water to reduce it to proof spirit, it is said to be "10 over proof." On the other hand, if 100 volumes of a spirit require 10 volumes of a spirit of 0·825 to raise it to proof, the sample is said to be "10 under proof."

Proof spirit is still very far from being pure; being a dilute alcohol, containing about half its weight of water, together with a peculiar oil and other foreign matters. It may be further purified and strengthened by redistillation, or *rectification* as it is called. Whisky is the spirit usually employed for this purpose; and from every hundred gallons, between fifty-seven and fifty-eight may be obtained, of the average strength of rectified spirit (sp. gr. 0·835), corresponding to the *Alcohol* of the U. S. Pharmacopœia, and the *Spiritus Rectificatus* of the British Colleges. When this is once more cautiously distilled, it will be further purified from water, and the sp. gr. attained will be about 0·825, which is the lightest spirit that can be obtained by ordinary distillation, and is the pure spirit of the British system of excise. It still, however, contains eleven per cent. of water. In the mean while, the spirit, by these repeated distillations, becomes more and more freed from the contaminating oil, called *grain oil* or *fusel oil.* (See *Alcohol Amylicum.*)

Properties. Alcohol, using this term in a generic sense, is a colourless, transparent, volatile liquid, of a penetrating, agreeable odour, and burning taste. It should be wholly free from foreign odour, which, when present, is probably owing to grain or fusel oil. When free from water, it is called

anhydrous or *absolute alcohol.* (See *Alcohol, Ed., Dub.*, in the second part of this work.) It is inflammable, and burns without smoke or residue, the products being water and carbonic acid. Its flame is of a bluish colour when strong; but yellowish when weak. It combines in all proportions with water and ether; and, when diluted with distilled water, preserves its transparency. Its density varies with the proportion of water it contains. When of the sp. gr. 0·820, its boiling point is at 176°. Its value depends upon the quantity of absolute alcohol contained in it; and, as this is greater in proportion as the sp. gr. is less, it is found convenient to take the density of a sample in estimating its strength. This is done by instruments with bulbs and long stems, called hydrometers, which, by being allowed to float in the spirit, sink deeper into it in proportion as it is lighter. Any given hydrometer strength corresponds to some particular specific gravity; and, by referring to tables constructed for the purpose, the per centage of absolute alcohol indicated in each case is at once shown. The following table, constructed by Lowitz and improved by Thomson, is of this kind. We have placed in notes, referring to their respective specific gravities in the table, the names of the different officinal spirits, whereby the per centage of absolute alcohol is indicated which they severally contain.

Table of the Specific Gravity of different Mixtures by Weight of Absolute Alcohol and Distilled Water, at the Temperature of 60°.

100 *Parts.*		*Sp. Gr. at* 60°.	100 *Parts.*		*Sp. Gr. at* 60°.	100 *Parts.*		*Sp. Gr. at* 60°.	100 *Parts.*		*Sp. Gr. at* 60°.
Alc.	*Wat.*		*Alc.*	*Wat.*		*Alc.*	*Wat.*		*Alc.*	*Wat.*	
100	0	·796*	76	24	·857	52	48	·912**	28	72	·962
99	1	·798	75	25	·860	51	49	·915	27	73	·963
98	2	·801	74	26	·863	50	50	·917	26	74	·965
97	3	·804	73	27	·865	49	51	·920††	25	75	·967
96	4	·807	72	28	·867	48	52	·922	24	76	·968
95	5	·809	71	29	·870	47	53	·924	23	77	·970
94	6	·812	70	30	·871	46	54	·926	22	78	·972
93	7	·815	69	31	·874	45	55	·928	21	79	·973
92	8	·817†	68	32	·875	44	56	·930	20	80	·974
91	9	·820	67	33	·879	43	57	·933	19	81	·975
90	10	·822	66	34	·880	42	58	·935‡‡	18	82	·977
89	11	·825‡	65	35	·883	41	59	·937	17	83	·978
88	12	·827	64	36	·886	40	60	·939	16	84	·979
87	13	·830	63	37	·889	39	61	·941	15	85	·981
86	14	·832	62	38	·891	38	62	·943	14	86	·982
85	15	·835§	61	39	·893	37	63	·945	13	87	·984
84	16	·838‖	60	40	·896	36	64	·947	12	88	·986
83	17	·840¶	59	41	·898	35	65	·949	11	89	·987
82	18	·843	58	42	·900	34	66	·951	10	90	·988
81	19	·846	57	43	·903	33	67	·953	9	91	·989
80	20	·848	56	44	·904	32	68	·955	8	92	·990
79	21	·851	55	45	·906	31	69	·957	7	93	.991
78	22	·853	54	46	·908	30	70	·958	6	94	·992
77	23	·855	53	47	·910	29	71	·960			

Alcohol is capable of dissolving a great number of substances; as, for example, sulphur and phosphorus in small quantity, iodine and ammonia

* Alcohol, *Ed., Dub.* † Spiritus Fortior, *Dub.* (nearly).
‡ Lightest spirit obtained by ordinary distillation. § Alcohol, *U. S.*
‖ Spiritus Rectificatus, *Lond., Ed.* ¶ Spiritus Rectificatus, *Dub.*
** Spiritus Tenuior, *Ed.* †† Spiritus Tenuior, *Lond., Dub.* ‡‡ Alcohol Dilutum, *U. S.*

freely, and potassa, soda, and lithia in the caustic state, but not as carbonates. Among organic substances, it is a solvent of the organic vegetable alkalies, urea, tannic acid, sugar, mannite, camphor, resins, balsams, volatile oils, and soap. It dissolves the fixed oils sparingly, except castor oil, which is abundantly soluble. It acts on most acids, forming ethers with some, and effecting the solution of others. All deliquescent salts are soluble in alcohol, except carbonate of potassa; while the efflorescent salts, and those either insoluble or sparingly soluble in water, are mostly insoluble in it. It dissolves muriate of ammonia, and most of the chlorides that are readily soluble in water; also some nitrates, but none of the metallic sulphates.

Officinal alcohol, though of standard strength, may still be impregnated with an essential oil, called *grain* or *fusel oil.* This is usually removed by digesting the alcohol with charcoal, especially animal charcoal. It may be detected by adding a little of the solution of nitrate of silver to the alcohol, and then exposing it to a bright light. If the oil be present, it will be converted into a black powder by the action of the oxide of silver upon it. Officinal alcohol will not withstand this test; as the best contains a little of the foreign oil. The Edinburgh College tests its rectified spirit, corresponding to the U. S. alcohol, in the following way. Four fluidounces (*Imp. meas.*), treated with twenty-five minims of a solution of one part of nitrate of silver in forty of distilled water, exposed to a bright light for twenty-four hours, and then freed from the black powder which forms by being passed through a filter, purified by weak nitric acid, undergo no farther change when again exposed to light with more of the test. Here a limited degree of contamination by fusel oil is allowed.

Medical Properties, &c. Alcohol is a very powerful diffusible stimulant. It is the intoxicating ingredient in all spirituous and vinous liquors, including under the latter term, porter, ale, and cider, and every liquid in short which has undergone the vinous fermentation. In a diluted state, and taken in small quantity, it excites the system, renders the pulse full, communicates additional energy to the muscles, and gives temporary exaltation to the mental faculties. In some states of acute disease, characterized by excessive debility, it is a valuable remedy. In chronic diseases, physicians should be cautious in prescribing alcoholic remedies, whether alone or in the form of tinctures, for fear of begetting intemperate habits in their patients. Externally, alcohol is sometimes applied to produce cold by evaporation; but, when its evaporation is repressed, it acts as a stimulant. A mixture of equal parts of rectified spirit and white of egg is stated by Dr. Christison to be an excellent application to excoriations from pressure, in their early stage, occurring in protracted diseases. It is to be applied frequently by a fine brush or feather, and renewed as it dries, until an albuminous coating is formed over the excoriated surface.

As an article of daily use, alcoholic liquors produce the most deplorable consequences. Besides the moral degradation which they cause, their habitual use gives rise to dyspepsia, hypochondriasis, visceral obstructions, dropsy, paralysis, and not unfrequently mania.

In the arts alcohol is used to form drying varnishes, and in chemistry, as an important analytic agent. Being a powerful antiseptic, it is very useful in preserving anatomical preparations.

Effects as a Poison. When taken in large quantity, alcohol, in the various forms of ardent spirit, produces a true apoplectic state, and occasionally speedy death. The face becomes livid or pale, the respiration stertorous, and the mouth frothy; and sense and feeling are more or less completely lost. Where the danger is imminent, an emetic may be administered, or the stomach pump used. The affusion of cold water is often very useful. An

enema of two tablespoonfuls of common salt in a pint of warm water is said to dissipate rapidly the more serious symptoms of intoxication. As a counter-poison, acetate of ammonia has been found to act with advantage. After death, abundant evidence is furnished of the absorption of the alcohol. By Dr. Percy it was detected by chemical analysis in the brain, and by others in the ventricles. Dr. Wright has detected it in the urine, after the use of whisky. Mr. R. D. Thomson has proposed the following test for minute quantities of alcohol. Distil one-third of the suspected liquid, and to the distillate add a crystal or two of chromic acid, and stir. If the smallest quantity of alcohol be present, green oxide of chromium, and aldehyd perceptible to the smell, will be developed. Instead of chromic acid, a few grains of powdered bichromate of potassa, acted on by a few drops of sulphuric acid, may be used.

Pharmaceutic Uses. Alcohol is very extensively employed as a pharmaceutic agent. Either in its rectified state or diluted with water, it is used in the preparation of collodion, ethereal oil, morphia, some of the syrups, and all the tinctures, spirits, ethers, and resinous extracts. It is added to the vinegars, some of the medicated waters, and one or more of the decoctions and infusions, to assist in their preservation, and serves as a vehicle or diluent of certain active medicines, as in *Spiritus Ammoniæ*, *Spiritus Ammoniæ Aromaticus*, and *Acidum Sulphuricum Aromaticum*. It is also employed for various incidental purposes connected with its solvent power.

Off. Prep. Alcohol, *Ed.;* Alcohol Dilutum; Spiritus Fortior; Spiritus Tenuior. B.

ALETRIS. *U. S., Secondary.*

Star Grass.

The root of Aletris farinosa. *U. S.*

ALETRIS. *Sex. Syst.* Hexandria Monogynia. — *Nat. Ord.* Liliaceæ.

Gen. Ch. Corolla tubular, six-cleft, wrinkled, persistent. *Stamens* inserted into the base of the segments. *Style* triangular, separable into three. *Capsule* opening at the top, three-celled, many seeded. *Bigelow.*

Aletris farinosa. Willd. *Sp. Plant.* ii. 183; Bigelow, *Am. Med. Bot.* iii. 92. This is an indigenous perennial plant, the leaves of which spring immediately from the root, and spread on the ground in the form of a star. Hence have originated the popular names of *star grass*, *blazing star*, and *mealy starwort*, by which it is known in different parts of the country. The leaves are sessile, lanceolate, entire, pointed, very smooth, longitudinally veined, and of unequal size, the largest being about four inches in length. From the midst of them a flower stem rises, one or two feet in height, nearly naked, with remote scales, which sometimes become leaves. It terminates in a slender scattered spike, the flowers of which stand on very short pedicels, and have minute bractes at the base. The calyx is wanting. The corolla is tubular, oblong, divided at the summit into six spreading segments, of a white colour, and, when old, of a mealy or rugose appearance on the outside. The plant is found in almost all parts of the United States, growing in fields and about the borders of woods, and flowering in June and July.

Properties. The root, which is the officinal portion, is small, crooked, branched, blackish externally, brown within, and intensely bitter. The bitterness is extracted by alcohol, and the tincture becomes turbid upon the addition of water. The decoction is moderately bitter; but much less so than the tincture. It affords no precipitate with the salts of iron. (*Bigelow.*)

Medical Properties. In small doses the root appears to be simply tonic, and may be employed advantageously for similar purposes with other bitters of the same class. When freely given it is apt to occasion nausea. In very large doses, it is said to be cathartic and emetic, and to produce some narcotic effect. It has been employed, with asserted benefit, in colic, dropsy, and chronic rheumatism. The powder may be administered as a tonic in the dose of ten grains. W.

ALLIUM. *U. S., Ed.*

Garlic.

The bulb of Allium sativum. *U. S., Ed.*

Ail, *Fr.;* Knoblauch, *Germ.;* Aglio, *Ital.;* Ajo, *Span.*

ALLIUM. *Sex. Syst.* Hexandria Monogynia. — *Nat. Ord.* Liliaceæ.

Gen. Ch. Corolla six-parted, spreading. *Spathe* many-flowered. *Umbel* crowded. *Capsule* superior. *Willd.*

This is a very extensive genus, including more than sixty species, most of which are European. Of the nine or ten indigenous in this country, none are officinal. Dr. Griffith states that the bulb of *A. Canadense* has been substituted for the cultivated garlic, and found equally efficient. (*Med. Bot.*, p. 653.) Of the European species several have been used from a very early period, both as food and medicine. *A. sativum*, or garlic, is the only one at present officinal; and to this we shall confine our observations in the present place, simply stating that few genera present a greater resemblance in sensible and medical properties, among the various species that compose them, than the present. For an account of *A. Cepa*, or onion, and *A. Porrum*, or leek, which have recently been discharged from the British Pharmacopœias, see the Appendix.

Allium sativum. Willd. *Sp. Plant.* ii. 68; Woodv. *Med. Bot.* p. 749, t. 256. This is a perennial plant, and like all its congeners, bulbous. The bulbs are numerous, and enclosed in a common membranous covering, from the base of which the fibres that constitute the proper root descend. The stem is simple, and rises about two feet. The leaves are long, flat, and grass-like, and sheath the lower half of the stem. At the termination of the stem is a cluster of flowers and bulbs mingled together, and enclosed in a pointed spathe, which opens on one side and withers. The flowers are small and white, and make their appearance in July. This species of garlic grows wild in Sicily, Italy, and the south of France; and is cultivated in all civilized countries.

The part employed, as well for culinary purposes as in medicine, is the bulb. The bulbs are dug up with a portion of the stem attached, and, having been dried in the sun, are tied together in bunches, and thus brought to market. They are said to lose by drying nine parts of their weight out of fifteen, with little diminution of their sensible properties. This species of Allium is commonly called *English garlic*, to distinguish it from those which grow wild in our fields and meadows.

Properties. Garlic, as found in the shops, is of a shape somewhat spherical, flattened at the bottom, and drawn towards a point at the summit, where a portion of the stem several inches in length projects. It is covered with a white, dry, membranous envelope, consisting of several delicate laminæ, within which the small bulbs are arranged around the stem, having each a distinct coat. These small bulbs, which in common language are called *cloves* of garlic, are usually five or six in number, of an oblong shape, somewhat curved, and in their interior are whitish, moist, and fleshy. They have a

disagreeable pungent odour, so peculiar as to have received the name of *alliaceous*. Their taste is bitter and acrid. The peculiar smell and taste, though strongest in the bulb, are found to a greater or less extent in all parts of the plant. They depend on an *essential oil*, which is very volatile, and may be obtained by distillation, passing over with the first portions of water. As first obtained, the oil is of a dark brownish-yellow colour, heavier than water, and decomposed at its boiling temperature. It may be purified by repeated distillation in a salt-water bath, and is then lighter than water, of a pale yellow colour, and not decomposed by boiling. According to Wertheim, it consists of a peculiar organic radical called *allyle* (C_6H_5), combined with one equivalent of sulphur. From one hundred weight of garlic Wertheim obtained from three to four ounces of the impure oil, and about two-thirds as much of the rectified. (*Chem. Gaz.*, iii. 177.) The impure oil has an exceedingly pungent odour, and strong acrid taste; and, when applied to the skin, produces much irritation, and sometimes even blisters. Besides this oil, fresh garlic, according to Cadet-Gassicourt, contains, in 1406 parts, 520 of mucilage, 37 of albumen, 48 of fibrous matter, and 801 of water. Bouillon-Lagrange mentions, among its constituents, sulphur, a saccharine matter, and a small quantity of fecula. The fresh bulbs yield upon pressure nearly a fourth part of juice, which is highly viscid, and so tenacious as to require dilution with water before it can be easily filtered. When dried, it serves as a lute for porcelain. It has the medical properties of the bulbs. Water, alcohol, and vinegar extract the virtues of garlic. Boiling, however, if continued for some time, renders it inert.

Medical Properties and Uses. The use of garlic, as a medicine and condiment, ascends to the highest antiquity. When it is taken internally, the oil is speedily absorbed, and, pervading the system, becomes sensible in the breath and various secretions. Even externally applied, as for example to the soles of the feet, it imparts its peculiar odour to the breath, urine, and perspiration, and, according to some writers, may be tasted in the mouth. Its effects upon the system are those of a general stimulant. It quickens the circulation, excites the nervous system, promotes expectoration in debility of the lungs, produces diaphoresis or diuresis according as the patient is kept warm or cool, and acts upon the stomach as a tonic and carminative. It is said also to be emmenagogue. Applied to the skin, it is irritant and rubefacient, and moreover exercises, to a greater or less extent, its peculiar influence upon the system, in consequence of its absorption. Moderately employed, it is beneficial in enfeebled digestion and flatulence; and is habitually used as a condiment by many who have no objection to an offensive breath. It has been given with advantage in chronic catarrh, humoral asthma, and other pectoral affections in which the symptoms of inflammation have been subdued, and a feeble condition of the vessels remains. We use it habitually, and with great benefit, in such affections occurring in children, as well as in the nervous and spasmodic coughs to which patients of this class are peculiarly liable. Some have recommended it in old atonic dropsies and calculous disorders; and it has been employed in the treatment of intermittents. It is thought also to be an excellent anthelmintic, especially in cases of ascarides, in which it is given both by the mouth and the rectum. The juice is said sometimes to check nervous vomiting, in the dose of a few drops. If taken too largely, or in excited states of the system, garlic is apt to occasion gastric irritation, flatulence, hemorrhoids, headache, and fever. As a medicine, it is at present more used externally than inwardly. Bruised and applied to the feet, it acts very beneficially, as a revulsive, in disorders of the head; and is especially useful in the febrile complaints of children, by

quieting restlessness and producing sleep. In the same state, it is used to resolve indolent tumours. Its juice mixed with oil, or the garlic itself, bruised and steeped in spirits, is frequently used as a liniment in infantile convulsions, and other cases of spasmodic or nervous disorder among children. The same application has been made in cases of cutaneous eruption. A clove of garlic, or a few drops of the juice, introduced into the ear, are said to prove efficacious in atonic deafness; and the bulb, bruised and applied in the shape of a poultice above the pubes, has sometimes restored action to the bladder, in cases of retention of urine, from debility of that organ. In the same shape, it has been recommended as a resolvent in indolent tumours.

Garlic may be taken in the form of pill; or the clove may be swallowed either whole, or cut into pieces of a convenient size. Its juice is also frequently administered mixed with sugar. The infusion in milk was at one time highly recommended, and the syrup is officinal. The dose in substance is from half a drachm to a drachm, or even two drachms, of the fresh bulb. That of the juice is half a fluidrachm.

Off. Prep. Syrupus Allii. W.

ALOE. *U. S.*

Aloes.

The inspissated juice of the leaves of Aloe spicata, Aloe Socotrina, and other species of Aloe. *U. S.*

Off. Syn. ALOE BARBADENSIS. Aloe vulgaris. *Folii resecti succus spissatus.* ALOE HEPATICA. Aloës species incerta. *Folii succus spissatus.* ALOE SOCOTRINA. Aloës species incerta. *Folii resecti succus aëre induratus. Lond.;* ALOE BARBADENSIS. ALOE INDICA. ALOE SOCOTORINA. From undetermined species of Aloe. *Ed.;* ALOE HEPATICA. *Extract* or *inspissated juice,* from the leaves of one or more undetermined species of Aloe. *Dub.*

Suc d'aloès, *Fr.;* Aloe, *Germ., Ital.;* Aloë, *Span.;* Musebber, *Arab.*

Most of the species belonging to the genus Aloe are said to yield a bitter juice, which has all the properties of the officinal aloes. It is impossible, from the various and sometimes conflicting accounts of writers, to determine exactly from which of the species the drug is in all instances actually derived. *Aloe spicata,* however, is generally acknowledged to be an abundant source of it; and *A. vulgaris* and *A. Socotrina* are usually ranked among the medicinal species. In Lindley's Flora Medica, *A. purpurascens, A. arborescens, A. Commelyni,* and *A. multiformis,* all natives of the Cape of Good Hope, are enumerated as yielding aloes; and others are, without doubt, occasionally resorted to. We shall confine ourselves to a description of the three following species, which probably yield most of the aloes of commerce.

Aloe. *Sex. Syst.* Hexandria Monogynia.—*Nat. Ord.* Liliaceæ.

Gen. Ch. Corolla erect, mouth spreading, bottom nectariferous. *Filaments* inserted into the receptacle. *Willd.*

Aloe spicata. Willd. *Sp. Plant.* ii. 185. This species of aloe was first described by Thunberg. The stem is round, three or four feet high, about four inches in diameter, and leafy at the summit. The leaves are spreading, subverticillate, about two feet long, broad at the base, gradually narrowing to the point, channeled or grooved upon their upper surface, and with remote teeth upon their edges. The flowers are bell-shaped, and spread horizontally in very close spikes. They contain a large quantity of purple honey juice.

Beneath each flower is a broad, ovate, acute bracte, of a white colour, with three green streaks, and nearly as long as the corolla. Of the six petals, the three inner are ovate, obtuse, white, with three green lines, and broader than the outer, which otherwise resemble them. The stamens are much longer than the corolla. The *spiked aloe* is a native of Southern Africa, growing near the Cape of Good Hope, and, like all the other species of this genus, preferring a sandy soil. In some districts of the colony it is found in great abundance, particularly at Zwellendam, near Mossel Bay, where it almost covers the surface of the country. Much of the Cape aloes is said to be derived from this species.

A. Socotrina. Lamarck, *Encycl.*, i. 85; De Cand. *Plantes Grasses, fig.* 85; Curtis' *Bot. Mag., pl.* 472; Carson's *Illust. of Med. Bot.* ii. 48, *pl.* 92.—*A. vera.* Miller, *Dict., ed.* 8, *no.* 55. The stem of this species is erect, a foot and a half or more in height, woody, and leafless below, where it is very rough from the remains of former leaves. At top it is embraced by green, sword-shaped, ascending leaves, somewhat concave on their upper surface, convex beneath, curved inward at the point, with numerous small white serratures at their edges. The flowers, which are in a cylindrical, simple raceme, are scarlet near the base, pale in the centre, and greenish at the summit, and have unequal stamens, of which three are longer than the corolla. The plant received its name from the island of Socotra, of which it is said to be a native; and is supposed to be the source of the Socotrine aloes.

A. vulgaris. Lamarck, *Encycl.*, i. 86; De Cand. *Plantes Grasses, fig.* 27; Carson's *Illust. of Med. Bot.* ii. 46, *pl.* 90. This species has a very short woody stem, and lanceolate embracing leaves, which are first spreading, then ascending, of a glaucous-green colour, somewhat mottled with darker spots, flat on the upper surface, convex beneath, and armed with hard reddish spines, distant from each other, and perpendicular to the margin. The flower-stem is axillary, of a glaucous-reddish colour, and branched, with a cylindrical-ovate spike of yellow flowers, which are at first erect, then spreading, and finally pendulous, and do not exceed the stamens in length. A. vulgaris is a native of south-eastern Europe and the north of Africa, and is cultivated in Italy, Sicily, Malta, and especially in the West Indies, where it contributes largely to furnish the Barbadoes aloes.

The proper aloetic juice has generally been thought to exist in longitudinal vessels beneath the epidermis of the leaves, and readily flows out when these are cut transversely; but, according to M. Edmond Robiquet, who has made elaborate researches in relation to this drug, these vessels are air-ducts, and the juice flows in the inter-cellular passages between them. The liquid obtained by expression from the parenchyma is mucilaginous, and possessed of little medicinal virtue. The quality of the drug depends much upon the mode of preparing it. The finest kind is that obtained by exudation, and subsequent inspissation in the sun. Most of the better sorts, however, are prepared by artificially heating the juice which has spontaneously exuded from the cut leaves. The chief disadvantage of this process is the conversion of a portion of the soluble active principle into an insoluble and comparatively inert substance, through the influence of an elevated temperature. The plan of bruising and expressing the leaves, and boiling down the resulting liquor, yields a much inferior product; as a large portion of it must be derived from the mucilaginous juice of the parenchyma. The worst plan of all is to boil the leaves themselves in water, and evaporate the decoction. The quality of the drug is also affected by the careless or fraudulent mixture of foreign matters with the juice, and the unskilful management of the inspissation.

Commercial History and Varieties. Four chief varieties of aloes are

known in commerce, that of the Cape of Good Hope, the Socotrine, the hepatic, and the Barbadoes, of which the first two are most used in this country.

1. Cape Aloes, which is by far the most abundant, is imported from the Cape of Good Hope, either directly, or through the medium of English commerce. It is collected by the Hottentots and Dutch boors indiscriminately from *A. spicata* and other species, which grow wild in great abundance. Dr. L. Pappe, of Cape Town, states that the best aloes is derived from *Aloe ferox* (*Lam.*) growing at Swellendam, and a weaker product from *A. Africana* and *A. plicatilis* of Miller. (*Flor. Capens.* 28.) The process is very simple. According to Hallbeck, a Moravian missionary who resided at the Cape, a hole is made in the ground, in which a sheep skin is spread with the smooth side upward. The leaves are then cut off near the stem, and arranged around the hole, so that the juice which runs out may be received into the skin. The juice flows most freely in hot weather. (*Un. Breth. Mission. Intelligencer, N. Y.*, vi. 436.) When a sufficient quantity of the liquor has been collected, it is inspissated by artificial heat in iron cauldrons, care being taken to prevent its burning by constant stirring. When sufficiently concentrated, it is poured into boxes or skins, where it concretes upon cooling. The finest kind is collected at the Missionary Institution at Bethelsdorp, and hence called *Bethelsdorp aloes.* Its superiority is owing exclusively to the greater care observed in conducting the evaporation, and in avoiding the intermixture of earth, stones, and other impurities. (*Dunzterville, in Pereira's Mat. Med.*)

Cape aloes has sometimes been confounded with the Socotrine, from which, however, it differs very considerably in appearance. By the German writers it is called *shining aloes.* When freshly broken, it has a very dark olive or greenish colour approaching to black, presents a smooth bright almost glassy surface, and, if held up to the light, appears translucent at its edges. The small fragments also are semi-transparent, and have a tinge of yellow or red mixed with the deep olive of the opaque mass. The same tinge is sometimes observable in the larger pieces. The powder is of a fine greenish-yellow colour, and, being generally more or less sprinkled over the surface of the pieces as they are kept in the shops, gives them a somewhat yellowish appearance. The odour is strong and disagreeable, but not nauseous. It has not the slightest mixture of the aromatic. Cape aloes, when perfectly hard, is very brittle, and readily reduced to powder; but, in very hot weather, it is apt to become somewhat soft and tenacious, and the interior of the pieces is occasionally more or less so even in winter. It is usually imported in casks or boxes. Dr. Pereira says that a variety of aloes is sometimes imported into England from the Cape, of a reddish-brown colour like hepatic aloes.

2. Socotrine Aloes. The genuine Socotrine aloes is produced in the Island of Socotra, which lies in the Straits of Babelmandel, about forty leagues to the east of Cape Guardafui; but we are told by Ainslie that the greater part of what is sold under that name is prepared in the kingdom of Melinda, upon the eastern coast of Africa; and Wellsted states that the aloes of the neighbouring parts of Arabia is the same as that of Socotra. The commerce in this variety of aloes is carried on chiefly by the maritime Arabs, who convey it either to India, or up the Red Sea by the same channel through which it reached Europe before the discovery of the southern passage into the Indian Ocean. Mr. Vaughan states that nearly the whole product of the island is carried to Maculla, on the southern coast of Arabia, and thence transhipped to Bombay. (*Pharm. Journ. and Trans.*, xii. 268.) The species of aloe which yields it is not certainly known; but is probably the A. Socotrina. According to Wellsted, the plant grows on the sides and

summits of mountains, from five hundred to three thousand feet above the level of the plains. It is found in all parts of the island, but most abundantly on the western portion, where the surface is thickly covered with it for miles. It appears to thrive best in parched and barren places. Much less of the drug is collected than formerly, and in the year 1833 only two tons were exported. The whole produce was formerly monopolized by the Arabian Sultan of Kisseen; but at present the business of collecting the drug is entirely free to the inhabitants. The leaves are plucked at any period of the year, and are placed in skins into which the juice is allowed to exude. In what way the inspissation is effected we are not informed by Wellsted; but, according to Hermann, it is by exposure to the heat of the sun. The aloes is exported in skins. Its quality differs much according to the care taken in its preparation. (*Wellsted's Voyage to the coast of Arabia, and Tour in the Island of Socotra.*) A portion ascends the Red Sea, and through Egypt reaches the ports of Smyrna and Malta, whence it is sent to London. Another portion is carried to Bombay, and thence transmitted to various parts of the world. The little that reaches this country either comes by special order from London, or is brought by our India traders. We have known of two arrivals directly into the United States, said to be from the Island of Socotra, and have in our possession parcels of aloes brought by both. They are identical in character, and correspond with the following description.

Socotrine aloes is in pieces of a yellowish or reddish-brown colour, wholly different from that of the former variety. Sometimes the colour is very light, especially in the fresh and not fully hardened parcels; sometimes it is a deep brownish-red like that of garnets. It is rendered much darker by exposure to the air; and the interior of the masses is consequently much lighter coloured than the exterior. Its surface is somewhat glossy, and its fracture smooth and conchoidal, with sharp and semi-transparent edges. The colour of its powder is a bright golden yellow. It has a peculiar, not unpleasant odour, and a taste, which, though bitter and disagreeable, is accompanied with an aromatic flavour. Though hard and pulverulent in cold weather, it is somewhat tenacious in summer, and softens by the heat of the hand.

Under the name of Socotrine aloes are occasionally to be met with in the market, small parcels beautifully semi-transparent, shining, and of a yellowish, reddish, or brownish-red colour. These, however, are very rare, and do not deserve to be considered as a distinct variety. They are probably portions of the juice carefully inspissated in the sun, and may accompany the packages brought from any of the commercial sources of aloes.

When in mass, as imported from the East, Socotrine aloes is soft and plastic, and of a very light yellowish-brown colour in the interior. It becomes hard and brittle when broken into pieces; and the London dealers hasten the result by exposing it to a very gentle heat, so as to evaporate the moisture. Pereira tells us that impure and dirty pieces of the drug are melted and strained, and that the skins from which the best portions have been removed are washed with water, which is then evaporated. No inconsiderable portion of the Socotrine aloes received from London has probably undergone such processes.

Occasionally the juice has been imported into London in casks, not thoroughly inspissated. In this state it is of the consistence of molasses, of an orange or yellowish colour, and of a strong fragrant odour. It separates, upon standing, into a transparent liquid, and an opaque, lighter-coloured granular portion which subsides. Pereira found the latter portion to consist of innumerable minute prismatic crystals, and believed it to be identical with or closely analogous to the aloin of the Messrs. Smith. When the

juice is heated, the deposit dissolves, and the whole being evaporated yields a solid, transparent product, having all the properties of fine Socotrine aloes. (*Pharm. Journ. and Trans.*, xi. 439.)

Much of the aloes sold as Socotrine has never seen the Island of Socotra, nor even the Indian seas. It has been customary to affix this title, as a mark of superior value, to those parcels of the drug, from whatever source they may have been derived, which have been prepared with unusual care, and are supposed to be of the best quality. Thus, both in Spain and the West Indies, the juice which is obtained without expression, and inspissated in the sun without artificial heat, has been called Socotrine aloes; and is probably little inferior to the genuine drug.

Socotrine aloes has been very long known under this name, and in former times held the same superiority in the estimation of the profession, which it still to a certain degree retains.

3. Hepatic Aloes. Much confusion and uncertainty have prevailed in relation to this kind of aloes. The name was originally applied to a product from the East Indies, of a reddish-brown or liver colour, which gave origin to the designation. From a supposed resemblance between this and the aloes from the West Indies, the name was very commonly applied also to the latter variety, and was also extended to portions of the drug collected in Spain and other parts of the south of Europe. But the West India aloes is decidedly different from any now brought from the East, and deserves the rank of a distinct variety, with the name of Barbadoes aloes. In this country, we seldom meet with aloes bearing the name of the hepatic, although much that is sold as Socotrine probably deserves it. In the drug commerce of London, it is still recognised as a distinct variety. It is imported into England chiefly from Bombay; but, according to Ainslie, is not produced in Hindostan, being taken thither from Yemen in Arabia. It is probably obtained from the same plant or plants which yield the Socotrine, but prepared with less care, or by a somewhat different process.* In relation to the Socotrine and hepatic aloes, we should probably not be far wrong in considering the former as embracing the finest, and the latter the inferior parcels of the same variety; and it is in fact stated that they sometimes come together, a large mass of the hepatic being crossed by a vein of the Socotrine. They are both embraced by the Edinburgh College under the title of Aloe Indica—an improper designation; as the aloes produced in India is altogether inferior, and is seldom or never exported from that region. The variety which the Edinburgh College designates as Socotrine aloes, and defines to be "in thin pieces translucent and garnet-red, almost entirely soluble in spirit of the strength of sherry," may possibly merit the title; but certainly the description is not applicable to the drug as usually brought from Socotra.

Hepatic aloes is reddish-brown, but darker and less glossy than the Socotrine. Its odour is somewhat like that of the Socotrine, but less agreeable, and is wholly different from that of Cape aloes. The taste is nauseous, and intensely bitter. The fracture is not so smooth, nor the edges so sharp and transparent as in either of the first-mentioned varieties. It softens in the hand, and becomes adhesive. The powder is of a dull yellow colour.

4. Barbadoes Aloes. This is the name by which the aloes produced in

* Dr. Pereira has concluded, we think somewhat prematurely, from his observations on the juice of aloes before referred to, that the Socotrine is prepared by evaporation by artificial heat, to which it owes its transparency; while the hepatic is opaque, because dried in the sun. If this were the case, Barbadoes aloes, which is wholly opaque, more so even than the hepatic, should have been dried in the sun, instead of being inspissated by heat, as it really is.—*Note to the tenth edition.*

the West Indies is now generally designated. The aloes plants are largely cultivated in the poorer soils of Jamaica and Barbadoes, especially of the latter island. The species from which most of the drug is procured is *A. vulgaris;* but *A. Socotrina*, *A. purpurascens*, and *A. arborescens*, are also said to be cultivated. The process employed appears to be somewhat different in different places, or at least as described by different authors. A fine kind was formerly prepared by the spontaneous inspissation of the juice, placed in bladders or shallow vessels, and exposed to the sun. The common Barbadoes aloes, however, is now made, either by boiling the juice to a proper consistence, or by first forming a decoction of the leaves, chopped and suspended in water in nets or baskets, and then evaporating the decoction. In either case, when the liquor has attained such a consistence that it will harden on cooling, it is poured into calabashes and allowed to concrete. It is imported into England in gourds weighing from 60 to 70 pounds, or even more. In consequence of the great demand for it in veterinary practice, it commands a high price in Great Britain; and very little is consumed in the United States.

The colour of Barbadoes aloes is not uniform. Sometimes it is dark-brown or almost black, sometimes of a reddish-brown or liver colour, and again of some intermediate shade. It has usually a dull fracture, and is almost perfectly opaque, even at the edges, and in thin layers. It is also distinguishable by its odour, which is very disagreeable and even nauseous. The powder is of a dull olive-yellow colour.

Besides these varieties of aloes, others are mentioned by authors. A very inferior kind, supposed to consist of the dregs of the juice which furnished the better sorts, almost black, quite opaque, hard, of a rough fracture and very fetid odour, and full of various impurities, was formerly sold under the name of *caballine*, *fetid*, or *horse aloes*. It was used exclusively for horses; but, in consequence of the cheapness of better kinds, has been banished from veterinary practice, and is not now found in the market. Aloes has been imported from Muscat, and a considerable quantity came over in a vessel sent by the Sultan to the United States. Some of a similar origin has been called *Mocha aloes* in London; but it is nothing more than an inferior sort of hepatic. Several inferior kinds produced in different parts of Hindostan have been described by Pereira under the name of *India aloes;* but they are not brought, unless accidentally, into the markets of Europe or this country.

General Properties. The odour of aloes is different in the different varieties. The taste is in all of them intensely bitter and very tenacious. The colour and other sensible properties have already been sufficiently described. Several distinguished chemists have investigated the nature and composition of aloes. Braconnot found it to consist of a bitter principle, soluble in water, and in alcohol of 38° B., which he considered peculiar and named *resino-amer;* and of another substance, in much smaller proportion, inodorous, and nearly tasteless, very soluble in alcohol, and scarcely soluble in boiling water, which he designated by the name of *flea-coloured principle*. These results were essentially confirmed by the experiments of Trommsdorff, Bouillon-Lagrange, and Vogel, who considered the former substance as extractive matter, and the latter as having the chief characters of resin. Besides these principles, Trommsdorff discovered, in a variety of hepatic aloes, a proportion of insoluble matter which he considered as albumen; and Bouillon-Lagrange and Vogel found that Socotrine aloes yields, by distillation, a small quantity of volatile oil, which they could not obtain from the hepatic. The proportions of the ingredients were found to vary greatly in the different varieties of the drug; and the probability is, that scarcely any two specimens would afford precisely the same results. Braconnot found about 73 per cent. of the

bitter principle, and 26 of the *flea-coloured principle*. Trommsdorff obtained from Socotrine aloes about 75 parts of extractive, and 25 of resin; and from the hepatic, 81·25 of extractive, 6·25 of resin, and 12·50 of albumen, in 100 parts. The former variety, according to Bouillon-Lagrange and Vogel, contains 68 per cent. of extractive and 32 of resin; the latter 52 of extractive, 42 of resin, and 6 of the albuminous matter of Trommsdorff. We are not aware that any analysis has been published of the Cape aloes as a distinct variety.

Berzelius considers the resin of Trommsdorff and others, to belong to that form of matter which he calls *apothême* (see *Extracts*), and which is nothing more than extractive, altered by the action of the air. It may be obtained separate by treating aloes with water, and digesting the undissolved portion with oxide of lead, which unites with the apothême forming an insoluble compound, and leaves a portion of unaltered extractive, which had adhered to it, dissolved in the water. The oxide of lead may be separated by nitric acid very much diluted; and the apothême remains in the form of a brown powder, insoluble in cold water, very slightly soluble in boiling water, to which it imparts a yellowish-brown colour, soluble in alcohol, ether, and alkaline solutions, and burning like tinder without flame and without being melted. According to the same author, the *bitter extractive* which constitutes the remainder of the aloes, may be obtained by treating the watery infusion of the drug with oxide of lead, to separate a portion of apothême which adheres to it, and evaporating the liquor. It is a yellowish, translucent, gum-like substance, fusible by a gentle heat, of a bitter taste, soluble in ordinary alcohol, but insoluble in that fluid when anhydrous, and in ether.

A more recent analysis of aloes has been made by M. Edmund Robiquet. A portion of hyacinthine, transparent aloes, considered as genuine Socotrine, was found by him to consist, in 100 parts, of 85 of *aloesin*, 2 of ulmate of potassa, 2 of sulphate of lime, 0·25 of gallic acid, 8 of albumen, and traces of carbonate of potassa, carbonate of lime, and phosphate of lime. To get pure aloesin, M. Robiquet exhausted aloes in powder with cold water; evaporated the infusion one-half; added an excess of acetate of lead, which precipitated the gallate, ulmate, and albuminate of that metal; poured into the clear liquor solution of ammonia; separated the yellowish-orange coloured precipitate, consisting of oxide of lead combined with aloesin, washed it with boiling water, and then decomposed it by a current of sulphuretted hydrogen with the exclusion of atmospheric air. Sulphuret of lead was deposited, and a colourless liquid floated above it, which, being decanted, and evaporated in vacuo, yielded aloesin in slightly yellowish scales, without any sign of crystallization. Thus procured, aloesin is very soluble in water and alcohol, but slighty soluble in ether, and quite insoluble in the fixed and volatile oils. It is entirely dissipated at a red heat. If exposed to the air, during desiccation, it becomes intensely red, in consequence of the absorption of a minute proportion of oxygen, which, however, scarcely affects its properties in other respects. It possesses in a high degree the bitter taste and purgative property of aloes, and might be used as a substitute; 8 parts of it representing 10 parts of Socotrine and 50 of Cape aloes. (*Journ. de Pharm.*, 3e *sér.*, x. 173.)

Aloin. The bitter substances noticed above, viz., the *resino-amer* of Braconnot, the *bitter extractive* of Berzelius and others, and the *aloesin* of Robiquet, probably contain the active principle of aloes, but combined with impurities which render it insusceptible of crystallization. Messrs. T. and H. Smith, of Edinburgh, have succeeded in obtaining it quite pure and in crystals, and name it *aloin*. This has been examined by Mr. Stenhouse, and found, when

quite free from water, to have a definite composition, represented by the formula $C_{34}H_{18}O_{14}$. There can be no doubt that it is the active principle of aloes; as it has been found to operate invariably as a cathartic in the dose of one or two grains, and occasionally in that of half a grain.

It is obtained most readily from Barbadoes aloes. The process consists in mixing this, previously powdered, with sand, exhausting it with cold water, evaporating the infusion in *vacuo* to the consistence of syrup, and allowing the residue to rest in a cool place. In two or three days the concentrated liquid becomes filled with a brownish-yellow granular mass of minute crystals, which is impure aloin. This is separated, by pressure between folds of bibulous paper, from a greenish-brown matter that contaminates it, and then repeatedly crystallized from hot water, the temperature of which should not exceed 150°, as aloin is rapidly oxidized at the boiling point. By dissolving it in hot alcohol, and allowing the solution to cool, it is obtained in the shape of minute needle-shaped crystals, arranged in a star-like form. These are pale-yellow; at first sweetish to the taste, but soon intensely bitter; combustible without residue; slightly soluble in cold water or alcohol, but readily dissolved by these liquids when moderately heated; soluble also readily in alkaline solutions, which are rendered of an orange-yellow colour, and become rapidly darker, especially when heated, in consequence of the oxidation of the aloin, and its conversion into resin. By the action of strong nitric acid it is converted into chrysammic acid. It is neither acid nor alkaline; but with strong solution of subacetate of lead is precipitated in combination with the oxide of that metal. (See *Ed. Monthly Journ. of Med. Sci.*, xii. 127, Feb. 1851, and *Pharm. Journ. and Trans.*, xi. 458.) There can be no doubt that aloin exists also in Socotrine and Cape aloes; and the Messrs. Smith, though they at first failed in obtaining it from these varieties, have subsequently succeeded with the Socotrine. (*Ed. Monthly*, xiv. 581.)

Aloes yields its active matter to cold water, and when good is almost wholly dissolved by boiling water; but the inert portion, or apothême of Berzelius, is deposited as the solution cools. It is also soluble in alcohol, rectified or diluted. Long boiling impairs its purgative properties by oxidizing the aloin and rendering it insoluble. The alkalies, their carbonates, and soap alter in some measure its chemical nature, and render it of easier solution. It is inflammable, swelling up and decrepitating when it burns, and giving out a thick smoke which has the odour of the drug.

Those substances only are incompatible with aloes which alter or precipitate the soluble matter; as the insoluble portion is without action upon the system. Among these is the infusion of galls, which we have found, probably through its tannic acid, to afford a copious precipitate with an aqueous solution of aloes. It is said that such a solution will keep a long time, even for several months, without exhibiting mouldiness or putrescency, though it becomes ropy.

Medical Properties and Uses. Aloes was known to the ancients. It is mentioned in the works of Dioscorides and Celsus, the former of whom speaks of two kinds. The varieties are similar in their mode of action. They are all cathartic, operating very slowly but certainly, and having a peculiar affinity for the large intestines. Their action, moreover, appears to be directed rather to the muscular coat than to the exhalant vessels; and the discharges which they produce are, therefore, seldom very thin or watery. In a full dose they quicken the circulation, and produce general warmth. When frequently repeated, they are apt to irritate the rectum, giving rise, in some instances, to hemorrhoids, and aggravating them when already existing. Aloes has also a decided tendency to the uterine system. Its emmenagogue effect, which is often very considerable, is generally attributed to a sympathetic ex-

tension of irritation from the rectum to the uterus; but we can see no reason why the medicine should not act specifically upon this organ; and its influence in promoting menstruation is by no means confined to cases in which its action upon the neighbouring intestine is most conspicuous. A peculiarity in the action of this cathartic is, that an increase of the quantity administered, beyond the medium dose, is not attended by a corresponding increase of effect. Its tendency to irritate the rectum may be obviated, in some measure, by combining it with soap or an alkaline carbonate; but it does not follow, as supposed by some, that this modification of its operation is the result of increased solubility; for aloes given in a liquid state produces the same effect as when taken in pill or powder, except that it acts somewhat more speedily. Besides, when externally applied to a blistered surface, it operates exactly in the same manner as when internally administered; thus proving that its peculiarities are not dependent upon the particular form in which it may be given, but on specific tendencies to particular parts. (Gerhard, *N. Am. Med. and Surg. Journ.*, x. 155.) With its other powers, aloes combines the property of slightly stimulating the stomach. It is, therefore, in minute doses, an excellent remedy in habitual costiveness, attended with torpor of the digestive organs. It has been supposed to stimulate the hepatic secretion; and certainly acts sometimes very happily in jaundice, producing bilious stools even after calomel has failed. From its special direction to the rectum, it has been found peculiarly useful in the treatment of ascarides. In amenorrhœa it is perhaps more frequently employed than any other remedy, entering into almost all the numerous empirical preparations which are habitually resorted to by females in that complaint, and enjoying a no less favourable reputation in regular practice. It is, moreover, frequently given in combination with more irritating cathartics, in order to regulate their liability to excessive action. In the treatment of amenorrhœa, it is said to be peculiarly efficacious when given, in the form of enema, about the period when the menses should appear. Aloes is contra-indicated by the existence of hemorrhoids, and is obviously unsuitable, unless modified by combination, to the treatment of inflammatory diseases.

The medium dose is 10 grains; but as a laxative it will often operate in the quantity of 2 or 3 grains; and, when a decided impression is required, the dose may be augmented to 20 grains. In consequence of its excessively bitter and somewhat nauseous taste, it is most conveniently administered in the shape of pill.*

Off. Prep. Decoctum Aloës Compositum; Enema Aloës; Extractum Aloës Aquosum; Ext. Aloës Barbadensis; Ext. Aloës Socotrinæ; Ext. Colocynth. Comp.; Pilulæ Aloës; Pil. Aloës Comp.; Pil. Aloës et Assafœtidæ; Pil. Aloës et Ferri; Pil. Aloës et Myrrhæ; Pil. Cambogiæ Comp.; Pil. Colocynth. Comp.; Pil. Rhei Comp.; Pulvis Aloës Compositus; Pulvis Aloës et Canellæ; Tinctura Aloës; Tinct. Aloës et Myrrhæ; Tinct. Benzoini Comp.; Tinct. Rhei et Aloës; Vinum Aloës. W.

* Dr. Paris enumerates the following empirical preparations, containing aloes as a leading ingredient; Anderson's pills, consisting of aloes, jalap, and oil of aniseed; Hooper's pills, of aloes, myrrh, sulphate of iron, canella, and ivory black; Dixon's antibilious pills, of aloes, scammony, rhubarb, and tartarized antimony; Speediman's pills, of aloes, myrrh, rhubarb, extract of chamomile, and ess. oil of chamom.; Dinner pills, of aloes, mastich, red roses, and syrup of wormwood; Fothergill's pills, of aloes, scammony, colocynth, and oxide of antimony; Peter's pills, of aloes, jalap, scammony, gamboge, and calomel; and Radcliff's Elixir, of aloes, cinnamon, zedoary, rhubarb, cochineal, syrup of buckthorn, and spirit and water as the solvent; to which may be added Lee's Windham pills, consisting of gamboge, aloes, soap, and nitrate of potassa; and Lee's New London pills, of aloes, scammony, gamboge, calomel, jalap, soap, and syrup of buckthorn.

ALTHÆÆ FLORES. *U. S.*

Marshmallow Flowers.

The flowers of Althæa officinalis. *U. S.*

ALTHÆÆ FOLIA. *Ed.*

Marshmallow Leaves.

The leaves of Althæa officinalis. *Ed.*

ALTHÆÆ RADIX. *U. S., Ed.*

Marshmallow Root.

The root of Althæa officinalis. *U. S., Ed.*

Off. Syn. ALTHÆA. Althæa officinalis. *Radix. Lond.*

Guimauve, *Fr.*; Eibisch, *Germ.*; Altea, *Ital.*; Altea, Malvavisco, *Span.*

ALTHÆA. *Sex. Syst.* Monadelphia Polyandria.—*Nat. Ord.* Malvaceæ.

Gen. Ch. Calyx double, the exterior six or nine-cleft. *Capsules* numerous, one-seeded. *Willd.*

Althæa officinalis. Willd. *Sp. Plant.* iii. 770; Woodv. *Med. Bot.* p. 552, t. 198. Marshmallow is an herbaceous perennial, with a perpendicular branching root, and erect woolly stems, from two to four feet or more in height, branched and leafy towards the summit. The leaves are alternate, petiolate, nearly cordate on the lower part of the stem, oblong-ovate and obscurely three-lobed above, somewhat angular, irregularly serrate, pointed, and covered on both sides with a soft down. The flowers are terminal and axillary, with short peduncles, each bearing one, two, or three flowers. The corolla has five spreading, obcordate petals, of a pale purplish colour. The fruit consists of numerous capsules united in a compact circular form, each containing a single seed. The plant grows throughout Europe, inhabiting salt marshes, the banks of rivers, and other moist places. It is found also in this country on the borders of salt marshes. In some parts of the Continent of Europe, it is largely cultivated for medical use. The whole plant abounds in mucilage. The flowers, leaves, and root are officinal; but the last only is employed to any considerable extent in this country.

The roots should be collected in autumn from plants at least two years old. They are cylindrical, branched, as thick as the finger or thicker, from a foot to a foot and a half long, externally of a yellowish colour which becomes grayish by drying, within white and fleshy. They are usually prepared for the market by removing the epidermis. Our shops are supplied chiefly if not exclusively from Europe.

Properties. Marshmallow root comes to us in pieces three or four inches or more in length, usually not so thick as the finger, generally round, but sometimes split, white externally and downy from the mode in which the epidermis is removed, light and easily broken with a short somewhat fibrous fracture, of a peculiar faint smell, and a mild mucilaginous sweetish taste. Those pieces are to be preferred which are plump and but slightly fibrous. The root contains a large proportion of mucilage, besides starch and saccharine matter, which it yields readily to boiling water. The mucilage, without the starch, is extracted by cold water, which thus becomes ropy. A prin-

ciple was discovered in the root by M. Bacon, which he supposed to be peculiar to the marshmallow, but which has been ascertained to be identical with the *asparagin* of Robiquet. MM. Boutron-Charlard and Pelouze found it to belong to that class of organic principles, which are convertible by strong acids, and other agencies, into ammonia and peculiar acids, and which are designated by the termination *amide*. Thus asparagin, which in this view should be called *asparamide*, is converted into ammonia and *asparmic*, or, as it was formerly named, *aspartic acid;* and one atom of the resulting asparmate of ammonia is equivalent to one atom of asparamide and one of water. (*Journ. de Pharm.*, xix. 208.) It is found in various other plants besides the marshmallow, as in the shoots of asparagus, in vetches grown in the dark, in all the varieties of the potato, and in the roots of the comfrey and liquorice plant. According to Professor Piria, asparagin has acid properties. It has no therapeutical value. Marshmallow is said to become somewhat acid by decoction. Those pieces should be rejected which are woody, discoloured, mouldy, of a sour or musty smell, or a sourish taste.

The roots of other *Malvaceæ* are sometimes substituted for that of marshmallow, without disadvantage, as they possess similar properties. Such are those of *Althæa rosea* or *hollyhock*, and *Malva Alcea*.

The leaves, which are recognised by the Edinburgh College, are without smell, and of a mucilaginous taste, and are used for the same purposes as the root.

Medical Properties and Uses. The virtues of marshmallow are exclusively those of a demulcent. The decoction of the root is much used in Europe in irritation and inflammation of the mucous membranes. The roots themselves, boiled and bruised, are sometimes employed as a poultice. The leaves and flowers are applied to similar uses. In France, the powdered root is much used in the preparation of pills and electuaries. Some prefer it to powdered liquorice root in the preparation of the mercurial pill.

Off. Prep. Mistura Althææ; Syrupus Althææ. W.

ALUMEN. *U. S., Lond., Ed., Dub.*

Alum.

Sulphate of alumina and potassa. *U. S.*

Alun, *Fr., Dan., Swed.;* Alaun, *Germ.;* Allume, *Ital.;* Alumbre, *Span.*

The officinal alum is a double salt, consisting of the tersulphate of alumina, united with sulphate of potassa.

Alum is manufactured occasionally from earths which contain it ready formed, but most generally from minerals which, from the fact of their containing most or all of its constituents, are called *alum ores*. The principal alum ores are the *alum stone*, which is a native mixture of subsulphate of alumina and sulphate of potassa, found in large quantities at Tolfa and Piombino in Italy, and certain natural mixtures of bisulphuret of iron with alumina, silica, and bituminous matter, called *aluminous schist* or *alum-slate*.

It is particularly at the Solfaterra, and other places in the kingdom of Naples, that alum is extracted from earths which contain it ready formed. The ground being of volcanic origin, and having a temperature of about 104°, an efflorescence of pure alum is formed upon its surface. This is collected and lixiviated, and the solution made to crystallize by slow evaporation in leaden vessels sunk in the ground.

The alum stone is manufactured into alum by calcination, and subsequent exposure to the air for three months; the mineral being frequently sprinkled

with water, in order that it may be brought to the state of a soft mass. This is lixiviated, and the solution obtained crystallized by evaporation. The alum stone may be considered as consisting of alum, united with a certain quantity of hydrate of alumina. This latter, by the calcination, loses its water, and becomes incapable of remaining united with the alum of the mineral, which is consequently set free. Alum of the greatest purity is obtained from this ore.

Alum-slate, when compact, is first exposed to the air for a month. It is then stratified with wood, which is set on fire. The combustion which ensues is slow and protracted. The sulphur is in part converted into sulphuric acid, which unites with the alumina; and the sulphate of alumina thus formed generates a portion of alum with the potassa derived from the ashes of the wood. The iron, in the mean time, is almost wholly converted into sesquioxide, and thus becomes insoluble. The matter is lixiviated, and the solution crystallized into alum by evaporation. The mother-waters, containing sulphate of alumina, are then drawn off, and made to yield a further portion of alum by the addition of sulphate of potassa, or chloride of potassium.

When the alum-slate is easily disintegrated, it is not subjected to combustion, but merely placed in heaps, and occasionally sprinkled with water. The bisulphuret of iron gradually absorbs oxygen, and passes into sulphate of the protoxide, which effloresces on the surface of the heap. Part of the sulphuric acid formed unites with the alumina; so that, after the chemical changes are completed, the heap contains both the sulphate of iron and the sulphate of alumina. At the end of about a year, the matter is lixiviated, and the solution of the two sulphates obtained is concentrated to the proper degree in leaden boilers. The sulphate of iron crystallizes, while the sulphate of alumina, being a deliquescent salt, remains in the mother-waters. These are drawn off, and treated with sulphate of potassa in powder, heat being at the same time applied. The whole is then allowed to cool, that the alum may crystallize. The crystals are then separated from the solution, and purified by a second solution and crystallization. They are next added to boiling water to full saturation, and the solution is transferred to a cask, where, on cooling, nearly the whole concretes into a crystalline mass. The cask is then taken to pieces, and the salt, having been broken up, is packed in barrels for the purposes of commerce.

Alum is sometimes manufactured by the direct combination of its constituents. With this view, clays are selected as free from iron and carbonate of lime as possible, and calcined to sesquioxidize the iron, and render them more easily pulverizable; after which they are dissolved, by the assistance of heat, in weak sulphuric acid. The sulphate of alumina thus generated, is next crystallized into alum by the addition of sulphate of potassa in the usual manner. Alum is made in this way from the ashes of the Boghead cannel coal, which occurs near Edinburgh, according to the patent of Messrs. Barlow and Gore. These ashes contain a large proportion of alumina, and form the residue of the combustion of the coke, derived from the coal, when used for gas-making.

Besides the officinal alum, which is sometimes called *potassa-alum*, there are several varieties of this salt, in which the potassa is replaced by some other base, as, for example, ammonia or soda. *Ammoniacal alum*, or the sulphate of alumina and ammonia, is sometimes manufactured in France, where it is formed by adding putrid urine to a solution of the sulphate of alumina. In Great Britain it is sometimes made by adding sulphate of ammonia from gas liquor to the sulphate of alumina. Scotch alum, made near Paisley, generally contains both potassa and ammonia. Ammoniacal

alum resembles so exactly the potassa-alum, that it is impossible by simple inspection to distinguish them; and in composition it is perfectly analogous to the potassa salt. It may, however, be distinguished by subjecting it to a strong calcining heat, after which alumina will be found as the sole residue; or by rubbing it up with potassa or lime and a little water, when the smell of ammonia will be perceived.

Properties. Alum is a white, slightly efflorescent salt, crystallized in regular octohedrons, and possessing a sweetish, astringent taste. It dissolves in between fourteen and fifteen times its weight of cold, and three-fourths of its weight of boiling water. Its solution is precipitated by ammonia and potassa and their carbonates, which throw down a gelatinous subsulphate of alumina, of variable composition, dependent upon the proportion of the precipitant employed. (*H. Bley.*) Alum is insoluble in alcohol and brandy. Its sp. gr. is 1·71. It reddens litmus, but changes the blue tinctures of the petals of plants to green. It cannot, therefore, be properly said to contain an excess of acid. When heated a little above 212°, it undergoes the aqueous fusion ; and, if the heat be continued, it loses its water, swells up, becomes a white, opaque, porous mass, and is converted into the officinal preparation, called *dried alum.* (See *Alumen Exsiccatum.*) Exposed to a red heat, it gives off oxygen, together with sulphurous and anhydrous sulphuric acids; and the residue consists of alumina and sulphate of potassa. When calcined with finely divided charcoal, it forms a spontaneously inflammable substance, called *Homberg's pyrophorus,* which consists of a mixture of sulphuret of potassium, alumina, and charcoal.

Several varieties of alum are known in commerce. *Roche alum,* so called from its having come originally from Roccha in Syria, is a sort which occurs in fragments about the size of an almond, and having a pale rose colour, which is given to it, according to Dr. Pereira, by bole or rose-pink. *Roman alum* also occurs in small fragments, covered with a rose-coloured efflorescence, derived from a slight covering of oxide of iron.

All the alums of commerce contain more or less sulphate of iron, varying from five to seven parts in the thousand. Roman alum is among the purest varieties, and is, therefore, much esteemed. The iron is readily detected by adding to a solution of the suspected alum a few drops of the ferrocyanuret of potassium, which will cause a greenish-blue tint, if iron be present. It may be detected also by precipitating the alumina as a subsulphate with a solution of potassa, and afterwards adding the alkali in excess. This will redissolve the precipitate, with the exception of any iron, which will be left in the state of sesquioxide. The proportion of iron usually present, though small, is an injurious impurity when the salt is used in dyeing. It may, however, be purified, either by dissolving it in the smallest quantity of boiling water, and stirring the solution as it cools, or by repeated solutions and crystallizations.

Incompatibles. Alum is incompatible with the alkalies and their carbonates, lime and lime-water, magnesia and its carbonate, tartrate of potassa, and acetate of lead.

Composition. Alum was regarded as a sulphate of alumina, until it was proved by Descroizilles, Vauquelin, and Chaptal to contain also sulphate of potassa, sulphate of ammonia, or both these salts. When its second base is potassa, it consists of one equivalent of tersulphate of alumina 171·4, one of sulphate of potassa 87·2, and twenty-four of water 216=474·6. In the ammoniacal alum, the equivalent of sulphate of potassa is replaced by one of sulphate of oxide of ammonium. *Alumina* is classed by the chemist as an earth, and may be obtained by subjecting ammoniacal alum to a strong cal-

cining heat. It is essential to the constitution of true alum, as it cannot be replaced by any other base. It consists of two eqs. of a metallic radical called *aluminium* 27·4, and three of oxygen 24=51·4. It is, therefore, a sesquioxide.

Medical Properties, &c. Alum, in ordinary doses, is astringent and antispasmodic; in large doses, purgative and emetic. It is employed as an astringent in passive hemorrhages, colliquative sweats, diabetes, and chronic dysentery and diarrhœa; also in gleet and leucorrhœa, in which diseases it is sometimes combined with cubebs. It has been recommended by Kreysig and Dzondi in dilatation of the heart, and in aortic aneurism. Its efficacy as an antispasmodic in hooping-cough has been much insisted on by Dr. Davies, editor of Underwood on Children. As a purgative, it has been employed in colica pictonum. The practice was introduced by Grashuis, a Dutch physician, in 1752, and imitated by Dr. Percival with great success. Its use in this disease has been latterly revived, and its efficacy fully sustained, by Kapeler and Gendrin of Paris, and Copland of London. It allays nausea and vomiting, relieves flatulence, mitigates the pain, and opens the bowels with more certainty than any other medicine. Sometimes it is advantageously conjoined with opium and camphor. It is also efficacious in nervous colics. Sir James Murray has found it a very useful remedy in the peculiar affection of the stomach, attended by the frequent vomiting of a large quantity of glairy fluid. He gave it in doses of ten or twelve grains three or four times a day, mixed with an equal quantity of cream of tartar to prevent constipation, and a little ginger to obviate flatulence. By Dr. C. D. Meigs, alum has been strongly recommended, after an experience of more than twenty years, as an excellent emetic in pseudo-membranous croup. In these cases it has the merit of acting with certainty and promptness, and without producing that extreme prostration which frequently follows the use of antimonials. (*Med. Exam.* for 1838, i. 414.) His son, Dr. J. F. Meigs, has also borne testimony to its value as an emetic in this dangerous disease. In a case in which an ounce of opium had been swallowed, Dr. C. D. Meigs found alum a very efficient emetic. After thirty grains of sulphate of zinc had been given without effect, half an ounce of alum was administered, followed by copious vomiting. After a short interval, a second half ounce was given, with the effect of renewing the vomiting; and the result was that the patient entirely recovered. (*Trans. of the Col. of Physicians of Philad.*, N. S., ii. 47.)

In various anginose affections, alum is found highly useful, applied topically either in powder or solution. When the affection is attended with membranous exudation, its efficacy has been particularly insisted on by Bretonneau, applied in solution prepared with vinegar and honey for adults, and in powder, by *insufflation*, in the cases of children. When used in the latter way, a drachm of finely powdered alum may be placed in one end of a tube, and then blown by means of the breath into the throat of the child. Velpeau, in 1835, extended the observations of Bretonneau, and has used alum successfully, not only in simple inflammatory sore-throat, but in those forms of angina dependent on small-pox, scarlatina, &c. In these cases, the powdered alum may be applied several times a day to the fauces, by means of the index finger. In relaxation of the uvula, and in the beginning of sore-throat, a solution of alum is one of our best gargles. It forms also a useful astringent wash in certain states of mercurial sore-mouth. In gleet and leucorrhœa the solution is an approved remedy, either alone or conjoined with sulphate of zinc. (See *Liquor Aluminis Compositus.*) It is frequently applied as a local styptic, in epistaxis, by means of a plug soaked in a saturated solution, and pressed up the nostril, and in menorrhagia, by the aid of a sponge,

soaked in a similar solution, and introduced into the vagina. In the latter stages of conjunctival inflammation it is often proper, and in the purulent ophthalmia of infants, it forms the most efficacious remedy we possess. In these cases, it is usually applied in the form of the *alum cataplasm*, made by coagulating the whites of two eggs with a drachm of alum.

The ordinary dose of alum is from ten to twenty grains, repeated every two or three hours, mixed with syrup or molasses. Sir James Murray objects to its administration in solution, and greatly prefers the form of an impalpable powder, mixed with molasses, as furnishing the means of presenting the remedy slowly to the surfaces intended to be acted upon. In hooping-cough the dose is from two to ten grains, according to the age of the child, repeated three times a day. As a purge in colica pictonum, from half a drachm to two drachms may be given every three or four hours. In croup the dose, as an emetic, is a teaspoonful of the powder, mixed with honey, syrup, or molasses, and repeated every ten or fifteen minutes, until free vomiting is induced. An elegant mode of giving alum in solution is in the form of *alum whey*, made by boiling two drachms of alum with a pint of milk, and then straining to separate the curd. The dose is a wineglassful, containing about fifteen grains of alum. As a collyrium, the solution is made of various strengths; as four, six, or eight grains to the fluid-ounce of water. A solution containing from half an ounce to an ounce of alum in a pint of water, and sweetened with honey, forms a convenient gargle. Solutions for gleet, leucorrhœa, ulcers, &c., must vary in strength according to the state of the parts to which they are applied.

Off. Prep. Alumen Exsiccatum; Liquor Aluminis Compositus; Pulvis Aluminis Compositus. B.

AMMONIA.

Ammonia.

All the ammoniacal compounds owe their distinctive properties to the presence of a peculiar gaseous substance, composed of nitrogen and hydrogen, called *ammonia*. This is most easily obtained by the action of lime on muriate of ammonia or sal ammoniac; when the lime unites with the muriatic acid, so as to form chloride of calcium and water, and expels the ammonia. It is transparent and colourless, like common air, but possesses a hot and acrid taste, and an exceedingly pungent smell. It has a powerful alkaline reaction, and, from this property and its gaseous nature, was called the *volatile alkali* by the earlier chemists. Its sp. gr. is 0·59. It is irrespirable, the glottis closing spasmodically when the attempt is made to breathe it. It consists of one eq. of nitrogen 14, and three of hydrogen 3=17; or, in volumes, of one volume of nitrogen and three volumes of hydrogen, condensed into two volumes. Its symbol is NH_3.

The salts of ammonia may be divided into hydracid salts and oxacid salts. Thus, when muriatic acid unites with ammonia, we have the hydracid salt called muriate of ammonia, which is usually considered to be a compound of muriatic acid and ammonia, with the symbol NH_3,HCl. But Berzelius supposes that, in the act of uniting, the hydrogen of the muriatic acid is transferred to the elements of the ammonia, and that the compound thus formed, uniting with the chlorine, gives rise to a salt, represented by NH_4Cl. To this hypothetical compound (NH_4) Berzelius gives the name of *ammonium*, and consequently to muriate of ammonia, the appellation of *chloride of ammonium*.

Applying the same view to the oxacid salts of ammonia, Berzelius conceives that they are compounds of *oxide of ammonium* (NH_4O) with their several acids. It is found that the true oxacid salts of ammonia always contain one eq. of water, which cannot be separated from them without destroying their identity; and it is supposed that the elements of this eq. of water, united with the elements of one eq. of ammonia, form oxide of ammonium. To apply Berzelius's view to sulphate of ammonia, this salt is usually considered a monohydrated sulphate of ammonia (NH_3,SO_3,HO); but he makes it the sulphate of oxide of ammonium, without water (NH_4O,SO_3).

The atmosphere contains a minute proportion of ammonia, probably in the form of carbonate.

Ammonia and its compounds act variously on the economy. When uncombined, and merely dissolved in water as a vehicle, its local action is that of a rubefacient, vesicant, or caustic, according to the strength of the solution, and the length of its application. Internally, it acts variously as a stimulant, antispasmodic, antacid, and alexipharmic. In saline combination, its therapeutic effects are much modified; but these will be most appropriately noticed under the head of each salt.

The following table contains a list of the principal officinal preparations of ammonia, with their synonymes.

I. In Aqueous Solution.

Liquor Ammoniæ Fortior, *U. S.;* Ammoniæ Liquor Fortior, *Lond., Dub.;* Ammoniæ Aqua Fortior, *Ed.*—*Stronger Solution of Ammonia.*

Linimentum Ammoniæ Compositum, *Ed.*

Linimentum Camphoræ Compositum, *Lond., Dub.*

Tinctura Ammoniæ Composita, *Lond.*

Liquor Ammoniæ, *U. S.* Ammoniæ Liquor, *Lond., Dub.;* Ammoniæ Aqua, *Ed.*—*Solution of Ammonia. Water of Ammonia.*

Hydrargyrum Ammoniatum, *U. S.;* Hydrargyri Ammonio-Chloridum, *Lond., Dub.;* Hydrargyri Præcipitatum Album, *Ed.*—*Ammoniated Mercury. White Precipitate.*

Linimentum Ammoniæ, *U. S., Lond., Ed., Dub.*—*Liniment of Ammonia. Volatile Liniment.*

Linimentum Hydrargyri, *Lond.;* Linimentum Hydrargyri Compositum, *Dub.*

II. In Spirituous Solution.

Spiritus Ammoniæ, *U. S., Ed.*—*Spirit of Ammonia.*

Tinctura Castorei Ammoniata, *Ed.*

Tinctura Guaiaci Ammoniata, *Ed.*

Tinctura Opii Ammoniata, *Ed.*

Tinctura Valerianæ Ammoniata, *Ed.*

Spiritus Ammoniæ Aromaticus, *U. S., Lond., Ed., Dub.*—*Aromatic Spirit of Ammonia.*

Tinctura Colchici Composita, *Lond.*

Tinctura Guaiaci Ammoniata, *U. S.;* Tinctura Guaiaci Composita, *Lond.*

Tinctura Valerianæ Ammoniata, *U. S.;* Tinctura Valerianæ Composita, *Lond.*

Spiritus Ammoniæ Fœtidus, *Lond., Ed., Dub.*—*Fetid Spirit of Ammonia.*

III. In Saline Combination.

Ammoniæ Murias, *U. S., Ed., Dub.;* Ammoniæ Hydrochloras, *Lond.*—*Muriate of Ammonia. Sal Ammoniac.*

Ferrum Ammoniatum, *U. S.;* Ferri Ammonio-Chloridum, *Lond.*

Ammoniæ Carbonas, *U. S.*, *Ed.*; Ammoniæ Sesquicarbonas, *Lond.*, *Dub.*—*Carbonate of Ammonia. Mild Volatile Alkali.*

Cuprum Ammoniatum, *U. S.*, *Ed.*; Cupri Ammonio-Sulphas, *Lond.*, *Dub.*

Liquor Ammoniæ Sesquicarbonatis, *Lond.*; Ammoniæ Carbonatis Aqua, *Ed.*

Linimentum Ammoniæ Sesquicarbonatis, *Lond.*

Ammoniæ Bicarbonas, *Dub.*

Liquor Ammoniæ Acetatis, *U. S.*, *Lond.*; Ammoniæ Acetatis Aqua, *Ed.*; Ammoniæ Acetatis Liquor, *Dub.*—*Solution of Acetate of Ammonia. Spirit of Mindererus.*

Liquor Ammoniæ Citratis, *Lond.*—*Solution of Citrate of Ammonia.*

Ammoniæ Hydro-Sulphuretum, *Dub.*

Ferri Ammonio-citras, *Lond.*, *Dub.*—*Ammonio-citrate of Iron.*

The ammonia in the spirit of ammonia of the U. S. and Ed. Pharmacopœias is in the caustic state. In the aromatic and fetid spirits of ammonia, the alkali is caustic in the Edinburgh preparations, but carbonated in those of the other Pharmacopœias. It is seen by the table that the *ammoniated tinctures* are made in the Edinburgh Pharmacopœia with the *simple* spirit of ammonia; in the U. S. and London Pharmacopœias with the *aromatic* spirit.

B.

LIQUOR AMMONIÆ FORTIOR. *U. S.*

Stronger Solution of Ammonia.

An aqueous solution of ammonia of the specific gravity 0·882. *U. S.*

Off. Syn. AMMONIÆ LIQUOR FORTIOR. *Lond.*, *Dub.*; AMMONIÆ AQUA FORTIOR. *Ed.*

This preparation is too strong for internal exhibition, but forms a convenient ammoniacal solution for reduction, with distilled water, to the strength of ordinary officinal solution of ammonia (Liquor Ammoniæ), or for preparing strong rubefacient and vesicating lotions and liniments. (See *Linimentum Ammoniæ Compositum.*)

The United States and London Pharmacopœias include this solution in the list of the Materia Medica; but in the Edinburgh and Dublin Pharmacopœias a formula is given for its preparation. The Edinburgh formula is as follows:

"Take of Muriate of Ammonia, *thirteen ounces;* Quicklime, *thirteen ounces;* Water, *seven fluidounces and a half;* Distilled Water, *twelve fluidounces.* Slake the Lime with the Water, cover it up till it cool, triturate it well and quickly with the Muriate of Ammonia previously in fine powder, and put the mixture into a glass retort, to which is attached a receiver with a safety-tube. Connect with a receiver a bottle also provided with a safety-tube, and containing four ounces of the Distilled Water, but capable of holding twice as much. Connect this bottle with another loosely corked, and containing the remaining eight ounces of Distilled Water. The communicating tubes must descend to the bottom of the bottles at the further end from the retort; and the receiver and bottles must be kept cool by snow, ice, or a running stream of very cold water. Apply to the retort a gradually increasing heat till gas ceases to be evolved; remove the retort, cork up the aperture in the receiver where it was connected with the retort, and apply to the receiver a gentle and gradually increasing heat, to drive over as much of the gas in the liquid contained in it, but as little of the water as possible. Should the liquid in the last bottle not have the density of 960, reduce it with some of the Stronger

Aqua Ammoniæ in the first bottle, or raise it with Distilled Water so as to form Aqua Ammoniæ of the prescribed density."

In this process the ammonia is disengaged in the usual manner from muriate of ammonia by the action of lime, as explained under the head of *Liquor Ammoniæ*. But it is perceived by the details of the process, that the Edinburgh College proposes to obtain both the *stronger* and *ordinary* solution of ammonia at one operation. This is done by connecting the retort with two bottles through an intervening empty receiver, and charging the bottles severally with one-third and two-thirds of the prescribed distilled water. The receiver between the retort and the bottles serves to detain impurities. The water in the first bottle becomes nearly saturated with ammonia, a result which is favoured by the application of cold. After the gas has ceased to be disengaged from the retort, this is removed; and any ammonia which may have been condensed with water in the receiver, is saved by being driven over with a gentle heat. As the water in the first bottle will not take up all the ammonia disengaged, the balance is allowed to pass into the second bottle, where it impregnates the water to a greater or less extent, forming a weak aqueous ammonia. The aqueous ammonia in the first bottle is the Edinburgh *Ammoniæ Aqua Fortior*, and that in the second is converted into Liquor Ammoniæ of the proper officinal strength, by the addition of aqueous ammonia from the first bottle, if too weak, or of distilled water, if too strong.

Properties of Aqueous Ammonia of Maximum Strength. It is a colourless liquid, of a caustic, acrid taste, and very pungent smell. It is strongly alkaline, and immediately changes turmeric, when held over its fumes, to reddish-brown. Cooled down to 40° below zero, it concretes into a gelatinous mass, and at the temperature of 130° enters into ebullition, owing to the rapid disengagement of the gas. Its sp. gr. is 0·875 at 50°, when it contains 32·5 per cent. of ammonia.

Properties of the Officinal Stronger Solution of Ammonia. This has similar properties to those above mentioned. Its officinal sp. gr. is 0·882, *U. S.*, *Lond.*, 0·880, *Ed.*, and 0·900, *Dub.* When of the density 0·882, it contains about 29 per cent. of ammonia. The liquor ammoniæ fortior of the shops is usually deficient in strength, commonly ranging in density from 0·900 to 0·920. Even though of proper officinal strength at first, it generally becomes gradually weaker by the escape of ammonia. To prevent its deteriorating, it should be kept in closely stopped bottles in a cool place. If precipitated by lime-water, it contains carbonic acid. After having been saturated with nitric acid, a precipitate produced by carbonate of ammonia indicates earthy impurity, by nitrate of silver, a chloride, and by chloride of barium, a sulphate.

Liquor Ammoniæ Fortior is a convenient preparation for making *Liquor Ammoniæ* by due dilution with distilled water; and the Pharmacopœias have given directions for this purpose. In the U. S. and London Pharmacopœias, the stronger solution is directed to be diluted with two measures of distilled water; in the Edinburgh, with two and a half measures. By dilution in these proportions, the stronger preparation is reduced to the strength of Liquor Ammoniæ, *U. S.*, *Lond.*, *Ed.* (sp. gr. 0·960).

When purchasing or making the Stronger Solution of Ammonia, the apothecary should not trust to its being of the officinal strength; but should ascertain the point by taking its density, either with the specific gravity bottle or the hydrometer. Another method of ascertaining the density, is by the *ammonia-meter* of Mr. J. J. Griffin, of London, described and figured in the *Pharm. Journ. and Trans.*, x. 413. In reducing it to make Liquor Ammoniæ, the same precaution should be used; and, if the mixture should not have the sp. gr. 0·960, it should be brought to that density by the addition either of the stronger solution or of distilled water, as the case may require.

Medical Properties and Uses. This solution is too strong for medical employment in its unmixed state. Its rubefacient, vesicating, and caustic properties, when duly reduced by admixture with tincture of camphor and spirit of rosemary, will be noticed under the head of *Linimentum Ammoniæ Compositum.* When a solution of ammonia of 25° (sp. gr. 0·905) is mixed with fatty matter in certain proportions, the mixture forms the *vesicating ammoniacal ointment* of Dr. Gondret. The amended formula for this ointment is as follows. Take of lard 32 parts, oil of sweet almonds 2 parts. Melt them together by the *gentle* heat of a candle or lamp, and pour the melted mixture into a bottle with a wide mouth. Then add 17 parts of solution of ammonia, of 25°, and mix, with continued agitation, until the whole is cold. The ointment must be preserved in a bottle with a ground stopper, and kept in a cool place. When well prepared it vesicates in ten minutes.

Pharm. Uses. The officinal stronger solution of ammonia is used as a chemical agent to prepare two Edinburgh officinals, *Ferrugo* and *Ferri Oxidum Nigrum.*

Off. Prep. Linimentum Ammoniæ Compositum; Linimentum Camphoræ Compositum; Liquor Ammoniæ; Spiritus Ammoniæ Aromaticus, *Dub.;* Spiritus Ammoniæ Fœtidus, *Dub.;* Tinctura Ammoniæ Composita. B.

AMMONIÆ MURIAS. *U. S., Ed., Dub.*

Muriate of Ammonia.

Chlorohydrate of Ammonia. *U. S.*

Off. Syn. AMMONIÆ HYDROCHLORAS. *Lond.*

Sal ammoniac, Hydrochlorate of ammonia; Hydrochlorate d'ammoniaque, Sel ammoniac, *Fr.;* Salmiak, *Germ.;* Sale ammoniaco, *Ital.;* Sal ammoniaco, *Span.*

This salt is placed in the Materia Medica list of all the Pharmacopœias commented on in this work. It originally came from Egypt, where it was obtained by sublimation from the soot, resulting from the burning of camels' dung, which is used in that country for fuel.

Preparation. At present muriate of ammonia is derived from two principal sources, the ammoniacal liquor, called *gas liquor*, found in the condensing vessels of coal gas-works, and the brown, fetid ammoniacal liquor, known under the name of *bone spirit*, which is a secondary product, obtained, during the destructive distillation of bones, by the manufacturers of animal charcoal for the use of sugar-refiners. These two liquors are the chief sources of the ammoniacal compounds; for they are both used to procure muriate of ammonia, and this salt is employed, directly or indirectly, for obtaining all the other salts of ammonia. Other sources are stale urine, coal soot, guano, peat, and bituminous schist.

Gas liquor contains carbonate, hydrocyanate, hydrosulphate, and sulphate of ammonia, but principally the carbonate. It is saturated with sulphuric acid, and the solution obtained, after due evaporation, furnishes brown crystals of sulphate of ammonia. These are then sublimed with chloride of sodium in iron pots, lined with clay and furnished with a leaden dome or head. By the mutual action of the sulphate, chloride, and water, there are formed muriate of ammonia which sublimes into the head, and sulphate of soda which remains behind. Thus NH_3,SO_3,HO and NaCl become NH_3,HCl and NaO,SO_3. Sometimes, instead of the ammonia of the gas liquor being first converted into the sulphate, it is made at once into muriate of ammonia by the addition of muriatic acid or chloride of calcium. When chloride of calcium is employed, the chief reaction takes place between carbonate of ammonia and the chloride, with the result of forming muriate of

ammonia in solution, and a precipitate of carbonate of lime. The solution is duly evaporated, whereby brown crystals of muriate of ammonia are obtained. These, after having been dried, are purified by sublimation in an iron subliming pot, coated with a composition of clay, sand, and charcoal, and covered with a dome of lead. These pots are sometimes sufficiently large to hold 500 pounds. "A gentle fire is kept up under the subliming pot for seven or eight days, when the dome having cooled down, and the sal ammoniac somewhat contracted, so as to loosen from the sides, the dome is thrown off from the iron pot, and about two or three hundred weight of white, semi-transparent sal ammoniac are knocked off in cakes." (*Pereira, Mat. Med., 3d. Ed.*)

In the destructive distillation of bones for making animal charcoal, the distilled products are the bone spirit already mentioned, being chiefly an aqueous solution of carbonate of ammonia, and an empyreumatic oil, called *animal oil.* These products all result from a new arrangement of the ultimate constituents of the animal matter. Thus, hydrogen and oxygen form the water; carbon and oxygen, the carbonic acid; nitrogen and hydrogen, the ammonia; and carbon, hydrogen, and oxygen, the animal oil.

Muriate of ammonia may be obtained from bone spirit in the manner just described for procuring it from gas liquor. Sometimes, however, the sulphate of ammonia is not made by direct combination, but by digesting the bone spirit with ground plaster of Paris (sulphate of lime). By double decomposition, sulphate of ammonia and carbonate of lime are formed. The sulphate of ammonia is then converted into the muriate by sublimation with common salt, in the manner just explained.

Other processes, besides those given above, have been proposed or practised for obtaining muriate of ammonia. For an account of the manufacture of ammoniacal salts, and for a list of the patents, issued in Great Britain, since 1827, for their preparation in different modes and from various materials, the reader is referred to the *Pharm. Journ. and Trans.*, xii. 29, 63, and 113.

Commercial History. All the muriate of ammonia consumed in the United States is obtained from abroad. Its commercial varieties are known under the names of the *crude* and *refined.* The crude is imported from Calcutta in chests, containing from 350 to 400 pounds. This variety is consumed almost exclusively by coppersmiths and other artisans in brass and copper, being employed for the purpose of keeping the metallic surfaces bright, preparatory to brazing. The refined comes to us exclusively from England, packed in casks containing from 5 to 10 cwt.

Properties. Muriate of ammonia is a white, translucent, tough, fibrous salt, occurring in commerce in large cakes, about two inches thick, convex on one side and concave on the other. It has a pungent, saline taste, but no smell. Its sp. gr. is 1·45. It dissolves in three parts of cold, and one of boiling water, and cold is produced during its solution. It is less soluble in rectified spirit than in water, and sparingly so in absolute alcohol. This salt is very difficult to powder in the ordinary way. Its pulverization, however, may be effected readily by making a boiling saturated solution of the salt, and stirring it as it cools. The salt may thus be made to granulate, and in this state, after having been drained from the remaining solution and dried, may be readily powdered. Muriate of ammonia, at a red heat, sublimes without decomposition, as its mode of preparation shows. Exposed to a damp atmosphere, it becomes slightly moist. It has the property of increasing the solubility of corrosive sublimate in water. It is decomposed by the strong mineral acids, and by the alkalies and alkaline earths; the former disengaging muriatic acid, the latter ammonia, both sensible to the smell. Muriate of ammonia is the salt usually employed for obtaining gaseous ammonia,

which is conveniently disengaged by means of lime. Though neutral in composition, it slightly reddens litmus. It is incompatible with acetate of lead and nitrate of silver, producing a precipitate with the former of chloride of lead, with the latter of chloride of silver.

According to the Edinburgh Pharmacopœia, muriate of ammonia is not subject to adulteration. If it be not entirely volatilized by heat and soluble in water, it contains impurity. Still, as ordinarily prepared, it contains iron in the state of protochloride. The metal may be detected by boiling a small portion of a saturated solution of the salt with a drop or two of nitric acid, and then adding ferrocyanuret of potassium, when the characteristic blue colour, occasioned by iron, will be produced. (*Henry Wurtz.*) If the salt be entirely volatilized by heat, and yet produce a precipitate with chloride of barium, the presence of sulphate of ammonia is indicated.

Composition. Muriate of ammonia is composed of one eq. of muriatic acid 36·42, and one of ammonia 17 = 53·42; or, in ultimate constituents, of one eq. of chlorine, one of nitrogen, and four of hydrogen. Viewed as *chloride of ammonium*, it consists of one eq. of chlorine and one of ammonium (NH_4Cl).

Medical Properties. Muriate of ammonia acts primarily on the alimentary canal, purging in large doses, but rather constipating in small ones. Its secondary action is that of a stimulating alterative on the capillary, glandular, and lymphatic systems, and on the mucous, serous, and fibrous tissues, the nutrition of which it is supposed to improve. It has been recommended in catarrhal and rheumatic fevers; in pleuritis, peritonitis, dysentery, and other inflammations of the serous and mucous membranes, after the first violence of the disease has abated; in chronic inflammation and enlargement of the thoracic and abdominal viscera; and in amenorrhœa, when dependent on deficient action of the uterus. Several cases of pectoral disease, simulating incipient phthisis, are reported to have been cured by this salt in Otto's Bibliothek for 1834. According to Dr. Watson, it is a very efficacious remedy in hemicrania. In 1851, Dr. Aran reported his success with this remedy in intermittent fever to the Academy of Medicine, of Paris, having cured eleven out of thirteen cases. M. Fischer, of Dresden, in 1821, recommended this salt in chronic enlargement of the prostate, and since then, several German practitioners have confirmed his statement. The dose is from five to thirty grains, repeated every two or three hours, and given either in powder mixed with powdered gum or sugar, or dissolved in syrup or mucilage. When given in enlarged prostate, the dose is fifteen grains every two hours, gradually increased until nearly half an ounce is taken daily. When the dose is greater than the system can bear, it produces disordered digestion, a miliary eruption, profuse sweats, and scorbutic symptoms. It is very little used as an internal remedy in the United States; but is a good deal employed on the continent of Europe, especially in Germany, where it is deemed a powerful alterative and resolvent.

Externally, muriate of ammonia is used in solution as a stimulant and resolvent in contusions, indolent tumours, &c. The strength of the solution must be varied according to the intention in view. An ounce of the salt, dissolved in nine fluidounces of water and one of alcohol, forms a solution of convenient strength. When the solution is to be used as a wash for ulcers, or an injection in leucorrhœa, it should not contain more than from one to four drachms of the salt to a pint of water.

Off. Prep. Ammoniæ Aqua Fortior; Ammoniæ Carbonas; Ferrum Ammoniatum; Liquor Ammoniæ; Liquor Hydrargyri Bichloridi; Spiritus Ammoniæ; Spiritus Ammoniæ Aromaticus, *U. S., Lond.*; Spiritus Ammoniæ Fœtidus, *Lond.* B.

AMMONIACUM. *U. S., Lond., Ed., Dub.*

Ammoniac.

The concrete juice of Dorema Ammoniacum. *U. S.* Gum-resin from the stalk and pedicel. *Lond.* Gummy-resinous exudation. *Ed., Dub.*

Gomme ammoniaque, *Fr.;* Ammoniak, *Germ.;* Gomma ammoniaco, *Ital.;* Gomma amoniaco, *Span.;* Ushek, *Arab.;* Semugh belshereen, *Persian.*

Much uncertainty long existed as to the ammoniac plant. It was generally believed to be a *Ferula*, till Willdenow raised, from some seeds mixed with the gum-resin found in the shops, a plant which he ascertained to be a *Heracleum*, and named *H. gummiferum*, under the impression that it must be the source of the medicine. On this authority, the plant was adopted by the British Colleges, and recognised in former editions of our national Pharmacopœia. Willdenow expressly acknowledged that he could not procure from it any gum-resin, but ascribed the result to the influence of climate. The *Heracleum*, however, did not correspond exactly with the representations given of the ammoniac plant by travellers; and Sprengel ascertained that it was a native of the Pyrenees, and never produced gum. Mr. Jackson, in his account of Morocco, imperfectly described a plant of that country, supposed to be a *Ferula*, from which gum-ammoniac is procured by the natives. This plant was ascertained by Dr. Falconer to be *Ferula Tingitana* (Royle's *Mat. Med.*), and its product is thought to be the ammoniacum of the ancients, which was obtained from Africa; but this is not the drug now used under that name, which comes exclusively from Persia. M. Fontaniér, who resided many years in Persia, saw the ammoniac plant growing in the province of Fars, and sent a drawing of it with specimens to Paris. From these it was inferred to be a species of Ferula; and Merat and De Lens proposed for it the name originally given to it by Lemery, of *F. ammonifera*. It was subsequently, however, ascertained, from specimens obtained in Persia by Colonel Wright, and examined by Dr. David Don, that it belonged to a genus allied to Ferula, but essentially different, and named by Mr. Don, *Dorema*. It is described in the 16th volume of the Linnæan Transactions, under the name of *Dorema Ammoniacum*. This is now acknowledged by all the officinal authorities. The same plant has been described and figured by Jaubert and Spach in their "*Illustrations of Oriental Plants*" (Paris, 1842, t. 40, p. 78), by the name of *Diserneston gummiferum*, under the erroneous impression that it belonged to a previously undescribed genus.

The ammoniac plant is umbelliferous, and belongs to the class and order Pentandria Digynia of Linnæus. It grows spontaneously in Farsistan, Irauk, Chorassan, and other Persian provinces. Dr. Grant found it growing abundantly in Syghan near Bameean, on the northwest slope of the Hindoo Coosh mountains. It attains the height of six or seven feet, and in the spring and early part of summer abounds in a milky juice, which flows out upon the slightest puncture. From the accounts of travellers, it appears that, in the month of May, the plant is pierced in innumerable places by an insect of the beetle kind. The juice, exuding through the punctures, concretes upon the stem, and when quite dry is collected by the natives. M. Fontaniér states that the juice exudes spontaneously, and that the harvest is about the middle of June. According to Dr. Grant, the drug is collected in Syghan, like assafetida, from the root of the plant. The gum-resin is sent to Bushire, whence it is transmitted to India, chiefly to Bombay. A small portion is said to be taken to the ports of the Levant, and thence distributed. The name of the drug is thought to have been derived from the temple of Jupiter

Ammon in the Libyan desert, where the ammoniac of the ancients is said to have been collected; but Mr. Don considers it a corruption of *Armeniacum*, originating in the circumstance that the gum-resin was formerly imported into Europe through Armenia.

Properties. Ammoniac comes either in the state of tears, or in aggregate masses, and in both forms is frequently mixed with impurities. That of the tears, however, is preferable, as the purest may be conveniently picked out and kept for use. These are of an irregular shape, usually more or less globular, opaque, yellowish on the outside, whitish within, compact, homogeneous, brittle when cold, and breaking with a conchoidal shining fracture. The masses are of a darker colour and less uniform structure, appearing, when broken, as if composed of numerous white or whitish tears, embedded in a dirty gray or brownish substance, and frequently mingled with foreign matters, such as seeds, fragments of vegetables, and sand, or other earth. We have seen masses composed of agglutinated tears alone.

The smell of ammoniac is peculiar, and stronger in the mass than in the tears. The taste is slightly sweetish, bitter, and somewhat acrid. The sp. gr. is 1·207. When heated, the gum-resin softens and becomes adhesive, but does not melt. It burns with a white flame, swelling up, and emitting a smoke of a strong, resinous, slightly alliaceous odour. It is partly soluble in water, alcohol, ether, vinegar, and alkaline solutions. Triturated with water, it forms an opaque milky emulsion, which becomes clear upon standing. The alcoholic solution is transparent, but is rendered milky by the addition of water. Bucholz obtained from 100 parts of ammoniac, 22·4 parts of gum, 72·0 of resin, 1·6 of bassorin, and 4·0 of water including volatile oil and loss. Braconnot obtained 18·4 per cent. of gum, 70·0 of resin, 4·4 of a gluten-like substance (bassorin), and 6·0 of water, with 1·2 per cent. of loss. Hagen succeeded in procuring the volatile oil in a separate state by repeated distillation with water. It has a penetrating disagreeable odour, and a taste at first mild, but afterwards bitter and nauseous. The resin of ammoniac is dissolved by alcohol, and the fixed and volatile oils; but it is divided by ether into two resins, of which one is soluble, the other insoluble in that menstruum.

Medical Properties and Uses. This gum-resin is stimulant and expectorant, in large doses cathartic, and, like many other stimulants, may be so given as occasionally to prove diaphoretic, diuretic, or emmenagogue. It has been employed in medicine from the highest antiquity, being mentioned in the writings of Hippocrates. The complaints in which it is most frequently used are chronic catarrh, asthma, and other pectoral affections, attended with deficient expectoration without acute inflammation, or with a too copious secretion from the bronchial mucous membrane, dependent upon debility of the vessels. It is thought to have been useful in some cases of amenorrhœa, and in chlorotic and hysterical conditions of the system arising out of that complaint. It has also been prescribed in obstructions or chronic engorgements of the abdominal viscera, under the vague notion of its deobstruent power. Any good which it may do in these affections, is more probably ascribable to its revulsive action upon the alimentary mucous membrane. Authors speak of its utility in long and obstinate colics dependent on mucous matter lodged in the intestines; but it would be difficult to ascertain in what cases such mucous matter existed, and, even admitting its presence, to decide whether it was a cause or a result of the diseased action. Ammoniac is usually administered in combination with other expectorants, with tonics, or emmenagogues. It is much less used than formerly. Externally applied in the shape of a plaster, it is thought to be useful as a discutient or resolvent in white swellings of the joints, and other indolent tumours. (See *Emplastrum Ammoniaci.*) It is

given in substance, in the shape of pill or emulsion. The latter form is preferable. (See *Mistura Ammoniaci.*) The dose is from ten to thirty grains.

Off. Prep. Ammoniacum Præparatum; Emplastrum Ammoniaci; Emplast. Ammoniaci cum Hydrargyro; Emplast. Gummosum; Mistura Ammoniaci; Pilulæ Ipecacuanhæ cum Scillâ; Pil. Scillæ Compositæ. W.

AMYGDALA AMARA. *U. S., Ed.*

Bitter Almonds.

The kernels of the fruit of Amygdalus communis—variety *amara. U. S., Ed.*

Amande amère, *Fr.;* Bittere Mandeln, *Germ.;* Mandorle amare, *Ital.;* Almendra amarga, *Span.*

AMYGDALA DULCIS. *U. S., Ed.*

Sweet Almonds.

The kernels of the fruit of Amygdalus communis—variety *dulcis. U. S., Ed.*

Off. Syn. AMYGDALA (*Jordanica*). Amygdalus communis, *var. dulcis. Semen. Lond.* AMYGDALA. Amygdalus communis. Variety *Dulcis.* The kernels of the fruit. *Dub.*

Amande douce, *Fr.;* Süsse Mandeln, *Germ.;* Mandorle dolci, *Ital.;* Almendra dulce, *Span.*

AMYGDALUS. *Sex. Syst.* Icosandria Monogynia.—*Nat. Ord.* Amygdaleæ.

Gen. Ch. Calyx five-cleft, inferior. *Petals* five. *Drupe* with a nut perforated with pores. *Willd.*

Amygdalus communis. Willd. *Sp. Plant.* ii. 982; Woodv. *Med. Bot.* p. 507, t. 183. The almond tree rises usually from fifteen to twenty feet in height, and divides into numerous spreading branches. The leaves stand upon short footstalks, are about three inches long, and three-quarters of an inch broad, elliptical, pointed at both ends, veined, minutely serrated, with the lower serratures and petioles glandular, and are of a bright green colour. The flowers are large, of a pale red colour varying to white, with very short peduncles, and petals longer than the calyx, and are usually placed in numerous pairs upon the branches. The fruit is of the peach kind, with the outer covering thin, tough, dry, and marked with a longitudinal furrow, where it opens when fully ripe. Within this covering is a rough shell, which contains the kernel or almond.

There are several varieties of this species of Amygdalus, differing chiefly in the size and shape of the fruit, the thickness of the shell, and the taste of the kernel. The two most important are *Amygdalus* (*communis*) *dulcis* and *Amygdalus* (*communis*) *amara*, the former bearing sweet, the latter bitter almonds. Another variety is the *fragilis* of De Candolle, which yields the *soft-shelled almonds.*

The almond tree is a native of Persia, Syria, and Barbary, and is very extensively cultivated in various parts of the South of Europe. It has been introduced into the United States; but in the northern and middle sections the fruit does not usually come to perfection. We are supplied with sweet almonds chiefly from Spain and the South of France. They are distinguished into the soft-shelled and hard-shelled, the former of which come from Marseilles and Bordeaux, the latter from Malaga. From the latter port they are sometimes brought to us without the shell. In British commerce, the two chief varieties are the *Jordan* and *Valentia* almonds, the former imported

from Malaga, the latter from Valentia. The former are longer, narrower, more pointed, and more highly esteemed than the latter. The bitter almonds are obtained chiefly from Morocco, and are exported from Mogador.

Properties. The shape and appearance of almonds are too well known to require description. Each kernel consists of two white cotyledons, enclosed in a thin, yellowish-brown, bitter skin, which is easily separable after immersion in boiling water. When deprived of this covering, they are called *blanched almonds*. On exposure to the air they are apt to become rancid; but, if thoroughly dried and kept in well closed glass vessels, they may be preserved unaltered for many years. The two varieties require each a separate notice.

1. AMYGDALA DULCIS. *Sweet Almonds.* These, when blanched, are without smell, and have a sweet, very pleasant taste, which has rendered them a favourite article of diet in almost all countries where they are readily attainable. They are, however, generally considered of difficult digestion. By the analysis of M. Boullay, it appears that they contain in 100 parts, 5 parts of pellicle, 54 of fixed oil, 24 of albumen, 6 of uncrystallizable sugar, 3 of gum, 4 of fibrous matter, 3·5 of water, and 0·5 of acetic acid comprising loss. The albumen is somewhat peculiar, and is called *emulsin*. It may be obtained separate by treating the emulsion of almonds with ether, allowing the mixture, after frequent agitation, to stand until a clear fluid separates at the bottom of the vessel, drawing this off by a syphon, adding alcohol to it so as to precipitate the emulsin, then washing the precipitate with fresh alcohol, and drying it under the receiver of an air-pump. In this state it is a white powder, inodorous and tasteless, soluble in water, and insoluble in ether and alcohol. Its solution has an acid reaction, and, if heated to 212°, becomes opaque and milky; and gradually deposits a snow-white precipitate, amounting to about ten per cent. of the emulsin employed. (*Am. Journ. of Pharm.*, xxi. 354, from *Liebig's Annalen.*) Its distinguishing property is that of producing certain changes, hereafter to be noticed, in amygdalin, which property it loses when its solution is boiled, though not by exposure in the solid state to a heat of 212°. (*Ibid.*, 357.) It consists of nitrogen, carbon, hydrogen, and oxygen, with a minute proportion of sulphur, and is probably identical with the principle for which Robiquet proposed the name of *synaptase*. The fixed oil is described under the head of *Oleum Amygdalæ*, to which the reader is referred. Almonds, when rubbed with water, form a milky emulsion, the insoluble matters being suspended by the agency of the albuminous, mucilaginous, and saccharine principles.

2. AMYGDALA AMARA. *Bitter Almonds.* These are smaller than the preceding variety. They have the bitter taste of the peach-kernel, and, though when dry inodorous or nearly so, have, when triturated with water, the fragrance of the peach blossom. They contain the same ingredients as sweet almonds, and like them form a milky emulsion with water. It was formerly supposed that they also contained hydrocyanic acid and volatile oil, to which their peculiar taste and smell, and their peculiar operation upon the system were ascribed. It was, however, ascertained by MM. Robiquet and Boutron that these principles do not pre-exist in the almond, but result from the reaction of water; and Wöhler and Liebig proved, what was suspected by Robiquet, that they are formed out of a substance of peculiar properties, denominated *amygdalin*, which is the characteristic constituent of bitter almonds. This substance, which was discovered by Robiquet and Boutron, is white, crystallizable, inodorous, of a sweetish bitter taste, unalterable in the air, freely soluble in water and hot alcohol, very slightly soluble in cold alcohol, and insoluble in ether. Its elementary constituents are nitrogen, carbon, hydrogen, and oxygen; and it is supposed to be an *amide;* as, when treated with an alkali, it yields ammonia and a peculiar acid which

has been named *amygdalic acid.* Liebig and Wöhler recommend the following process for procuring it, in which the object of the fermentation is to destroy the sugar with which it is associated. Bitter almonds, previously deprived of their fixed oil by pressure, are to be boiled in successive portions of alcohol till they are exhausted. From the liquors thus obtained, all the alcohol is to be drawn off by distillation; care being taken, near the end of the process, not to expose the syrupy residue to too great a heat. This residue is then to be diluted with water, mixed with good yeast, and placed in a warm situation. After the fermentation which ensues has ceased, the liquor is to be filtered, evaporated to the consistence of syrup, and mixed with alcohol. The amygdalin is thus precipitated in connexion with a portion of gum, from which it may be separated by solution in boiling alcohol, which will deposit it upon cooling. If pure, it will form a perfectly transparent solution with water. Any oil which it may contain may be separated by washing it with ether. One pound of almonds yields at least 120 grains of amygdalin. (*Annalen der Pharm.*, xxii. and xxiii. 329.)*

Amygdalin, when mixed with an emulsion of *sweet* almonds, gives rise, among other products, to the volatile oil of bitter almonds and hydrocyanic acid—the emulsin of the sweet almonds acting the part of a ferment, by setting on foot a reaction between the amygdalin and water; and the same result is obtained when pure *emulsin* is added to a solution of amygdalin. It appears then that the volatile oil and hydrocyanic acid, developed in bitter almonds when moistened, result from the mutual reaction of amygdalin, water, and emulsin. Certain substances have the effect of preventing this reaction, as, for example, alcohol and acetic acid. (See *Am. Journ. of Pharm.*, xxi. 353.) It is asserted that emulsin procured from other seeds, as those of the poppy, hemp, and mustard, is capable of producing the same reaction between water and amygdalin, though in a less degree than that of the sweet or bitter almonds. (*Annal. der Pharm.*, xxviii. 290.) Amygdalin appears not to be poisonous when taken pure into the stomach; as there is nothing in the human system capable of acting the part of emulsin. Nevertheless, large quantities given to a dog have produced narcotic effects.

Bitter almonds yield their fixed oil by pressure; and the volatile oil, impregnated with hydrocyanic acid, may be obtained from the residue by distillation with water. (See *Oleum Amygdalæ amaræ.*)

Confectioners employ bitter almonds for communicating flavour to the syrup of orgeat. (See *Syrupus Amygdalæ.*) The kernel of the peach possesses similar properties, and is frequently used as a substitute. It has been ascertained that bitter almond paste, and other substances which yield the same volatile oil, such as bruised cherry-laurel leaves, peach leaves, &c., have the property of destroying the odour of musk, camphor, most of the volatile oils, creasote, cod-liver oil, the balsams, &c.; and M. Mahier, a French pharmaceutist, has employed them successfully to free mortars and bottles from the odour of assafetida, and other substances of disagreeable smell. All that is necessary is first to remove any oily substance by means of an alkali, and then to apply the paste or bruised leaves. (*Am. Journ. of Pharm.*, xviii. 209.)

Medical Properties and Uses. Sweet almonds exercise no other influence upon the system than that of a demulcent. The emulsion formed by triturating them with water is a pleasant vehicle for the administration of other medicines, and is itself useful in cases of catarrhal affection. Bitter almonds

* Amygdalin appears to be extensively diffused in plants, having been noticed not only in the different genera of the Amygdaleæ, as *Amygdalus*, *Cerasus*, and *Prunus*, but also by Wicke in various Pomaceæ, as *Pyrus malus*, *Sorbus Aucuparia*, *Sorbus hybrida*, *Sorbus torminales*, *Amelanchier vulgaris*, *Cotomaster vulgaris*, and *Cratægus Oxycantha*. (*Ann. der Chem. und Pharm.*, lxxix. 79.)

are more energetic, and, though not much in use, might undoubtedly be employed with advantage in cases to which hydrocyanic acid is applicable. An emulsion made with them has been beneficially prescribed in pectoral affections attended with cough, and is said to have cured intermittents. It probably operates by diminishing the excitability of the nervous system. Dr. A. T. Thomson says that he has found it useful as a lotion in acne rosea and impetigo. Bitter almonds are said by Hufeland to have been successfully employed for the expulsion of the tape worm. In some persons they produce urticaria, in the smallest quantities. Largely taken, they have sometimes proved deleterious.

Wöhler and Liebig propose, as a substitute for cherry-laurel water, which owes its effects to the hydrocyanic acid it contains, but is objectionable from its unequal strength, an extemporaneous mixture, consisting of 17 grains of amygdalin, and one fluidounce of an emulsion made with two drachms of *sweet* almonds, and a sufficient quantity of water. This mixture contains, according to the above named chemists, one grain of anhydrous hydrocyanic acid, and is equivalent to two fluidounces of fresh cherry-laurel water. If found to answer in practice, it will have the advantage of certainty in relation to the dose; as amygdalin may be kept any length of time unaltered. If the calculation of Wöhler and Liebig be correct as to the quantity of acid it contains, not more than a fluidrachm should be given as a commencing dose.

Off. Prep. of Sweet Almonds. Confectio Amygdalæ; Mistura Acaciæ; Mistura Amygdalæ; Mistura Camphoræ; Syrupus Amygdalæ.

Off. Prep. of Bitter Almonds. Syrupus Amygdalæ. W.

AMYLUM. *U. S., Lond., Ed., Dub.*

Starch.

The fecula of the seeds of Triticum vulgare. *U. S., Lond., Ed.* Starch from the seeds of Triticum Œstivum. *Dub.*

Amidon, *Fr.;* Stärkmehl, *Germ.;* Amido, *Ital.;* Almidon, *Span.*

Starch is a proximate vegetable principle contained in most plants, and especially abundant in the various grains; such as wheat, rye, barley, oats, rice, maize, &c.; in other seeds, as peas, beans, chestnuts, acorns, &c.; and in numerous tuberous roots, as those of the potato (*Solanum tuberosum*), the sweet potato (*Convolvulus Batatas*), the arrow-root, the cassava plant, and different species of Curcuma. The process for obtaining it consists essentially in reducing the substances in which it exists to a state of minute division, agitating or washing them with cold water, straining or pouring off the liquid, and allowing it to stand till the fine fecula which it holds in suspension has subsided. This, when dried, is starch, more or less pure according to the care taken in conducting the process. The starch of commerce is procured chiefly from wheat, sometimes also from potatoes. Our space will not allow us to enter into details in relation to the particular steps of the operation to which those substances are subjected; and the omission is of less consequence, as starch is never prepared by the apothecary.

Starch is white, pulverulent, opaque, and, as found in the shops, is usually in columnar masses, having a somewhat crystalline aspect, and producing a peculiar sound when pressed between the fingers. Its specific gravity is 1·53. When exposed to a moist air, it absorbs a considerable quantity of water, which may be driven off by a gentle heat. It is insoluble in alcohol, ether, and cold water; but unites with boiling water, which, on cooling, forms with it a soft semi-transparent paste, or a gelatinous opaline solution, according to the proportion of starch employed. The paste, placed on folds of blotting

paper, renewed as they become wet, abandons its water, contracts, and assumes the appearance of horn. If the proportion of starch be very small, the solution, after slowly depositing a very minute quantity of insoluble matter, continues permanent, and upon being evaporated yields a semi-transparent mass, which is partially soluble in cold water. The starch has, therefore, been modified by the combined agency of water and heat; nor can it be restored to its original condition. Exposed, in the dry state, to a temperature somewhat above 212°, it undergoes, according to Caventou, a similar modification; and a degree of heat sufficient to roast it slightly converts it into a substance soluble in cold water, called *British gum*, and applicable to the same purposes as gum in the arts. The same change in regard to solubility is, to a certain extent, produced by mechanical means, as by trituration in a mortar; and that the effect is not the result of heat evolved by friction is evinced by the fact, that it takes place when the starch is triturated with water.

The views now generally entertained in relation to starch, by which the above mentioned phenomena may be most conveniently explained, are those originally presented by Raspail, and subsequently confirmed and extended by Guibourt, Guérin, and others. According to these views, starch consists of organized granules, which, examined by the microscope, appear to be of various form and size. These granules consist of a thin exterior coating, and of an interior substance, the former wholly insoluble, the latter soluble in water. The former constitutes, according to M. Payen, only 4 or 5 thousandths of the weight of starch. In relation to the interior portion, different opinions have been held. M. Guérin supposed that it consisted of two distinct substances, one soluble in cold water, the other soluble at first in boiling water but becoming insoluble by evaporation. Thus, when one part of starch is boiled for fifteen minutes in one hundred parts of water, and the liquid is allowed to stand, a small portion, consisting of the broken teguments, is gradually deposited. If the solution be now filtered and evaporated, another portion is deposited which cannot afterwards be dissolved. When wholly deprived of this portion, and evaporated to dryness, the solution yields the part soluble in cold water. According to MM. Payen and Persoz, the interior portion of the globules consists only of a single substance, which is converted into the two just mentioned by the agency of water; and Thenard is inclined to the same opinion. An appropriate name for the interior soluble portion of starch is *amidin*, which has been adopted by some chemists. Starch, in its perfect state, is not affected by cold water, because the exterior insoluble teguments prevent the access of the liquid to the interior portion; but, when the pellicle is broken by the agency of heat, or by mechanical means, the fluid is admitted, and the starch partially dissolved. Another view of the structure of the starch granule, founded on microscopic observation, has been advanced by Schleiden. According to this view, it consists of concentric layers, all of which have the same chemical composition; but the outer layers, having been first formed, have more cohesion than the inner, and are consequently more difficult of solubility. The rings observed upon the surface of the granules, in some varieties, are merely the edges of these layers; and the point or hylum about which the rings are concentrically placed, is a minute hole, through which probably the substance of the interior layers was introduced. (*Pharm. Central Blatt*, 1844, p. 401.) MM. Payen and Guibourt at present admit that the starch granule is organized throughout, and consists of but a single chemical principle; the differences in solubility being ascribable to the more compact organization of the exterior layer, which enables it to resist the action of water. (*Journ. de Pharm.*, 3e *sér.*, ix. 193.)

Iodine forms with starch, whether in its original state or in solution, a blue compound; and the tincture of iodine is the most delicate test of its presence

in any mixture. The colour varies somewhat according to the proportions employed. When the two substances are about equal, the compound is of a beautiful indigo-blue; if the iodine is in excess, it is blackish-blue; if the starch, violet-blue. A singular property of the iodide of starch is that its solution becomes colourless if heated to about 200°, and afterwards recovers its blue colour upon cooling. By boiling, the colour is permanently lost. Alkalies unite with starch, forming soluble compounds, which are decomposed by acids, the starch being precipitated. It is thrown down from its solution by lime-water and baryta-water, forming insoluble compounds with these earths. The solution of subacetate of lead precipitates it in combination with the oxide of the metal. Starch may be made to unite with tannin by boiling their solutions together; and a compound results, which, though retained by the water while hot, is deposited when it cools. By long boiling with diluted sulphuric, muriatic, or oxalic acid, it is converted first into *dextrine*,* and ultimately into a saccharine substance similar to the sugar of grapes. A similar conversion into dextrine and the sugar of grapes is effected by means of a principle called *diastase*, discovered by MM. Payen and Persoz in the seeds of barley, oats, and wheat, after germination. (See *Hordeum*.) Strong muriatic and nitric acids dissolve it; and the latter, by the aid of heat, converts it into oxalic and malic acids. Concentrated sulphuric acid decomposes it. Mixed with hot water, and exposed to a temperature of 70 or 80°, it undergoes fermentation, which results in the formation of several distinct principles, among which are sugar, a gummy substance (perhaps *dextrine*), and a modification of starch which De Saussure called *amidine*.

The tegumentary portion of starch, for which the name of *amylin* has been proposed, when entirely freed from the interior soluble matter, is wholly insoluble in water even by prolonged boiling, is insoluble in alcohol, and is said to suffer no change by the action of diastase. The acids, however, act upon it as they do upon starch. It approaches nearer in properties to lignin than to any other principle.

Starch, as obtained from different substances, is somewhat different in its characters. *Wheat starch*, when examined with a microscope, is found to consist of granules of various sizes, the smaller being spheroidal, the larger rounded and flattened, with the hylum in the centre of the flattened surface, and surrounded by concentric rings, which often extend to the edge. The granules are mixed with loose integuments, resulting from the process of grinding. This variety of starch has a certain degree of hardness and adhesiveness, owing, according to Guibourt, to the escape of a portion of the interior substance of the broken granules, which attracts some moisture from the air, and thus becoming glutinous, acts as a bond between those which remain unbroken. Another opinion attributes this peculiar consistence to the retention of a portion of the gluten of the wheat flour, which causes the granules to cohere. *Potato starch* is employed in various forms, being prepared so as to imitate more costly amylaceous substances, such as arrow-root

* *Dextrine* is a substance resembling gum in appearance and properties, but differing from it in not affording mucic acid by the action of nitric acid. It is largely dissolved by water, hot or cold, and forms a mucilaginous solution, from which it is precipitated by alcohol. This fluid has no action on dextrine. Large quantities of dextrine are now manufactured in England, and employed for various purposes in the arts, under the name of *artificial gum*. It is found in the market in the form of mucilage, in that of a white brilliant powder, and in small masses or fragments resembling natural gum. According to M. Emile Thomas, it may be distinguished from gum Arabic by the taste and smell of potato oil which it always possesses. It is made by the action either of acids or of diastase on starch. For particulars as to the manufacture, the reader is referred to a paper by M. Thomas, republished in the *American Journal of Pharmacy*, vol. xix. p. 284.

and sago. In its ordinary state, it is more pulverulent than wheat starch, has a somewhat glistening appearance, and may be distinguished, with the aid of the microscope, by the size of its granules, which are larger than those of any other known fecula, except canna or *tous les mois*. They are exceedingly diversified in size and shape, though their regular form is thought to be ovate. They are characterized by concentric rings or rugæ, which are most readily distinguishable in the fresh starch, and are said by Raspail to disappear upon desiccation. These surround a minute circular hole or hylum upon the surface of the granule. In some instances there are two of these holes, one at each end, or both at the same end. The characters of other kinds of fecula will be given under the heads of the several officinal substances of which they constitute the whole or a part. Starch consists of carbon, hydrogen, and oxygen; its formula, from whatever source it may be derived, being, according to the latest opinions, $C_{12}H_{10}O_{10}$.

According to Chevallier, starch is sometimes adulterated with carbonate and sulphate of lime, and the fraud is also practised of saturating it with moisture, of which it will absorb 12 per cent. without any obvious change.

Medical Properties, &c. Starch is nutritive and demulcent, but in its ordinary form is seldom administered internally. Powdered and dusted upon the skin, it is sometimes used to absorb irritating secretions, and prevent excoriation. Dissolved in hot water and allowed to cool, it is often employed in enemata, either as a vehicle of other substances, or as a demulcent application in irritated states of the rectum. It may be used as an antidote to iodine taken in poisonous quantities.

Off. Prep. Decoctum Amyli; Enema Opii vel Anodynum; Mucilago Amyli; Pulvis Tragacanthæ Compositus; Trochisci Acaciæ. W.

ANETHUM. *Lond., Ed.*

Dill Seeds.

Fruit of Anethum graveolens. *Lond., Ed.*

Aneth à odeur forte, *Fr.;* Dill, *Germ.;* Aneto, *Ital.;* Eneldo, *Span.*

ANETHUM. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Umbelliferæ or Apiaceæ.

Gen. Ch. Fruit nearly ovate, compressed, striated. *Petals* involuted, entire. *Willd.*

Anethum graveolens. Willd. *Sp. Plant.* i. 1469; Woodv. *Med. Bot.* p. 125, t. 48. Dill is an annual plant, three or four feet high, with a long, spindle-shaped root; an erect, striated, jointed, branching stem; and bipinnate or tripinnate, glaucous leaves, which stand on sheathing footstalks, and have linear and pointed leaflets. The flowers are yellow, and in large, flat, terminal umbels, destitute of involucre. The plant is a native of Spain, Portugal, and the South of France; and is found growing wild in various parts of Africa and Asia. It is cultivated in all the countries of Europe, and has been introduced into our gardens. The seeds, as the fruit is commonly called, are the only part used. They are usually rather more than a line in length, and less than a line in breadth, of an oval shape, thin, concave on one side, convex and striated on the other, of a brown colour, and surrounded by a yellowish membranous expansion. Their smell is strong and aromatic, but less agreeable than that of fennel-seed; their taste, moderately warm and pungent. These properties depend on a volatile oil, which may be obtained separate by distillation. It is of a pale yellow colour, and of the sp. gr. 0·881. The bruised seeds impart their virtues to alcohol and to boiling water.

Medical Properties. Dill seeds have the properties common to the aromatics, but are very seldom used in this country. They may be given in powder or infusion. The dose is from fifteen grains to a drachm.

Off. Prep. Aqua Anethi; Oleum Anethi. W.

ANGELICA. *U. S. Secondary.*

Angelica.

"The root and herb of Angelica atropurpurea." *U. S.*

ANGELICA. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Umbelliferæ or Apiaceæ.

Gen. Ch. Fruit elliptic, compressed, somewhat solid and corticate, ridges three, dorsal acute, intervals grooved, margin alated. *Gen. involucre* none. (*Sprengel.*) *Umbel* large, many-rayed, spreading; *umbellet* dense, subhemispheric; *involucell* about eight-leaved. *Calyx* five-toothed. *Petals* inflected. *Nuttall.*

Angelica atropurpurea. Willd. *Sp. Plant.* i. 1430. This indigenous species of Angelica, sometimes called *masterwort*, has a perennial purplish root, and a smooth herbaceous stem, the dark colour of which has given rise to the specific name of the plant. The leaves are ternate, and supported by very large inflated petioles. The partitions of the leaf are nearly quinate, with ovate, acute, deeply serrate, somewhat lobed leaflets, of which the three terminal are confluent. The flowers are greenish-white.

The purple angelica extends throughout the United States from Canada to Carolina, growing in meadows and marshy woods, and flowering in June and July. It is smaller than *A. Archangelica*, with a less succulent stem. The whole plant is officinal. It has a strong odour, and a warm aromatic taste. The juice of the recent root is acrid, and is said to be poisonous; but the acrimony is dissipated by drying.

Medical Properties, &c. The medical virtues of the plant are similar to those of the garden angelica of Europe, for which it has been proposed as a substitute. It is, however, little employed. An infusion is occasionally used in flatulent colic; and we are told that the stems are sometimes candied by the country people. W.

ANGELICA. *Ed.*

Garden Angelica.

Root of Angelica Archangelica. *Ed.*

Angelique, *Fr.;* Engelwurzel, *Germ.;* Arcangelica, *Ital.;* Angelica, *Span.*

ANGELICA. See ANGELICA. *U. S.*

Angelica Archangelica. Willd. *Sp. Plant.* i. 1428; Woodv. *Med. Bot.* p. 86, t. 35.—*Archangelica officinalis.* Hoch, De Cand., &c. *Garden angelica* has a long, thick, fleshy, biennial root, furnished with many fibres, and sending up annually a hollow, jointed, round, channelled, smooth, purplish stem, which rises five feet or more in height, and divides into numerous branches. The leaves, which stand upon round fistulous footstalks, are very large, doubly pinnate, with ovate lanceolate, pointed, acutely serrate leaflets, of which the terminal one is three-lobed. The flowers are small, greenish-white, and disposed in very large, many-rayed, terminal umbels, composed of numerous dense, hemispherical umbellets.

This plant is a native of the north of Europe, and is found in the high

mountainous regions in the southern section of that continent, as in Switzerland and among the Pyrenees. It is cultivated in various parts of Europe, and may be occasionally met with in the gardens of this country. It flowers during the summer. The whole plant has a fragrant odour and aromatic properties; but the root and fruit only are officinal.

1. The *root* should be dug up in the autumn of the first year, as it is then least liable to become mouldy and worm-eaten. It is spindle-shaped, an inch or more thick at top, and beset with long descending radicles. The fresh root has a yellowish-gray epidermis, a fleshy yellow parenchyma, and when wounded yields a honey-coloured juice, having all the aromatic properties of the plant. The dried root is grayish-brown and much wrinkled externally, whitish and spongy within, and breaks with a starchy fracture, exhibiting shining resinous points. It is very apt to be attacked by worms, and is said to keep best, in the state of powder, in full and well closed vessels. The smell is strong and fragrant, and the taste at first sweetish, afterwards warm, aromatic, bitterish, and somewhat musky. These properties are extracted by alcohol, and less perfectly by water. The constituents of the root, according to the younger Buchner, are volatile oil, a volatile acid which he calls *angelicic acid*, a wax-like substance, a crystallizable sub-resin, a brittle amorphous resin, a bitter principle, tannic acid, malic acid, sugar, starch, albumen, pectic acid, fibrin, and various salts. (*Journ. de Pharm.*, 3*e sér.* ii. 124.) Five hundred parts yield nearly four parts of volatile oil.

2. The *seeds*, as the fruit is commonly called, are two or three lines long, oval, obtuse or somewhat notched at the ends, flat and marked with a longitudinal furrow on one side, convex with three angular ridges on the other. They are ash-coloured, and have the same smell and taste as the root. They are said to keep well.

Medical Properties. Angelica is an elegant aromatic tonic, but is little employed in the United States. The Laplanders, in whose country it flourishes, are said to esteem it highly as a condiment and medicine. In Europe, the stems are frequently made into a preserve, and used in desserts in order to excite the stomach. The dose of the root or seeds is from thirty grains to a drachm. W.

ANGUSTURA. *U. S.*

Angustura Bark.

The bark of Galipea officinalis. *Hancock. U. S.*

Off. Syn. CUSPARIA. Galipea Cusparia. *Cortex. Lond.;* CUSPARIA. Bark of *Galipea officinalis. Ed.*

Angusture, *Fr.;* Angusturarinde, *Germ.;* Corteccia dell' Angustura, *Ital.;* Corteza de Angostura, *Span.*

The subject of Angustura bark, in its botanical relations, has been involved in some confusion. The drug was at first supposed to be derived from a species of Magnolia, and was referred by some to *Magnolia glauca* of this country. Humboldt and Bonpland were the first to throw light upon its true source. When at Angustura, a South American city on the Orinoco, they received specimens of the foliage of the plant from which the bark was obtained; and afterwards believed that they had found the same plant in a tree growing in the vicinity of Cumana. This latter they had the opportunity of personally inspecting, and were therefore enabled to describe accurately. Unable to attach it to any known genus, they erected it into a new one, with the title of *Cusparia*, a name of Indian origin, to which they added the specific appellation of *febrifuga*. On their authority *Cusparia*

febrifuga was generally believed to be the true source of the medicine, and was recognised as such by the London College. A specimen having in the meantime been sent by them to Willdenow, the name of *Bonplandia* was imposed on the new genus by that celebrated botanist; and was subsequently adopted by Humboldt and Bonpland themselves, in their great work on equinoctial plants. Hence the title of *Bonplandia trifoliata*, by which the tree is described in many works on Materia Medica. De Candolle, however, having found in the description all the characters of the genus *Galipea* of Aublet, rejected both these titles, and substituted that of *Galipea Cusparia*, which has been adopted by the London College. But, after all these commutations, it appears from the researches of Dr. Hancock, who resided for several months in the country of the Angustura bark tree, that the plant described by Humboldt and Bonpland is not that which yields the medicine, but probably another species of the same genus. Among other striking differences between them is that of their size; the tree described by Humboldt and Bonpland being not less than sixty or eighty feet in height, while that from which the bark is obtained is never more than twenty feet. Hancock proposes for the latter the title of *Galipea officinalis*, which has been adopted in the U.S. and Edinburgh Pharmacopœias.

GALIPEA. *Sex. Syst.* Diandria Monogynia.—*Nat. Ord.* Rutaceæ.

Gen. Ch. Corolla inferior, irregular, four or five cleft, hypocrateriform. *Stamens* four; two sterile. *Loudon's Encyc.*

Galipea officinalis. Hancock, *Trans. Lond. Medico-Bot. Soc.* This is a small tree, irregularly branched, rising to the medium height of twelve or fifteen feet, with an erect stem from three to five inches in diameter, and covered with a smooth gray bark. The leaves are alternate, petiolate, and composed of three leaflets, which are oblong, pointed at each extremity, from six to ten inches in length, from two to four in breadth, and supported upon the common petiole by short leafstalks. They are very smooth and glossy, of a vivid green colour, marked occasionally with small whitish round spots, and, when fresh, of a strong odour resembling that of tobacco. The flowers are numerous, white, arranged in axillary and terminal peduncled racemes, and of a peculiar unpleasant odour. The fruit consists of five bivalve capsules, of which two or three are commonly abortive. The seeds, two of which are contained in each capsule, one often abortive, are round, black, and of the size of a pea. The tree grows abundantly on the mountains of Carony, between the 7th and 8th degrees of N. Latitude; and is well known in the missions, near the Orinoco, upwards of two hundred miles from the ocean. It flourishes at the height of from six hundred to one thousand feet above the level of the sea. Its elegant white blossoms, which appear in vast profusion in August and September, add greatly to the beauty of the scenery.

The bark is generally brought from the West Indies packed in casks; but, according to Mr. Brande, the original package, as it comes from Angustura, consists of the leaves of a species of palm, surrounded by a network of sticks.

Properties. The pieces are of various lengths, for the most part slightly curved, rarely quilled, sometimes nearly flat, from half a line to a line or more in thickness, pared away towards the edges, covered externally with a light yellowish-gray or whitish wrinkled epidermis, easily scraped by the nail, and internally of a yellowish-fawn colour. They are very fragile, breaking with a short, resinous fracture, and yield, on being pulverized, a pale yellow powder; but, when macerated for a short time in water, they become soft and tenacious, and may be cut into strips with scissors. The smell of Angustura bark is peculiar and disagreeable when fresh, but becomes fainter with age; the taste is bitter and slightly aromatic, leaving a sense of pungency at the end of the tongue. According to Fischer, it contains volatile oil, bitter

extractive, a hard and bitter resin, a soft resin, a substance analogous to caoutchouc, gum, lignin, and various salts. The volatile oil, which may be obtained by distillation with water, is of a pale yellowish colour, lighter than water, of an acrid taste, and with the odour of the bark. *Cusparin* is the name given by Saladin to a principle, deposited in tetrahedral crystals, when an infusion of the bark is treated with absolute alcohol, at common temperatures, and allowed to evaporate spontaneously. It is neutral, fusible at a gentle heat, by which it loses 23·09 per cent. of its weight, soluble in 200 parts of cold and 100 parts of boiling water, soluble in the concentrated acids and in the alkalies, and precipitated by the infusion of galls. (*J. de Pharm.*, xxii. 662.) The virtues of the bark probably reside in the volatile oil, and bitter principles. They are extracted by water and alcohol.

Dr. A. T. Thomson states that precipitates are produced with the infusion by the solutions of sulphate of iron, tartrate of antimony and potassa, sulphate of copper, acetate and subacetate of lead, bichloride of mercury, nitrate of silver, and pure potassa; by nitric and sulphuric acids; and by the infusions of galls and yellow cinchona; but how far these substances are medicinally incompatible with the bark, it would be difficult to determine.

False Angustura. Under this title, the European writers on Materia Medica describe a bark which was introduced on the continent mixed with true Angustura bark, and possessing poisonous properties, producing in some instances unpleasant effects when prescribed by mistake for that medicine. It is distinguished by its greater thickness, hardness, weight, and compactness; by its resinous fracture; by the appearance of its epidermis, which is sometimes covered with a ferruginous efflorescence, sometimes is yellowish-gray, and marked with prominent white spots; by the brownish colour and smoothness of its internal surface, which is not, like that of the genuine bark, separable into laminæ; by the white slightly yellow powder which it yields; by its total want of odour, and its intense tenacious bitterness. When steeped in water, it does not become soft like the true Angustura. Analyzed by Pelletier and Caventou, it was found to contain a peculiar alkaline principle which they called *brucia*, and upon which its poisonous operation depends. (See *Nux Vomica.*) In consequence of the presence of this principle, a drop of nitric acid upon the internal surface of the bark produces a deep blood-red spot. The same acid, applied to the external surface, renders it emerald-green. In true Angustura bark, a dull red colour is produced by the acid on both surfaces. The *false Angustura* was at first supposed to be derived from *Brucea antidysenterica;* and was afterwards referred to some unknown species of Strychnos, in consequence of containing *brucia*, which is a characteristic ingredient of that genus of plants. At present, it is ascribed to *Strychnos Nux vomica*, the bark of which, according to Dr. O'Shaughnessy, exactly corresponds with the description of Angustura, and like it contains brucia. Little of this bark reaches the United States.

Medical Properties and Uses. Angustura bark had been long used by the natives of the country where it grows, before it became known elsewhere. From the continent its employment extended to the West Indies, where it acquired considerable reputation. It was first taken to Europe about seventy years since. It is now ranked among the officinal remedies throughout Europe and America; but it has not sustained its early reputation, and in the United States is not much prescribed. Its operation is that of a stimulant tonic. In large doses it also evacuates the stomach and bowels, and is often employed for this purpose in South America. It was at one time considerably used as a febrifuge in the place of Peruvian bark; but has not been found generally successful in the intermittents of northern latitudes. It is said to be peculiarly efficacious in bilious diarrhœas and dysenteries; and

has been recommended in dyspepsia, and other diseases in which a tonic treatment is demanded. The testimony, however, of practitioners in Europe and the United States, is not strongly in its favour; and it is probably better adapted to tropical diseases than to those of temperate climates. Hancock employed it extensively in the malignant bilious intermittent fevers, dysenteries, and dropsies of Angustura and Demerara; and speaks in strong terms of its efficacy in these complaints. He used it in the form of fermented infusion, as recommended by the native practitioners.

It may be given in powder, infusion, tincture, or extract. The dose in substance is from ten to thirty grains. In larger quantities it is apt to produce nausea. From five to fifteen grains is the dose of the extract, which, however, according to Dr. Hancock, is inferior to the powder or infusion. To obviate nausea, it is frequently combined with aromatics.

Off. Prep. Infusum Angusturæ; Tinctura Cuspariæ. W.

ANISUM. *U. S., Lond., Ed., Dub.*

Anise.

The fruit of Pimpinella Anisum. *U. S., Lond., Ed., Dub.*

Graines d'anis, *Fr.;* Anissame, *Germ.;* Semi d'aniso, *Ital.;* Simiente de anis, *Span.;* Anison, *Arab.*

PIMPINELLA. *Sex. Syst.* Pentandria Digynia. — *Nat. Ord.* Umbelliferæ or Apiaceæ.

Gen. Ch. Fruit ovate oblong. *Petals* inferior. *Stigma* nearly globular. *Willd.*

Pimpinella Anisum. Willd. *Sp. Plant.* i. 1473; Woodv. *Med. Bot.* p. 135, t. 52. This is an annual plant, about a foot in height, with an erect, smooth, and branching stem. The leaves are petiolate, the lower roundish-cordate, lobed, incised-serrate, the middle pinnate-lobed with cuneate or lanceolate lobes, the upper trifid, undivided, linear. The flowers are white, and in terminal compound umbels, destitute of involucres.

The anise plant is a native of Egypt and the Levant, but has been introduced into the south of Europe, and is cultivated in various parts of that continent. It is also cultivated occasionally in the gardens of this country. The fruit is abundantly produced in Malta and Spain. The Spanish is smaller than the German or French, and is usually preferred.

Anise seeds (botanically fruit) are about a line in length, oval, striated, somewhat downy, attached to their footstalks, and of a light greenish-brown colour, with a shade of yellow. Their odour is fragrant, and increased by friction; their taste warm, sweet, and aromatic. These properties, which depend upon a peculiar volatile oil, are imparted sparingly to boiling water, freely to alcohol. The volatile oil exists in the envelope of the seeds, and is obtained separate by distillation. (See *Oleum Anisi.*) Their internal substance contains a bland fixed oil. By expression, a greenish oil is obtained, which is a mixture of the two. The seeds are sometimes adulterated with small fragments of argillaceous earth, which resembles them in colour; and their aromatic qualities are occasionally impaired by a slight fermentation, which they are apt to undergo in the mass, when collected before maturity.

A case of poisoning is on record from the accidental admixture of the fruits of Conium maculatum, which bear some resemblance to those of anise, but may be distinguished by their crenate or notched ridges. They are, moreover, broader in proportion to their length, and are generally separated into half-fruits, while those of anise are whole.

The *Star aniseed*, the *badiane* of the French writers, though analogous in

sensible properties to the common aniseed, is derived from a different plant, being the fruit of *Illicium anisatum*, an evergreen tree growing in China, Japan, and Tartary. The fruit consists of from five to ten brownish ligneous capsules, four or five lines long, united together in the form of a star, each containing a brown shining seed. It is much used in France to flavour liquors; and the volatile oil, upon which its aromatic properties depend, is imported into this country from the East Indies, and sold as common oil of anise, to which, however, it is thought by some to be much superior.

Medical Properties and Uses. Anise is a grateful aromatic carminative; and, like several other fruits of a similar character, is supposed to have the property of increasing the secretion of milk. It has been in use from the earliest times. In Europe it is much employed in flatulent colic, and as a corrigent of griping or unpleasant medicines; but in this country fennel-seed is usually preferred. Anise may be given bruised, or in powder, in the dose of twenty or thirty grains or more. The infusion is less efficient. The volatile oil may be substituted for the seeds in substance. Much use is made of this aromatic for imparting flavour to liquors.

Off. Prep. Oleum Anisi. W.

ANTHEMIS. *U. S., Lond., Ed., Dub.*

Chamomile.

The flowers of Anthemis nobilis. *U. S., Lond., Dub.* The simple flowers. *Ed.*

Camomille Romaine, *Fr.;* Romische Kamille, *Germ.;* Camomilla Romana, *Ital.;* Manzanilla Romana, *Span.*

ANTHEMIS. *Sex. Syst.* Syngenesia Superflua. — *Nat. Ord.* Compositæ Senecionideæ. *De Cand.* Asteraceæ. *Lindley.*

Gen. Ch. Receptacle chaffy. *Seed down* none or a membranaceous margin. *Calyx* hemispherical, nearly equal. *Florets of the ray* more than five. *Willd.*

Several species of Anthemis have been employed in medicine. *A. nobilis*, which is the subject of the present article, is by far the most important. *A. Cotula*, or May-weed, is also recognised by the U. S. Pharmacopœia. (See *Cotula.*) *A. Pyrethrum*, which affords the pellitory root, is among the officinal plants. (See *Pyrethrum.*) *A. arvensis*, a native of this country and of Europe, bears flowers which have an acrid bitter taste, and possess medical properties analogous though much inferior to those of common chamomile. They may be distinguished by their want of smell. *L. tinctoria* is occasionally employed as a tonic and vermifuge in Europe.

Anthemis nobilis. Willd. *Sp. Plant.* iii. 2180; Woodv. *Med. Bot.* p. 47, t. 19. This is an herbaceous plant with a perennial root. The stems are from six inches to a foot long, round, slender, downy, trailing, and divided into branches, which turn upwards at their extremities. The leaves are bipinnate, the leaflets small, thread-like, somewhat pubescent, acute, and generally divided into three segments. The flowers are solitary, with a yellow convex disk, and white rays. The calyx is common to all the florets, of a hemispherical form, and composed of several small imbricated hairy scales. The receptacle is convex, prominent, and furnished with rigid bristle-like *paleæ*. The florets of the ray are numerous, narrow, and terminated with three small teeth. The whole herb has a peculiar fragrant odour, and a bitter aromatic taste. The flowers only are officinal.

This plant is a native of Europe, and grows wild in all the temperate parts of that continent. It is also largely cultivated for medicinal purposes. In France, Germany, and Italy, it is generally known by the name of *Roman*

chamomile. By cultivation the yellow disk florets are often converted into the white ray florets. Thus altered, the flowers are said to be *double*, while those which remain unchanged are called *single;* but, as the conversion may be more or less complete, it generally happens that with each of the varieties there are intermingled some flowers of the other kind, or in different stages of the change. The double flowers are generally preferred; though, as the sensible properties are found in the greatest degree in the disk, the single are the most powerful. On this account, the latter were formerly exclusively directed by the London College, and still are so by the Edinburgh College. It is rather, however, in aromatic flavour than in bitterness, that the radial florets are surpassed by those of the disk. If not well and quickly dried, the flowers lose their beautiful white colour, and are less efficient. Those which are whitest should be preferred. The seeds yield by expression a fixed oil, which is said to be applied in Europe to various economical uses.*

Though not a native of America, chamomile grows wild in some parts of this country, and is occasionally cultivated in our gardens for family use, the whole herb being employed. The medicine, as found in our shops, consists chiefly of the double flowers, and is imported from Germany and England. From the former country are also occasionally imported, under the name of chamomile, the flowers of *Matricaria Chamomilla*, a plant belonging to the same family as Anthemis, and possessing similar properties. (See *Matricaria.*)

Properties. Chamomile flowers, as usually found in the shops, are large, almost spherical, of a dull-white colour, a fragrant odour, and a warmish, bitter, aromatic taste. When fresh, their smell is much stronger, and was fancied by the ancients to resemble that of the apple. Hence the name *chamæmelum* (χαμαι on the ground, and μηλόν an apple); and it is somewhat singular that the Spanish name *manzanilla* (a little apple) has a similar signification. The flowers impart their odour and taste to both water and alcohol, the former of which, at the boiling temperature, extracts nearly one-fourth of their weight. They contain a volatile oil, a bitter principle, resin, gum, a small quantity of tannin, and various salts. The first two are probably their active ingredients. (See *Oleum Anthemidis.*) A volatile acid, in minute proportion, has been obtained from them by Schendler, said greatly to resemble, if it be not identical with valerianic acid.

Medical Properties and Uses. Chamomile is a mild tonic, in small doses acceptable and corroborant to the stomach, in larger quantities capable of acting as an emetic. In cold infusion it is often advantageously used in cases of enfeebled digestion, whether occurring as an original affection, or consequent upon some acute disease. It is especially applicable to that condition of general debility, with languid appetite, which often attends conva-

* To those who may be disposed to cultivate the flowers for the shops, the following statements made by Mr. Jacob Bell, from observations at the flower gardens at Mitcham, in Surrey, England, may not be without interest. The plant is usually propagated by dividing the root, though the seeds are employed when it is desired to introduce new varieties. Each root will serve as the source of thirty or forty plants. They are set in rows a yard apart, at intervals of about eighteen inches. The proper period for planting is March; and the flowers are in perfection in July, but continue to appear throughout the season. Extremely wet or extremely dry weather is injurious to the crop. It is more productive in a rather heavy loam, than either in light sandy soil, or in stiff clay. It requires little manure, but attention to weeding is necessary. Over-manuring increases the leaves at the expense of the flowers. When gathered, the flowers are dried upon canvass trays in a drying room, artificially warmed, where they remain about a day. The crop varies from three to ten hundred weight per acre. The single flowers are more productive than the double by weight; but, as they command a less price, the value of the crop is about the same. (*Pharm. Journ. and Trans.*, x. 118.)—*Note to ninth edition.*

lescence from idiopathic fevers. As a febrifuge it has also acquired much reputation, having been employed with advantage in intermittents and remittents; but we have remedies so much more efficient in these affections, that it is now seldom if ever employed. The tepid infusion is very often given to promote the operation of emetic medicines, or to assist the stomach in relieving itself when oppressed by its contents. The flowers are sometimes applied externally, in the form of fomentation, in cases of irritation or inflammation of the abdominal viscera, and as a gentle incitant in flabby, ill-conditioned ulcers. The dose of the powder as a tonic is from half a drachm to a drachm three or four times a day, or more frequently, according to the end proposed. The infusion is usually preferred. The decoction and extract cannot exert the full influence of the medicine; as the volatile oil, upon which its virtues partly depend, is driven off at the boiling temperature.

Off. Prep. Extractum Anthemidis; Infusum Anthemidis; Oleum Anthemidis. W.

ANTIMONIUM.

Antimony.

Stibium, *Lat.;* Antimoine, *Fr.;* Antimon, Spiessglanz, *Germ.;* Antimonio, *Span., Ital.*

Metallic antimony, sometimes called *regulus of antimony*, is not officinal in the British or United States Pharmacopœias; but, as it enters into the composition of a number of important pharmaceutical preparations, we have thought it proper to notice it under a distinct head.

Antimony exists in nature, 1. uncombined; 2. as an oxide; 3. as a tersulphuret; and 4. as a sulphuretted oxide. It is found principally in France and Germany.

Extraction. All the antimony of commerce is extracted from the native tersulphuret. The ore is first separated from its gangue by fusion. It is then reduced to powder, and placed on the floor of a reverberatory furnace; where it is subjected to a gentle heat, being constantly stirred about with an iron rake. The heat should not be sufficient to cause fusion. This process of roasting is known to be completed, when the matter is brought to the state of a dull grayish-white powder, called *antimony ash.* By this treatment the antimony is partly teroxidized, and partly converted into antimonious acid; while nearly all the sulphur is dissipated in the form of sulphurous acid gas: a portion of tersulphuret, however, remains undecomposed. The matter is then mixed either with tartar, or with charcoal impregnated with a concentrated solution of carbonate of soda, and the mixture heated in crucibles, placed in a melting furnace. The charcoal reduces the teroxide of antimony, while the alkali unites with the undecomposed tersulphuret, and forms with it melted scoriæ, which cover the reduced metal, and diminish its loss by volatilization.

Antimony is imported into the United States principally from France, packed in casks. A portion is also shipped from Trieste, from Holland, and occasionally from Cadiz. The Spanish antimony is generally in the form of pigs; the French, in circular cakes of about ten inches in diameter, flat on one side and convex on the other; the English, in cones. The French is most esteemed.

Properties, &c. The time of the discovery of antimony is not known; but Basil Valentine was the first to describe the method of obtaining it, in his work entitled *Currus Triumphalis Antimonii*, published towards the end of the fifteenth century. It is a brittle, brilliant metal, ordinarily of a la-

mellated texture, of a silver-white colour when pure, but bluish-white as it occurs in commerce. When rubbed between the fingers, it imparts a sensible odour. Its equivalent number is 129, symbol Sb, sp. gr. 6·7, and fusing point 810°, or about a red heat. On cooling after fusion, it assumes an appearance on the surface bearing some resemblance to a fern leaf. When strongly heated, it burns with the emission of white vapours, consisting of teroxide, formerly called *argentine flowers of antimony*. A small portion being fused, and then thrown from a moderate height upon a flat surface, divides into numerous globules, which burn rapidly as they move along. It forms three combinations with oxygen; one oxide—teroxide of antimony, and two acids—antimonious and antimonic acids. The teroxide contains three, antimonious acid four, and antimonic acid five eqs. of oxygen, combined with one of the metal. In addition to these, a *suboxide* is said to exist, which, according to Marchand, has a composition represented by the formula, Sb_3O_4. It may be obtained by decomposing a solution of tartar emetic by a Grove's battery. The teroxide will be noticed under the head of *Antimonii Oxidum*. *Antimonic acid* is a lemon-coloured powder, which may be prepared by oxidizing the metal by digestion in nitric acid, and then driving off the excess of nitric acid by a heat not exceeding 600°. When exposed to a red heat, it parts with oxygen, and is converted into *antimonious acid*. This is a white powder, and, though medicinally inert, frequently forms a large proportion of the preparation called antimonial powder. (See *Pulvis Antimonialis*.)

Antimony is officinal in the following states of combination:—

I. Sulphuretted:—

Antimonii Sulphuretum, *U. S., Ed., Dub.;* Antimonii Tersulphuretum, *Lond.*

Antimonii Sulphuretum Præparatum, *Dub.*

Antimonii Sulphuretum Præcipitatum, *U. S., Dub.;* Antimonii Oxysulphuretum, *Lond.;* Antimonii Sulphuretum Aureum, *Ed.*

II. Oxidized:—

Teroxide. Antimonii Oxidum, *Ed.;* Antimonii Oxydum, *Dub.*

Teroxide combined with tartaric acid and potassa. Antimonii et Potassæ Tartras, *U. S.;* Antimonii Potassio-Tartras, *Lond.;* Antimonium Tartarizatum, *Ed., Dub.* *Dissolved in wine.* Vinum Antimonii, *U. S.;* Vinum Antimonii Potassio-Tartratis, *Lond.;* Vinum Antimoniale, *Ed.* *Dissolved in dilute alcohol.* Antimonii Tartarizati Liquor, *Dub.* *Mixed with lard.* Unguentum Antimonii, *U. S.;* Ung. Antimonii Potassio-Tartratis, *Lond.;* Ung. Antimoniale, *Ed.;* Ung. Antimonii Tartarizati, *Dub.*

Teroxide and antimonious acid, mixed with phosphate of lime. Pulvis Antimonialis, *Ed., Dub.;* Pulvis Antimonii Compositus, *Lond.*

III. Combined with Chlorine:—

Antimonii Terchloridi Liquor, *Dub.*

The antimonial preparations are active in proportion to their solubility in the gastric juice. According to Mialhe, all those antimonials which contain the hydrated teroxide, or are easily converted into it, are most active. Hence metallic antimony in fine powder, and tartar emetic act with energy. The teroxide is much more active when prepared in the moist than in the dry way. According to Serullas, all the antimonial preparations, except tartar emetic and butter or terchloride of antimony, contain a minute proportion of arsenic. Tartar emetic is an exception, because, according to this chemist, it separates entirely, in the act of crystallizing, from any minute portion of arsenic in the materials from which it is prepared; the poisonous metal being left behind in the mother-waters of the process. B.

ANTIMONII SULPHURETUM. *U. S., Ed., Dub.*

Sulphuret of Antimony.

Native tersulphuret of antimony, purified by fusion. *U. S.*

Off. Syn. ANTIMONII TERSULPHURETUM. *Lond.*

Artificial sulphuret of antimony; Antimoine sulfuré, *Fr.;* Schwefelantimon, Schwefelspiessglanz, *Germ.;* Solfuro d'antimonio, *Ital.;* Antimonio crudo, *Span.*

Preparation, &c. The sulphuret of antimony of the Pharmacopœias is obtained from the native sulphuret, technically called *antimony ore*, by different processes of purification; the following being an outline of that generally pursued. The ore is placed in melting pots in a circular reverberatory furnace, and these are made to connect, by means of curved earthen tubes, with the receiving pots, situated outside the furnace. This arrangement affords facilities for removing the residue of the operation, and allows of the collection of the melted sulphuret, without interrupting the fire, and, consequently, without loss of time or fuel.

Properties, &c. Sulphuret of antimony is mostly prepared in France and Germany. It is called in commerce, antimony, or *crude antimony*, and occurs in fused roundish masses, denominated loaves. These are dark-gray externally, and exhibit internally, when broken, a brilliant steel-gray colour, and a striated crystalline texture. Their goodness depends upon their compactness and weight, and the largeness and distinctness of the fibres. The quality of the sulphuret cannot well be judged of, except in mass; hence it ought never to be bought in powder. It is entirely soluble in muriatic acid, by the aid of heat, with the evolution of sulphuretted hydrogen. The muriatic solution, when added to water, is decomposed with the production of a white powder (*oxychloride of antimony*). If the muriatic acid should have dissolved some lead or copper, the filtered solution, after the precipitation of the white powder, will give a dark-coloured precipitate with sulphuretted hydrogen; but if these metals should be absent, it will yield, with the same test, an orange-coloured precipitate, derived from a small quantity of antimony, not thrown down by the water. Arsenic may be detected by the usual tests for that metal. (See *Acidum Arseniosum.*)

Composition. The officinal sulphuret of antimony is a tersulphuret, consisting of one eq. of antimony 129, and three of sulphur 48=177.

Sulphuret of antimony requires to be levigated in order to fit it for medicinal use. (See *Antimonii Sulphuretum Præparatum.*)

Off. Prep. Antimonii et Potassæ Tartras; Antimonii Oxidum; Antimonii Sulphuretum Præcipitatum; Antimonii Sulphuretum Præparatum; Pulvis Antimonialis. B.

APOCYNUM ANDROSÆMIFOLIUM. *U. S. Secondary.*

Dog's-bane.

The root of Apocynum androsæmifolium. *U. S.*

Apocynum. *Sex. Syst.* Pentandria Digynia. —*Nat. Ord.* Apocynaceæ.

Gen. Ch. Calyx very small, five-cleft, persistent. *Corolla* campanulate, half five-cleft, lobes revolute, furnished at the base with five dentoid glands alternating with the stamens. *Anthers* connivent, sagittate, cohering to the stigma by the middle. *Style* obsolete. *Stigma* thick and acute. *Follicles* long and linear. *Seed* comose. *Nuttall.*

Apocynum androsæmifolium. Willd. *Sp. Plant.* i. 1259; Bigelow, *Am.*

Med. Bot. ii. 148. Dog's-bane is an indigenous, perennial, herbaceous plant, from three to six feet in height, and abounding in a milky juice, which exudes when the plant is wounded. The stem is erect, smooth, simple below, branched above, usually red on the side exposed to the sun, and covered with a tough fibrous bark. The leaves are opposite, petiolate, ovate, acute, entire, smooth on both sides, and two or three inches long. The flowers are white, tinged with red, and grow in loose, nodding, terminal or axillary cymes. The peduncles have very small acute bractes. The tube of the corolla is longer than the calyx, and its border spreading. The fruit consists of a pair of long, linear, acute follicles, containing numerous imbricated seeds, attached to a central receptacle, and each furnished with a long seed-down.

The plant flourishes in all parts of the United States from Canada to the Carolinas. It is found along fences and the skirts of woods, and flowers in June and July. The root is the part employed.

This is large, and, like other parts of the plant, contains a milky juice. Its taste is unpleasant and intensely bitter. Bigelow inferred from his experiments that it contained bitter extractive, a red colouring matter soluble in water and not in alcohol, caoutchouc, and volatile oil.

Medical Properties. The powder of the recently dried root acts as an emetic in the dose of thirty grains; and is said to be sometimes employed by practitioners in the country for this purpose. By Dr. Zollickoffer it is considered a useful tonic, in doses of from ten to twenty grains. Dr. Bigelow states that its activity is diminished, and eventually destroyed by keeping. It is among the remedies employed by the Indians in lues venerea. W.

APOCYNUM CANNABINUM. *U. S. Secondary.*

Indian Hemp.

The root of Apocynum cannabinum. *U. S.*

Apocynum. See APOCYNUM ANDROSÆMIFOLIUM.

Apocynum cannabinum. Willd. *Sp. Plant.* i. 1259; Knapp, *Am. Med. Rev.* iii. 197. In general appearance and character, this species bears a close resemblance to the preceding. The stems are herbaceous, erect, branching, of a brown colour, and two or three feet in height; the leaves are opposite, oblong-ovate, acute at both ends, and somewhat downy beneath; the cymes are paniculate, many-flowered, and pubescent; the corolla is small and greenish, with a tube not longer than the calyx, and an erect border; the internal parts of the flower are pinkish or purple. The plant grows in similar situations with *A. androsæmifolium*, flowers about the same period, and bears a similar fruit. It abounds in a milky juice, and has a tough fibrous bark, which, by maceration, affords a substitute for hemp. From this circumstance its common name was derived.

The root, which is the officinal part, is horizontal, five or six feet in length, about one-third of an inch thick, dividing near the end into branches which terminate abruptly, of a yellowish-brown colour when young, but dark-chestnut when old, of a strong odour, and a nauseous, somewhat acrid, permanently bitter taste. The internal or ligneous portion is yellowish-white, and less bitter than the exterior or cortical part. The fresh root, when wounded, emits a milky juice, which concretes into a substance resembling caoutchouc. In the dried state, it is brittle and readily pulverized, affording a powder like that of ipecacuanha. Dr. Knapp found it to contain a bitter principle, extractive, tannin, gallic acid, resin, wax, caoutchouc, fecula, lignin, and a peculiar active principle which he proposed to call *apocynin*. (*Am. Med. Review*, iii. 197.) Dr. Griscom, by a subsequent analysis, obtained similar

results, with the addition of gum. The root yields its virtues to water and alcohol, but, according to Dr. Griscom, most readily to the former.

Medical Properties and Uses.—Indian hemp is powerfully emetic and cathartic, sometimes diuretic, and, like other emetic substances, promotes diaphoresis and expectoration. It produces much nausea, diminishes the frequency of the pulse, and appears to induce drowsiness independently of the exhaustion consequent upon vomiting. The disease in which it has been found most beneficial is dropsy. An aggravated case of ascites, under the care of the late Dr. Joseph Parrish, was completely cured by the decoction of the plant, which acted as a powerful hydragogue cathartic. Dr. Knapp also found it useful in a case of dropsy. Other instances of its efficacy in this complaint have been published by Dr. Griscom of New York. (*Am. Journ. of Med. Sciences*, xii. 55.) From fifteen to thirty grains of the powdered root will generally produce copious vomiting and purging. The decoction is a more convenient form for administration. It may be prepared by boiling half an ounce of the dried root in a pint and a half of water to a pint, of which from one to two fluidounces may be given two or three times a day, or more frequently if requisite. The watery extract, in doses of three or four grains three times a day, will generally act on the bowels. W.

AQUA. *U. S., Ed.*

Water.

Natural water in the purest attainable state. *U. S.* Spring water. *Ed.*

Off. Syn. AQUA FONTANA. *Spring Water. Dub.*

Ὕδωρ, *Gr.;* Eau, *Fr.;* Wasser, *Germ.;* Acqua, *Ital.;* Agua, *Span.*

Water has always been included, as an officinal, in the United States Pharmacopœia, on account of its great importance as a medical and pharmaceutical agent. It was not admitted into the officinal lists of the British Pharmacopœias until the year 1839, when it was first recognised by the Edinburgh College. Since then it has been made officinal by the Dublin College, in its revised Pharmacopœia of 1850. It is more or less concerned in almost all the changes which take place in inorganic matter, and is essential to the growth and existence of living beings, whether animal or vegetable. In treating of a substance of such diversified agency, our limits will allow only of a sketch of its properties and modifications. We shall speak of it under the several heads of *pure water*, *common water*, and *mineral waters*.

Pure Water. Water, in a pure state, is a transparent liquid, without colour, taste, or smell. Its sp. gr. is assumed to be unity, and forms the term of comparison for that of all solids and liquids. A cubic inch of it, at the temp. of 60°, weighs very nearly 252·5 grains. It is compressible to a small extent, as was proved first by Canton, and afterwards, in an incontestable manner, by Perkins. Reduced in temp. to 32°, it becomes a solid or ice; and raised to 212°, an elastic fluid called steam. In the state of steam its bulk is increased nearly 1700 fold, and its sp. gr. so far diminished as not to be much more than half that of atmospheric air. At the temp. of 39° its density is at the maximum; and consequently, setting out from that point, it is increased in bulk by being either heated or cooled. It has the power of dissolving more or less of all the gases, including common air, the constituents of which are always present in natural water. It is uniformly present in the atmosphere, in the form of an invisible vapour, even in the driest weather.

Water consists of one equivalent of hydrogen 1, and one of oxygen 8=9; or, in volumes, of one volume of hydrogen and half a volume of oxygen, condensed into one volume of aqueous vapour or steam. On these data, it is

easy to calculate the sp. gr. of steam; for its density will be 0·0689 (sp. gr. of hydrogen) + 0·5512 (half the sp. gr. of oxygen) = 0·6201.

Common Water. From the extensive solvent powers of water, it is obvious that, in its natural state, it must be more or less contaminated with foreign matter. This is found to be the case; and, according to the nature of the strata through which it percolates, it becomes variously impregnated. When the foreign substances present are in so small an amount as not materially to alter its taste and other sensible qualities, it constitutes the different varieties of *common water*.

Common water possesses almost innumerable shades of difference, as obtained from different localities and sources, but all its varieties may be conveniently arranged under the two heads of soft and hard. A *soft water* is one which contains but inconsiderable impurities, and which, when used in washing, forms a lather with soap. By a *hard water* is understood a variety of water which contains one or more salts of lime, and, therefore, curdles soap, and is unfit for domestic purposes. Tincture of soap is a convenient and useful test for ascertaining the quality of water. In distilled water it produces no effect; in soft water, only a slight opalescence; and in hard water, a milky appearance. This latter appearance is due to the formation of an insoluble compound between the oily acids of the soap, and the lime of the calcareous salt.

The most usual foreign substances in common water, besides oxygen and nitrogen, and matters held in a state of mechanical suspension, are carbonic acid, sulphate and carbonate of lime, and chloride of sodium (common salt). Carbonic acid is detected by lime-water, which produces a precipitate before the water is boiled, but not afterwards, as ebullition drives off this acid. The presence of sulphate of lime is shown by precipitates being produced by nitrate of baryta, and, after ebullition, by oxalate of ammonia. The first test shows the presence of sulphuric acid, and the latter indicates lime not held in solution by carbonic acid. Carbonate of lime, when held in solution by an excess of carbonic acid, may be detected by boiling the water, which causes it to precipitate; but, even after ebullition and filtration, the water will retain enough carbonate of lime to give a precipitate with acetate of lead, according to the experiments of Prof. Connell, of St. Andrews. This result arises from the fact that carbonate of lime is to a minute extent soluble in water. Nitrate of silver will produce a precipitate, if any soluble chloride be present; and, ordinarily, the particular one present may be assumed to be common salt.

It is generally supposed that the oxygen and nitrogen present in natural waters are in the same proportion as in atmospheric air; but for the most part the oxygen is in larger proportion. In atmospheric air, the oxygen amounts to about 20 per cent. in volume; but the usual gaseous mixture, expelled from fresh water by boiling, contains about 32 per cent. of this gas.

Common water is also divided into varieties according to its source. Thus we have rain, snow, spring, river, well, lake, and marsh water.

Rain and *snow waters* are the purest kinds of natural water, being, in effect, produced by a natural distillation. Rain water, to be obtained as pure as possible, must be collected in large vessels in the open fields, at a distance from houses, and some time after the rain has commenced falling; otherwise it will be contaminated with the dust which floats in the atmosphere, and other impurities derived from roofs. The rain water of large cities contains nitrogenized organic matter, as shown by the odour produced by burning the residue, left when the water is evaporated to dryness.

Rain water ordinarily contains atmospheric air; and, according to Liebig, a little nitric acid, if it descended during a storm. According to an analysis, made by M. Martin, of rain water which fell at Marseilles during a violent

storm, 1000 parts by weight contained 0·004 parts of chlorine, and 0·003 parts of ammonia. Not a trace of iodine or of nitric acid was discovered. (*Chem. Gaz.*, Nov. 1853.) Snow water has a peculiar taste, which was formerly supposed to depend on the presence of air more oxygenous than that of the atmosphere; but in point of fact, when newly melted, it contains no air, and this accounts for its vapid taste. Both rain and snow water are sufficiently pure for employment in most chemical operations.

Spring water (aqua fontana) depends entirely for its quality on the strata through which it flows; being purest when it passes through sand or gravel. It almost always contains a trace of common salt, and generally other impurities, which vary according to the locality of the spring.

River water (aqua fluvialis), generally speaking, is less impregnated with saline matter than spring water, from its being made up in considerable part of rains, and from its volume bearing so large a proportion to the surface of its bed. On the other hand, it is much more apt to have mechanically suspended in it certain insoluble matters, of a vegetable and earthy nature, which impair its transparency.

Well water, like that from springs, is liable to contain various impurities. As a general rule, the purity of the water of a well will be in proportion to its depth, and the constancy with which it is used. Well water in large cities always contains nitrates. (*Dr. R. A. Smith.*) They arise from the rapid oxidation of nitrogenized organic matter, filtering through the soil. The presence of nitrates in water prevents the formation of any vegetable matter, which cannot be detected by the microscope, even after it has been long kept. *Artesian* or *overflowing wells*, on account of their great depth, generally afford a pure water.

Lake water cannot be characterized as having any invariable qualities. In most of the lakes in the United States, it is a pure and wholesome water.

Marsh water is generally stagnant, and contains vegetable remains undergoing decomposition. It is an unwholesome water, and ought never to be used for medicinal purposes.

Common waters are apt to contain organic matter in solution, of the nature of *ulmin* or *gein*. In order to ascertain whether its amount exceeds the minute quantity usually present in good water, Dupasquier has proposed chloride of gold as a test. From one to two fluidounces of the water to be tested, is put into a small flask, and a few drops of solution of chloride of gold, free from excess of muriatic acid, are added, so as to give the water a slight yellow tint. The liquid is then boiled. If the water contain the ordinary proportion of organic matter, the yellow tint remains unchanged; but if its quantity be greater than this, the liquid at first becomes brownish, and afterwards violet or bluish, in consequence of the reduction of the gold.

The term *Aqua*, in the U. S. Pharmacopœia, may be considered as designating any natural water of good quality. In the Edinburgh Pharmacopœia it means spring water, "so far at least free of saline matter as not to possess the quality of hardness, or contain above a 6000th of solid matter." A good water may be known by its being limpid and without smell. It answers well for the cooking of vegetables, and does not curdle soap. Upon the addition of nitrate of baryta, nitrate of silver, or oxalate of ammonia, its transparency is but slightly affected; and, upon being evaporated to dryness, it leaves but an inconsiderable residue.

Water should never be kept in leaden cisterns, on account of the risk of its dissolving a small portion of lead. This risk is greater in proportion to the softness and purity of the water; for it is found that the presence of a minute proportion of saline matter, as for example of a chloride or sulphate, protects the water from the slightest metallic impregnation. Mr. R. Phil-

lips, jun., attributes the preservative power to sulphate of lime, and not to a chloride, which would give rise to chloride of lead, which is slightly soluble. The protection is afforded by an insoluble film on the surface of the lead, formed by the decomposition of the saline matter.

The *Schuylkill water*, introduced into Philadelphia, possesses all the characteristics of a good water, except that it is occasionally turbid after heavy rains. It contains, on an average, in a wine gallon, according to an analysis by Prof. M. H. Boyè, of Philadelphia, 4·42 grains of foreign matter, nearly one-half of which is carbonate of lime. It is perfectly free from lead, even after standing in leaden pipes for thirty-six hours. (*Prof. E. N. Horsford.*) The Croton water of New York is also a good water. A brackish or hard water ought never to be employed in compounding prescriptions. For some pharmaceutical processes, however, no natural water is sufficiently pure; and hence the necessity of resorting to distilled water. (See *Aqua Destillata.*)

Matters, mechanically suspended in a natural water, may be removed by filtration through sand. On a large scale they may be separated by causing the water to percolate a bed of gravel and sand. Rest, causing subsidence, effects the same purpose, but in a less perfect manner, and requires time.

Mineral Waters. When natural waters are so far impregnated with foreign substances as to have a decided taste and a peculiar operation on the economy, they are called *mineral waters.* These are conveniently arranged under the four heads of *carbonated*, *sulphuretted*, *chalybeate*, and *saline.*

1. *Carbonated waters* are characterized by containing an excess of carbonic acid, which gives them a sparkling appearance, and the power of reddening litmus paper. These waters frequently contain the carbonates of lime, magnesia, and iron, which are held in solution by the excess of carbonic acid. The waters of Seltzer, Spa, and Pyrmont in Europe, and of the sweet springs in Virginia, belong to this class.

2. *Sulphuretted waters* are such as contain sulphuretted hydrogen, and are distinguished by the peculiar fetid smell of that gas, and by yielding a brown precipitate with the salts of lead or silver. Examples of this kind are the waters of Aix La Chapelle and Harrowgate in Europe, and those of the white, red, and salt sulphur springs in Virginia.

3. *Chalybeate waters* are characterized by a strong inky taste, and by striking a black colour with the infusion of galls, and a blue one with ferrocyanuret of potassium. The iron is generally in the state of carbonate of the protoxide, held in solution by excess of carbonic acid. By standing, the carbonic acid is given off, and the protoxide, by absorbing oxygen, is precipitated as a hydrated sesquioxide of an ochreous colour. The principal chalybeate waters are those of Tunbridge and Brighton in England, of Wies-baden in Germany, and of Bedford, Pittsburg, and Brandywine in the United States. The sediments of many of the chalybeate springs of Germany have been ascertained by Walchner to contain both arsenic and copper in minute quantities. These results have been confirmed by Dr. H. Will, who finds in some of these springs a minute proportion of tin, lead, and antimony, in addition to the arsenic and copper. In three springs Will found the ratio of the sesquioxide of iron to the other metals to be, on an average, as 48 to 1. According to M. Lassaigne, these arseniferous sediments exert no poisonous action on the inferior animals, a result which he attributes to the antidotal power of the iron.

4. *Saline waters* are those, the predominant properties of which depend upon saline impregnation. The salts most usually present are the sulphates and carbonates of soda, lime, and magnesia, and the chlorides of sodium, calcium, and magnesium. Potassa is occasionally present, and lithia has been detected by Berzelius in the spring of Carlsbad, in Germany. Bromine ex-

ists in considerable quantity in the saline at Theodorshalle, in Germany, as also in the salt springs of western Pennsylvania. The mineral springs at Saratoga, in the State of New York, contain a small proportion of iodine and bromine. The principal saline waters are those of Seidlitz in Bohemia, Cheltenham and Bath in England, and Harrodsburg and Saratoga in the United States. To these may be added, a most important saline water, that of the ocean.

We subjoin a summary view of the composition of most of the mineral waters enumerated under the foregoing heads.

1. CARBONATED. *Seltzer.* In a wine pint. Carbonic acid 17 cubic inches. *Solid contents;*—carbonate of soda 4 grs.; carbonate of magnesia 5; carbonate of lime 3; chloride of sodium 17. Total 29 grs. (*Bergmann.*)

Spa. In a wine pint. Carbonic acid 13 cubic inches. *Solid contents;*—carbonate of soda 1·5 grs.; carbonate of magnesia 4·5; carbonate of lime 1·5; chloride of sodium 0·2; oxide of iron 0·6. Total 8·3 grains. (*Bergmann.*)

Pyrmont. In a wine pint. Carbonic acid 26 cubic inches. *Solid contents;*—carbonate of magnesia 10 grs.; carbonate of lime 4·5; sulphate of magnesia 5·5; sulphate of lime 8·5; chloride of sodium 1·5; oxide of iron 0·6. Total 30·6 grs. (*Bergmann.*)

2. SULPHURETTED. *Aix la Chapelle.* In a wine pint. Sulphuretted hydrogen 5·5 cubic inches. *Solid contents;*—carbonate of soda 12 grs.; carbonate of lime 4·75; chloride of sodium 5. Total 21·75 grs. (*Bergmann.*)

Harrowgate old well. In a wine gallon. *Gaseous contents;*—sulphuretted hydrogen 14 cubic inches; carbonic acid 4·25; nitrogen 8; carburetted hydrogen 4·15. Total 30·4 cubic inches. *Solid contents;*—chloride of sodium 752 grs.; chloride of calcium 65·75; chloride of magnesium 29·2; bicarbonate of soda 12·8. Total 859·75 grs. (*English West. Quart. Journ.*)

White sulphur. Gaseous contents in a wine gallon;—sulphuretted hydrogen 2·5 cubic inches; carbonic acid 2; oxygen 1·448; nitrogen 3·552. Total 9·5. *Solid contents* in a pint;—sulphate of magnesia 5·588 grs.; sulphate of lime 7·744; carbonate of lime 1·150; chloride of calcium 0·204; chloride of sodium 0·180; oxide of iron a trace; loss 0·410. Total 15·276 grs. (*Prof. William B. Rogers.*)

3. CHALYBEATE. *Tunbridge.* In a wine gallon. *Solid contents;*—chloride of sodium 2·46 grs.; chloride of calcium 0·39; chloride of magnesium 0·29; sulphate of lime 1·41; carbonate of lime 0·27; oxide of iron 2·22; traces of manganese, vegetable fibre, silica, &c. 0·44; loss 0·13. Total 7·61 grs. (*Scudamore.*)

Brighton. In a wine pint. Carbonic acid 2·5 cubic inches. *Solid contents;*—sulphate of iron 1·80 grs.; sulphate of lime 4·09; chloride of sodium 1·53; chloride of magnesium 0·75; silica 0·14; loss 0·19. Total 8·5 grs. (*Marcet.*)

Cheltenham (*chalybeate*). In a wine pint. *Gaseous contents;*—carbonic acid 2·5 cubic inches. *Solid contents;*—carbonate of soda 0·5 grs.; sulphate of soda 22·7; sulphate of magnesia 6; sulphate of lime 2·5; chloride of sodium 41·3; oxide of iron 0·8. Total 73·8 grs. (*Brande and Parkes.*)

Bedford. In a wine pint. Carbonic acid not estimated. *Solid contents;*—carbonate of lime 2·120 grs.; sulphate of lime 11·274; sulphate of magnesia 3·974; sulphates of alumina and sesquioxide of iron 1·280; sulphate of soda 3·092; chloride of sodium 0·343; free sulphuric acid [?] 0·128; silica and organic matter a trace. Total 22·211 grs. (*J. Cheston Morris.* Medical Examiner, June, 1852.)

Rockbridge alum spring. In a wine gallon. Carbonic acid 7·536 grs. *Solid contents;*—sulphate of potassa 1·765 grs.; sulphate of lime 3·263; sulphate of magnesia 1·763; protoxide of iron 4·863; alumina 17·905; crenate of ammonia 0·700; chloride of sodium 1·008; silica 2·840; free sul-

phuric acid 15·224. Total 49·331. (*Dr. Hayes.*) In this analysis a free acid and free bases are made to coexist.

4. SALINE. *Seidlitz.* In a wine pint. *Solid contents;*—carbonate of magnesia 2·5 grs.; carbonate of lime 0·8; sulphate of magnesia 180; sulphate of lime 5; chloride of magnesium 4·5. Total 192·8 grs. (*Bergmann.*)

Cheltenham (pure saline). In a wine pint. *Solid contents;*—sulphate of soda 15 grs.; sulphate of magnesia 11; sulphate of lime 4·5; chloride of sodium 50. Total 80·5 grs. (*Parkes and Brande.*)

Bath. King's well. Sp. gr. 1·0025; temp. 115°. In an Imperial gallon. *Solid contents;*—carbonate of lime 8·820 grs.; carbonate of magnesia 0·329; carbonate of iron 1·064; sulphate of lime 80·052; sulphate of potassa 4·641; sulphate of soda 19·229; chloride of sodium 12·642; chloride of magnesium 14·581; silica 2·982; with traces of iodine and oxide of manganese. Total 144·34 grs. (*Merck and Galloway*, Chem. Gaz. for 1846, p. 496.)

Balston Spa. Sans Souci spring. In a wine gallon. *Solid contents;*—chloride of sodium 143·733 grs.; bicarbonate of soda 12·66; bicarbonate of magnesia 39·1; carbonate of lime 43·407; carbonate of iron 5·95; iodide of sodium 1·3; silica 1. Total 247·15 grs. (*Steel.*)

Saratoga. Iodine spring. In a wine gallon. *Gaseous contents;*—carbonic acid 336 cubic inches; atmospheric air 4. Total 340 cubic inches. *Solid contents;*—chloride of sodium 187 grs.; carbonate of magnesia 75; carbonate of lime 26; carbonate of soda 2; carbonate of iron 1; iodine 3·5. Total 294·5 grs. (*Prof. Emmons.*)

Saratoga. Pavilion spring. In a wine gallon. *Gaseous contents;*—carbonic acid 359·05 cubic inches; atmospheric air 5·03. Total 364·08 cubic inches. *Solid contents;*—chloride of sodium 187·68 grs.; carbonate of soda 4·92; carbonate of lime 52·84; carbonate of magnesia 56·92; carbonate of iron 3·51; sulphate of soda 1·48; iodide of sodium 2·59; alumina 0·42; silica 1·16; phosphate of lime 0·19; bromide of potassium a trace. Total 311·71 grs. (*Dr. J. R. Chilton.*)

Saratoga. Union spring. In a wine gallon. *Gaseous contents;*—carbonic acid 314·16 cubic inches; atmospheric air 4·62. Total 318·78 cubic inches. *Solid contents;*—chloride of sodium 243·620 grs.; carbonate of magnesia 84·265; carbonate of lime 41·600; carbonate of soda 12·800; carbonate of iron 5·452; iodide of sodium, or iodine 3·600; silica and alumina 1·570; bromide of potassium a trace. Total 392·907 grs. (*Dr. J. R. Chilton.*)

Saratoga. Congress spring. Gaseous contents in 100 cubic inches;—carbonic acid 114 cubic inches. *Solid contents* in a pound Troy;—chloride of ammonium 0 0326 grs.; chloride of potassium 1·6256; chloride of sodium 19·6653; iodide of sodium 0·0046; bromide of sodium 0·1613; carbonate of soda 0·8261; carbonate of lime 5·8531; carbonate of magnesia 4·1155; carbonate of strontia 0·0672; carbonate of protoxide of iron 0·0173; carbonate of protoxide of manganese 0·0202; sulphate of potassa 0·1379; nitrate of magnesia 0·1004; alumina 0·0069; silica 0·1112. Total 32·7452 grs. (*Schweitzer.*)

Sea Water. English Channel. In a thousand grains. Water 964·744 grs.; chloride of sodium 27·059; chloride of potassium 0·765; chloride of magnesium 3·667; bromide of magnesium 0·029; sulphate of magnesia 2·296; sulphate of lime 1·407; carbonate of lime 0·033. Total 1000·000 grs. (*Schweitzer.*) The proportion of chloride of sodium is from 36 to 37 parts in 1000 in the ocean, at a distance from land. Its amount is small in the interior of the Baltic. It is perceived that bromine is present in very minute amount. 100 pounds of sea water yield only 3½ grains of this element. According to Balard, iodine exists in the water of the Mediterranean; but it

has not been detected in the water of the ocean, the bromine being supposed to mask its presence. Besides these ingredients, others are alleged to exist in minute proportion in sea water; as fluorine by Dr. G. Wilson; lead, copper, and silver, by MM. Malaguti, Durocher, and Sarzeau; and iron and manganese by M. Uziglio. These results, except in regard to fluorine, are doubtful, and should be confirmed before being admitted. Anterior to Wilson's researches, Mr. Middleton and Prof. Silliman, Jun. had inferred the existence of fluorine in sea water, from its presence in marine animals. The lead and copper, mentioned above, were found in certain fuci only; the silver, in the sea water itself. Schweitzer's analysis gives a small proportion of carbonate of lime; but Bibra could not detect any. Dr. John Davy's examinations of sea water go to show that carbonate of lime does not exist at a great distance from land, except in very minute proportion; but becomes quite evident in water, taken at a distance of from fifty to a hundred miles from coasts.

Sea water, filtered, and charged with five times its volume of carbonic acid, forms, according to Pasquier, a gentle purgative, which keeps very well, and is not disagreeable to take. The dose is from half a pint to a pint.

Medical and Dietetic Properties of Water. Water is a remedy of great importance. When taken into the stomach, it acts by its temperature, by its bulk, and by being absorbed. When of the temperature of about 60°, it gives no positive sensation either of heat or cold; between 60° and 45°, it creates a cool sensation; and below 45°, a decidedly cold one. Between 60° and 100°, it relaxes the fibres of the stomach, and is apt to produce nausea, particularly if the effect of bulk be added to that of temperature. By its bulk and solvent powers, it often allays irritation by diluting the acrid contents of the stomach and bowels, and favouring their final expulsion; and by its absorption, it promotes the secretion of urine and cutaneous transpiration. Indeed, its influence is so great in the latter way, that it may be safely affirmed, that sudorifics and diuretics will not produce their proper effect, unless assisted by copious dilution.

Water externally applied as a bath, is also an important remedy. It may act by its own specific effect as a liquid, or as a means of modifying the heat of the body. It acts in the latter way differently, according to the particular temperature at which it may be applied. When this is above 97°, it constitutes either the vapour or hot bath; when between 97° and 85°, the warm bath; between 85° and 65°, the tepid bath; and between 65° and 32°, the cold bath.

The general action of the *vapour bath* is to accelerate the circulation, and produce profuse sweating. It acts locally on the skin by softening and relaxing its texture. In stiffness of the joints, and various diseases of the skin, it has often proved beneficial.

The *hot bath*, like the vapour bath, is decidedly stimulant. By its use the pulse becomes full and frequent, the veins turgid, the face flushed, the skin red, and the respiration quickened. If the temperature be high, and the constitution peculiar, its use is not without danger; as it is apt to produce a feeling of suffocation, violent throbbing in the temples, and vertigo with tendency to apoplexy. When it acts favourably, it produces profuse perspiration.

The *warm bath*, though below the animal heat, nevertheless produces a sensation of warmth; as its temperature is above that of the surface. It diminishes the frequency of the pulse, renders the respiration slower, lessens the heat of the body, and relaxes the skin. The warm bath cannot be deemed, strictly speaking, a stimulant. By relieving certain diseased actions and states, accompanied by morbid irritability, it often acts as a soothing

remedy, producing a disposition to sleep. It is proper in febrile and exanthematous diseases, in which the pulse is frequent, and the skin preternaturally hot and dry, and where the general condition is characterized by restlessness. It is contra-indicated in diseases of the head and chest.

The *tepid bath* is not calculated to have much modifying influence on the heat of the body. Its peculiar effects are to soften and cleanse the skin, and promote insensible perspiration.

The *cold bath* acts differently according to its temperature and manner of application, and the condition of the system to which it is applied. When of low temperature and suddenly applied, it acts primarily as a stimulant, by the sudden and rapid manner in which the caloric is abstracted; next as a tonic, by condensing the living fibres; and, finally, as a sedative. It is often useful in diseases of relaxation and debility, when practised by affusion or plunging. But it is essential to its efficacy and safety, that the stock of vitality should be sufficient to create, immediately after its use, those general sensations of warmth and invigoration included under the term reaction. It was used with advantage by the late Dr. Currie, of Liverpool, in the form of affusion, in certain febrile diseases, especially typhus and scarlatina. To make it safe, the heat must be steadily above the natural standard, and the patient must be free from all sense of chilliness, and not in a state of profuse perspiration.

Cold water is frequently applied as a sedative in local inflammations, and as a means of restraining hemorrhage. Its use, however, is inadmissible in inflammations of the chest.

Pharm. Uses. Water is employed in a vast number of preparations, either as a menstruum, or as a means of promoting chemical action by its solvent power.

Off. Prep. Aqua Destillata. B.

ARALIA NUDICAULIS. *U. S. Secondary.*

False Sarsaparilla.

The root of Aralia nudicaulis. *U. S.*

Aralia. *Sex. Syst.* Pentandria Pentagynia.—*Nat. Ord.* Araliaceæ.

Gen. Ch. Flowers umbelled. *Calyx* five-toothed, superior. *Petals* five. *Stigma* sessile, subglobose. *Berry* five-celled, five-seeded. *Torrey.*

Aralia nudicaulis. Willd. *Sp. Plant.* i. 1521; Rafinesque, *Med. Flor.* i. 53. The *false sarsaparilla, wild sarsaparilla,* or *small spikenard,* as this plant is variously called, is an indigenous perennial, with one leaf and one flower-stem, springing together from the root, or from a very short stalk, and seldom rising two feet in height. The leaf, which stands upon a long footstalk, is twice ternate, or once and quinate, with oblong-oval, acuminate leaflets, rounded at the base, serrate on the margin, and smooth on both surfaces. The scape or flower-stem is naked, shorter than the leaf, and terminated by three small umbels, each consisting of from twelve to thirty small yellowish or greenish flowers. The fruit consists of small round berries, about as large as those of the common elder. The plant grows throughout the United States, from Canada to the Carolinas, inhabiting shady and rocky woods, and delighting in a rich soil. It flowers in May and June.

The root, which is the officinal portion, is horizontal, creeping, sometimes several feet in length, about as thick as the little finger, more or less twisted, externally of a yellowish-brown colour, of a fragrant odour, and a warm, aromatic, sweetish taste. It has not been analyzed.

Medical Properties and Uses. False sarsaparilla is a gentle stimulant and diaphoretic, and is thought to have an alterative influence analogous to that of the root from which it derived its name. It is used in domestic practice, and by some practitioners in the country, in rheumatic, syphilitic, and cutaneous affections, in the same manner and dose as genuine sarsaparilla. A strong decoction has proved useful as a stimulant to old ulcers.

The root of *Aralia racemosa*, or *American spikenard*, though not officinal, is used for the same purposes as A. nudicaulis, which it is said to resemble in medical properties. Dr. Peck strongly recommends the root of *Aralia hispida*, called in Massachusetts *dwarf elder*, as a diuretic in dropsy. He uses it in the form of decoction, and finds it pleasanter to the taste and more acceptable to the stomach than most other medicines of the same class. (*Am. Journ. of Med. Sci.*, xix. 117.) W.

ARALIA SPINOSA. *U. S. Secondary.*

Angelica-tree Bark.

The bark of Aralia spinosa. *U. S.*

ARALIA. See ARALIA NUDICAULIS.

Aralia spinosa. Willd. *Sp. Plant.* i. 1520. This is an indigenous arborescent shrub, variously called *angelica-tree*, *toothache-tree*, and *prickly ash.* The last name, however, should be dropped; as it belongs properly to *Xanthoxylum fraxineum*, and if retained might lead to confusion. The stem is erect, simple, from eight to twelve feet high, armed with numerous prickles, and furnished near the top with very large bipinnate or tripinnate leaves, which are also prickly, and are composed of oval, pointed, slightly serrate leaflets. It terminates in an ample panicle, very much branched, and bearing numerous small hemispherical umbels, in each of which are about thirty white flowers.

This species of Aralia is found most abundantly and of the largest growth in the Southern States, where it is said sometimes to attain a height of from thirty to sixty feet. It grows also in the Western States, and as far north as New York. It is sometimes cultivated in the gardens of the north as a curious or ornamental plant. It flourishes in low, fertile woods, and flowers in August and September. The bark, root, and berries are medicinal; but the first only is directed by the Pharmacopœia.

The bark, as in the shops, is usually in small quills or half-quills, from two or three lines to half an inch in diameter, thin, fibrous, grayish externally, and armed with prickles or the remains of them, yellowish within, of an odour somewhat aromatic, and a bitterish taste, which becomes slightly acrid on chewing, and leaves a lasting sense of pungency upon the tongue. It yields its virtues to boiling water.

Medical Properties and Uses. The virtues of *Aralia spinosa* are those of a stimulant diaphoretic. According to Elliot, an infusion of the recent bark of the root is emetic and cathartic. The remedy is used in chronic rheumatism and cutaneous eruptions; and in some parts of the South has been employed in syphilis. Pursh states that a vinous or spirituous infusion of the berries is remarkable for relieving rheumatic pains; and a similar tincture is said to be employed in Virginia with advantage in violent colic. The pungency of this tincture has also been found useful in relieving toothache. The bark is most conveniently administered in decoction. W.

ARGENTUM. *U. S., Lond., Ed.*

Silver.

Off. Syn. ARGENTUM PURIFICATUM. *Refined Silver. Dub.*
Argent, *Fr.;* Silber, *Germ.;* Argento, *Ital.;* Plata, *Span.*

Silver is occasionally found in the metallic state, sometimes crystallized or in the form of vegetations, at other times combined with gold, antimony, arsenic, or mercury; but more usually it occurs in the state of sulphuret, either pure, or mixed with other sulphurets, as those of copper, lead, and antimony. It is sometimes found as a chloride.

The most productive mines of silver are found on this continent, being those of Mexico and Peru; the richest in Europe are those of Norway, Hungary, and Transylvania. The principal ore which is worked is the sulphuret. The mineral containing silver which is most disseminated, is argentiferous galena, which is a sulphuret of lead, containing a little sulphuret of silver. Argentiferous galena exists in several localities in the United States. A mine of silver was opened about the year 1841, in Davidson County, North Carolina. The ore is an argentiferous carbonate of lead, yielding about one-third of its weight of lead, from which from 100 to 400 ounces of silver are extracted per ton. (*Eckfeldt and Du Bois, Manual of Coins.*)

Extraction. Silver is extracted from its ores by two principal processes, *amalgamation* and *cupellation*. At Freyberg, in Saxony, the ore, which is principally the sulphuret, is mixed with a tenth of chloride of sodium (common salt), and roasted in a reverberatory furnace. The sulphur becomes acidified, and combines with sodium and oxygen, so as to form sulphate of soda, while the chlorine forms a chloride with the silver. The roasted mass is then reduced to very fine powder, mixed with half its weight of mercury, one-third of its weight of water, and about a seventeenth of iron in flat pieces, and subjected, for sixteen or eighteen hours, to constant agitation in barrels turned by machinery. The chlorine combines with the iron, and remains in solution as chloride of iron, while the silver forms an amalgam with the mercury. The amalgam is then subjected to pressure in leathern bags, through the pores of which the excess of mercury passes, a solid amalgam being left behind. This is then subjected to heat in a distillatory apparatus, by means of which the mercury is separated from the silver, which remains behind in the form of a porous mass. In Peru and Mexico the process is somewhat similar to the above, common salt and mercury being used; but slaked lime and sulphuret of iron are also employed, with an effect which is not very obvious.

When argentiferous galenas are worked for the silver they contain, they are first reduced, and the argentiferous lead obtained is fused on a large shallow *cupel* called a test, and exposed to the blast of a bellows, whereby the lead is oxidized, half vitrified, and driven off the test in scales, forming the substance called *litharge*. But, the operation being continued, the whole of the lead is separated, and the silver, not being oxidizable, remains behind as a brilliant fused mass. The time required for the separation is much abridged by the process of Mr. Pattinson, of Newcastle, England. This consists in allowing the melted alloy to cool slowly, and separating the crystals which first form, and which are much richer in silver than the original mass, by means of a perforated ladle. The crystals are then subjected to cupellation, for the separation of the lead which they still contain.

Properties. Silver is a white metal, very brilliant, tenacious, malleable, and ductile. In malleability and ductility, it is inferior only to gold. It is harder than gold, but softer than copper. Its equivalent number is 108,

symbol Ag, and sp. gr. about 10·4. It forms but one well characterized oxide, which is a protoxide. Exposed to a full red heat, it enters into fusion, and exhibits a brilliant appearance. It is not oxidized in the air, but contracts a superficial tarnish of sulphuret of silver by the action of sulphuretted hydrogen, which always exists in minute quantity in the atmosphere. It is entirely soluble in diluted nitric acid. If any gold be present, it will remain undissolved as a dark-coloured powder. From the nitric solution, the whole of the silver may be thrown down by chloride of sodium, as a white precipitate of chloride of silver, characterized by being completely soluble in ammonia. If the remaining solution contain copper or lead, it will be precipitated or discoloured by sulphuretted hydrogen.

Pharm. Uses. The only officinal preparations of silver are the *oxide*, *nitrate*, and *cyanuret*. The *chloride* will be noticed in the Appendix.

Off. Prep. Argenti Nitras; Argenti Nitras Fusus. B.

ARMORACIA. *U. S., Lond., Ed.*

Horse-radish.

The fresh root of Cochlearia Armoracia. *U. S., Lond., Ed.*

Raifort sauvage, *Fr.;* Meerrettig, *Germ.;* Rafano rusticano, *Ital.;* Rabano rusticano, *Span.*

COCHLEARIA. *Sex. Syst.* Tetradynamia Siliculosa.—*Nat. Ord.* Brassicaceæ or Cruciferæ.

Gen. Ch. Silicula emarginate, turgid, scabrous, with gibbous, obtuse valves. *Willd.*

Cochlearia Armoracia. Willd. *Sp. Plant.* iii. 451; Woodv. *Med. Bot.* p. 400, t. 145. The root of this plant is perennial, sending up numerous very large leaves, from the midst of which a round, smooth, erect, branching stem rises two or three feet in height. The radical leaves are lance-shaped, waved, scolloped on the edges, sometimes pinnatifid, and stand upon strong footstalks. Those of the stem are much smaller, without footstalks, sometimes divided at the edges, sometimes almost entire. The flowers are numerous, white, peduncled, and form thick terminal clusters. The calyx has four ovate, deciduous leaves, and the corolla an equal number of obovate petals, twice as long as the calyx, and inserted by narrow claws. The pod is small, elliptical, crowned with the persistent stigma, and divided into two cells, each containing from four to six seeds.

The horse-radish is a native of western Europe, growing wild on the sides of ditches, and in other moist situations. It is cultivated for culinary purposes in most civilized countries, and is said to have become naturalized in some parts of the United States. Its flowers appear in June.

The root, which is officinal in its fresh state, is long, tapering, whitish externally, very white within, fleshy, of a strong pungent odour when scraped or bruised, and of a hot, biting, somewhat sweetish taste. Its virtues are imparted to water and alcohol. They depend upon a volatile oil, which is dissipated by drying; the root becoming at first sweetish, and ultimately insipid and quite inert. Its acrimony is also destroyed by boiling. The *oil* may be obtained by distillation with water. It is colourless or pale yellow, heavier than water, very volatile, excessively pungent, acrid, and corrosive, exciting inflammation and even vesication when applied to the skin. Hubatka considers it as identical with the volatile oil of mustard. (*Journ. de Pharm., 3e sér.*, v. 42.) According to Gutret, only 6 parts of it are obtained from 10,000 of the root. Besides this principle, the fresh root contains, according to the same chemist, a bitter resin in minute quantity, sugar, extractive,

gum, starch, albumen, acetic acid, acetate and sulphate of lime, water, and lignin. From observations made by F. L. Winckler, it may be inferred that *myronic acid* exists in the root combined with potassa, and that it is from the reaction between this acid, *myrosine* also existing in the root, and water, that the volatile oil is produced, in the same manner as oil of mustard from mustard seed. (See *Sinapis.*) Horse-radish, when distilled with alcohol, yields none of the oil. (*Journ. für Prakt. Pharm.*, xviii. 89.) The root may be kept for some time without material injury, by being buried in sand in a cool place.

Medical Properties and Uses. Horse-radish is highly stimulant, exciting the stomach when swallowed, and promoting the secretions, especially that of urine. Externally applied, it is rubefacient. Its chief use is as a condiment to promote appetite and invigorate digestion; but it is also occasionally employed as a medicine, particularly in dropsical complaints attended with an enfeebled condition of the digestive organs, and of the system in general. It has, moreover, been recommended in palsy and chronic rheumatism, both as an internal and external remedy; and in scorbutic affections is highly esteemed. Cullen found advantage in cases of hoarseness from the use of a syrup prepared from an infusion of horse-radish and sugar, and slowly swallowed in the quantity of one or two teaspoonfuls, repeated as occasion demanded. The root may be given in the dose of half a drachm or more, either grated or cut into small pieces.

Off. Prep. Infusum Armoraciæ; Spiritus Armoraciæ Compositus. W.

ARNICA. *U. S. Secondary.*

Leopard's-bane.

The flowers of Arnica montana. *U. S.*

Arnique, *Fr.;* Berg Wolverly, Gemeines ächtes Fallkraut, *Germ.;* Arnica montana, *Ital., Span.*

Arnica. *Sex. Syst.* Syngenesia Superflua.—*Nat. Ord.* Compositæ-Senecionideæ. *De Cand.* Asteraceæ. *Lindley.*

Gen. Ch. Calyx with equal leaflets, in a double row. *Seed-down* hairy, sessile. *Seeds* both of the disk and ray furnished with seed-down. *Receptacle* hairy. *Hayne.*

Arnica montana. Willd. *Sp. Plant.* iii. 2106; Woodv. *Med. Bot.* p. 41, t. 17. This is a perennial, herbaceous plant, having a woody, brownish, horizontal root, ending abruptly, and sending forth numerous slender fibres of the same colour. The stem is about a foot high, cylindrical, striated, hairy, and terminating in one, two, or three peduncles, each bearing a flower. The radical leaves are ovate, entire, ciliated, and obtuse; those of the stem, which usually consist of two opposite pairs, are lance-shaped. Both are of a bright green colour, and somewhat pubescent on their upper surface. The flowers are very large, and of a fine orange-yellow colour. The calyx is greenish, imbricated, with lanceolate scales. The ray consists of about fourteen ligulate florets, twice as long as the calyx, striated, three-toothed, and hairy at the base; the disk, of tubular florets, with a five-lobed margin.

This plant is a native of the mountainous districts of Europe and Siberia, and is found, according to Nuttall, in the northern regions of this continent, west of the Mississippi. It has been introduced into England, and might no doubt be cultivated in this country; but it is very little used, and in the U. S. Pharmacopœia has been placed in the secondary list. The flowers, leaves, and root are employed; but the flowers are usually preferred.

Properties. The whole plant, when fresh, has a strong, disagreeable odour, which is apt to excite sneezing, and is diminished by desiccation. The taste

is acrid, bitterish, and durable. Water extracts its virtues. Chevallier and Lassaigne discovered in the flowers, gallic acid, gum, albumen, yellow colouring matter, an odorous resin, and a bitter principle which they considered identical with *cytisin*, discovered by them in the seeds of *Cytisus Laburnum*. This substance is yellow, of a bitter and nauseous taste, deliquescent, readily soluble in water and diluted alcohol, but with difficulty in strong alcohol, and insoluble in ether. In the dose of five grains it is powerfully emetic and cathartic; and it is supposed to be the active principle of the plant. The flowers also contain a small proportion of a blue volatile oil. Pfaff obtained from the root a volatile oil, an acrid resin, extractive, gum, and lignin. Mr. Wm. Bastick, of London, has separated an organic alkali from the flowers, and names it *arnicina*. It is solid, slightly bitter, but not acrid, of the odour of castor, slightly soluble in water, and much more soluble in alcohol and ether. (*Pharm. Journ. and Trans.*, x. 389.)*

Medical Properties and Uses. Leopard's-bane is a stimulant, directed with peculiar energy to the brain and whole nervous system, as manifested by the headache, spasmodic contractions of the limbs, and difficulty of respiration, which result from its use. It acts also as an irritant to the stomach and bowels, often producing an emetic and cathartic effect, and is said by Bergius to be diuretic, diaphoretic, and emmenagogue. It is much used by the Germans, who prescribe the flowers and root with advantage in amaurosis, paralysis, and other nervous affections. It is said to prove serviceable in that disordered condition which succeeds concussion of the brain from falls, blows, &c.; and from this circumstance has received the title of *panacea lapsorum*. It has also been recommended in paralytic affections, chronic catarrh of the old, intermittent fever, dysentery, diarrhœa, nephritis, gout, rheumatism, dropsy, chlorosis, and various other complaints, in most of which it seems to have been empirically prescribed. It is peculiarly useful in diseases attended with a debilitated or typhoid state of the system. The powdered flowers and leaves are employed as a sternutatory; and the inhabitants of Savoy and the Vosges are said to substitute them for tobacco. In France the flowers of Arnica are occasionally used, though much less than in Germany. In England and the United States they are little employed. They are best given in substance or infusion. The dose of the powder is from five to twenty grains frequently repeated. The infusion may be prepared by digesting an ounce in a pint of water, of which from half a fluidounce to a fluidounce may be given every two or three hours. It should always be strained through linen, in order to separate the fine fibres, which might otherwise irritate the throat. The poisonous properties of the plant are said to be best counteracted by the free use of vinegar or other dilute vegetable acid.

A tincture prepared from the flowers has recently come into use in this country as a domestic remedy in sprains, bruises, &c. It is employed externally. The Prussian and other German Pharmacopœias direct it to be made by digesting the flowers for four days in diluted alcohol, in the proportion of about two ounces to a pint. (*Pharm. Univers.*, i. 284.) W.

* Mr. Bastick obtained the alkaloid by the following process. The flowers were macerated with alcohol acidulated with sulphuric acid; the tincture was filtered, and treated with lime until it evinced an alkaline reaction; the liquid was then filtered, and the filtrate treated with sulphuric acid in slight excess; the acid solution was filtered and concentrated by evaporation; to the residue a little water was added, the liquid was evaporated until all the alcohol was driven off, and was then again filtered; the filtered liquor was saturated with carbonate of potassa, and after filtration was mixed with a considerable excess of carbonate of potassa; finally, the liquid was agitated with successive portions of ether until this fluid ceased to dissolve anything, and the ethereal solution obtained was left to spontaneous evaporation. Arnicina remained.

ARSENICUM. *U.S.*

Arsenic.

Off. Syn. ARSENICUM PURUM. *Dub.*
Arsenic, *Fr.;* Arsenik, *Germ.;* Arsenico, *Ital., Span.*

This metal was made officinal in the U. S. and Dublin Pharmacopœias of 1850, for the purpose of being used to form the iodide of arsenic, and the solution of the iodide of arsenic and mercury, two new officinals of those works. It is placed in the Materia Medica of the U. S. Pharmacopœia, but among the preparations in the Dublin, with the following formula.

"Take of White Oxide of Arsenic of Commerce two drachms [*Dub. weight*]. Place the Oxide at the sealed end of a hard German glass tube, of about half an inch in diameter and eighteen inches long, and, having covered it with about eight inches of dry and coarsely pulverized charcoal, and raised the portion of the tube containing the charcoal to a red heat, let a few ignited coals be placed beneath the Oxide, so as to effect its slow sublimation. When this has been accomplished, the metallic arsenic will be found attached to the interior of the tube at its distant or cool extremity.

"In conducting this process, the furnace used in the performance of an organic analysis should be employed, and the fuel should be ignited charcoal. It will be proper also to connect the open extremity of the tube with a flue, for the purpose of preventing the possible escape into the apartment of arsenical vapours; and, with the view of keeping it from being plugged by the metal, to introduce occasionally into it, as the sublimation proceeds, an iron wire through a cork, fixed (but not air-tight) in its open extremity."

In the above process, the white oxide (arsenious acid) is reduced by the agency of ignited charcoal, which attracts the oxygen of the acid, and revives the metal. On the large scale, metallic arsenic is generally obtained by heating arsenical pyrites ($FeAs,FeS_2$) in earthen tubes; when the metal sublimes, and two eqs. of protosulphuret of iron are left as a residue.

Properties. Arsenic is a brittle, crystalline metal, of a steel-gray colour, and possessing much brilliancy when recently broken or sublimed. Exposed to the air, its surface becomes dull and blackens. Its texture is granular, and sometimes a little scaly. Rubbed on the hands, it communicates a peculiar odour; but it is devoid of taste. Its sp. gr. is about 5·8. When heated to about 356° of Fahr., it sublimes without fusing, giving rise to white vapours having an alliaceous or garlicky odour. Its equivalent number is 75. It forms two combinations with oxygen, both having acid properties, called arsenious and arsenic acids, and three with sulphur, namely, bisulphuret of arsenic or realgar, tersulphuret or orpiment, corresponding in composition with arsenious acid, and quinto-sulphuret, corresponding with arsenic acid. (See *Acidum Arseniosum;* also *realgar* and *orpiment* in the Appendix.) *Arsenic acid* is obtained by boiling arsenious acid with nitromuriatic acid, and evaporating to dryness. It is a white, crystalline substance, soluble in water. It forms with nitrate of silver, a brick-red precipitate of arseniate of silver. It consists of one eq. of arsenic and five of oxygen (AsO_5).

Arsenic is much diffused. Besides being present in a great many minerals, it has been detected, in minute proportion, in the earth of grave yards by Orfila; in certain soils and mineral waters by M. Walchner; and in the ashes of various plants by M. Stein.

Arsenic is officinal:—

I. IN THE METALLIC STATE.

Arsenicum, *U. S.;* Arsenicum Purum, *Dub.*

II. Combined with oxygen.
Acidum Arseniosum, *U. S., Lond.;* Arsenicum Album, *Ed.;* Arsenici Oxydum Album Venale, *Dub. Purified by resublimation.* Acidum Arseniosum Purum, *Dub.*

III. Combined with chlorine.
Liquor Arsenici Chloridi, *Lond.*

IV. Combined with iodine.
Arsenici Iodidum, *U. S.*

V. Combined with iodine and mercury.
Liquor Arsenici et Hydrargyri Iodidi, *U. S.;* Arsenici et Hydrargyri Hydriodatis Liquor, *Dub.*

VI. In saline combination.
Liquor Potassæ Arsenitis, *U. S., Lond.;* Liquor Arsenicalis, *Ed., Dub.* B.

ARUM. *U. S. Secondary.*

Dragon-root.

The cormus of Arum triphyllum. *U. S.*

Arum. *Sex. Syst.* Monœcia Polyandria. — *Nat. Ord.* Araceæ.

Gen. Ch. Spathe one-leafed, cowled. *Spadix* naked above, female below, stamineous in the middle. *Willd.*

The root or cormus of *Arum maculatum* is occasionally used as a medicine in Europe, and formerly held a place in the Dublin Pharmacopœia. Its properties so closely resemble those of our *A. triphyllum,* that the substitution of the latter in our Pharmacopœia was obviously proper, independently of the consideration that the root is efficient only in the recent state.

Arum triphyllum. Willd. *Sp. Plant.* iv. 480; Bigelow, *Am. Med. Bot.* i. 52. The *dragon-root, Indian turnip,* or *wake-robin,* as this plant is variously called in common language, has a perennial root or cormus, which, early in the spring, sends up a large, ovate, acuminate, variously coloured spathe, convoluted at bottom, flattened and bent over at top like a hood, and supported by an erect, round, green or purplish scape. Within the spathe is a club-shaped spadix, green, purple, black, or variegated, rounded at the end, and contracted near the base, where it is surrounded by the stamens or germs in the dicœcious plants, and by both in the monœcious, the female organs being below the male. The spathe and upper portions of the spadix gradually decay, while the germs are converted into a compact bunch of shining, scarlet berries. The leaves, which are usually one or two in number, and stand on long sheathing footstalks, are composed of three ovate acuminate leaflets, paler on their under than their upper surface, and becoming glaucous as the plant advances. There are three varieties of this species, distinguished by the colour of the spathe, which in one is green, in another dark purple, and in a third white. The plant is a native of North and South America, and is common in all parts of the United States, growing in damp woods, in swamps, along ditches, and in other moist shady places. All parts of it are highly acrid, but the root only is officinal.

This is roundish, flattened, an inch or two in diameter, covered with a brown, loose, wrinkled epidermis, and internally white, fleshy, and solid. In the recent state, it has a peculiar odour, and is violently acrid, producing, when chewed, an insupportable burning and biting sensation in the mouth and throat, which continues for a long time, and leaves an unpleasant soreness behind. According to Dr. Bigelow, its action does not readily extend through the cuticle, as the bruised root may lie upon the skin till it becomes

dry, without producing pain or redness. The acrid principle is extremely volatile, and is entirely driven off by heat. It is not imparted to water, alcohol, ether, or olive oil. The root loses nearly all its acrimony by drying, and in a short time becomes quite inert. It was found by Mr. D. S. Jones to contain, besides the acrid principle, from 10 to 17 per cent. of starch, albumen, gum, sugar, extractive, lignin, and salts of potassa and lime. (*Am. Journ. of Pharm.*, xv. 83.) The starch may be obtained from it as white and delicate as from the potato. In Europe, the dried root of *A. maculatum* is said sometimes to be employed by the country people, in times of great scarcity, as a substitute for bread; and an amylaceous substance is prepared from it, in small quantities, in the Isle of Portland on the south coast of England, and called *Portland arrow-root*, or *Portland sago*. The Indian turnip may be preserved fresh for a year, if buried in sand. (*Thatcher.*)

Medical Properties and Uses. Arum in its recent state is a powerful local irritant, possessing the property of stimulating the secretions, particularly those of the skin and lungs. It has been advantageously given in asthma, pertussis, chronic catarrh, chronic rheumatism, and various affections connected with a cachectic state of the system. As immediately taken from the ground, it is too acrid for use. The recently dried root, which retains a portion of the acrimony, but not sufficient to prevent its convenient administration, is usually preferred. It may be given in the dose of ten grains, mixed with gum arabic, sugar, and water, in the form of emulsion, repeated two or three times a-day, and gradually increased to half a drachm or more. The powder, made into a paste with honey or syrup, and placed in small quantities upon the tongue, so as to be gradually diffused over the mouth and throat, is said to have proved useful in the aphthous sore-mouth of children. W.

ASARUM. *U. S. Secondary.*

Canada Snakeroot.

The root of Asarum Canadense. *U. S.*

ASARUM. *Sex. Syst.* Dodecandria Monogynia.—*Nat. Ord.* Aristolochiaceæ. *Gen. Ch. Calyx* three or four-cleft, sitting on the germen. *Corolla* none. *Capsule* coriaceous, crowned. *Willd.*

Asarum Canadense. Willd. *Sp. Plant.* ii. 838; Bigelow, *Am. Med. Bot.* i. 149; Barton, *Med. Bot.* ii. 85. This species of Asarum very closely resembles *A. Europæum* or asarabacca, in appearance and botanical character. It has a long, creeping, jointed, fleshy, yellowish root or rhizoma, furnished with radicles of a similar colour. The stem is very short, dividing, before it emerges from the ground, into two long round hairy leafstalks, each of which bears a broad kidney-shaped leaf, pubescent on both surfaces, of a rich shining light green above, veined and pale or bluish beneath. A single flower stands in the fork of the stem, upon a hairy pendulous peduncle. The flower is often concealed by the loose soil or decayed vegetable matter; so that the leaves with their petioles are the only parts that appear. There is no corolla. The calyx is very woolly, and divided into three broad concave acuminate segments, with the ends reflexed, of a deep brownish-purple colour on the inside, and of a dull purple, inclining to greenish externally. The filaments, which are twelve in number, and of unequal length, stand upon the germ, and rise with a slender point above the anthers attached to them. Near the divisions of the calyx are three filamentous bodies, which may be considered as nectaries. The pistil consists of a somewhat hexagonal germ, and a conical grooved style, surmounted by six revolute stigmas. The capsule is six-celled, coriaceous, and crowned with the adhering calyx.

Canada snakeroot, or *wild ginger*, is an indigenous plant, inhabiting woods and shady places from Canada to the Carolinas. Its flowering period is from April to July. All parts of the plant have a grateful aromatic odour, which is most powerful in the root. This is the officinal portion.

As we have seen it in the shops, it is in long, more or less contorted pieces, of a thickness from that of a straw to that of a goose-quill, brownish and wrinkled externally, whitish within, hard and brittle, and frequently furnished with short fibres. Its taste is agreeably aromatic and slightly bitter, said to be intermediate between that of ginger and serpentaria, but in our opinion bearing a closer resemblance to that of cardamom. The taste of the petioles, which usually accompany the root, is more bitter and less aromatic.

Among its constituents, according to Dr. Bigelow, are a light-coloured, pungent, and fragrant essential oil, a reddish bitter resinous matter, starch, and gum; in addition to which Mr. Rushton found fatty matter, chlorophylle, and salts of potassa, lime, and iron. Mr. Procter found the resin to be acrid as well as bitter, and without aromatic properties. The root imparts its virtues to alcohol, and less perfectly to water.

Medical Properties and Uses. Canada snakeroot is an aromatic stimulant tonic, with diaphoretic properties, applicable to similar cases with serpentaria, which it resembles in its effects. It is said to be sometimes used by the country people as a substitute for ginger. From the close botanical analogy of the plant with the European Asarum, it might be supposed, like that, to possess emetic and cathartic properties; but such does not appear to be the case, at least with the dried root. It would form an elegant adjuvant to tonic infusions and decoctions. It may be given in powder or tincture. The dose in substance is twenty or thirty grains. W.

ASCLEPIAS INCARNATA. *U. S. Secondary.*

Flesh-coloured Asclepias.

The root of Asclepias incarnata. *U. S.*

Asclepias. See ASCLEPIAS TUBEROSA.

Asclepias incarnata. Willd. *Sp. Plant.* i. 1267. This species has an erect downy stem, branched above, two or three feet high, and furnished with opposite, nearly sessile, lanceolate, somewhat downy leaves. The flowers are red, sweet-scented, and disposed in numerous crowded erect umbels, which are generally in pairs. The nectary is entire, with its horn exserted. In one variety the flowers are white.

The plant grows in all parts of the United States, preferring a wet soil, and flowering from June to August. Upon being wounded it emits a milky juice. The root is the officinal portion. Its properties are probably similar to those of *A. Syriaca;* but they have not, so far as we know, been fully tested. Dr. Griffith states that it has been employed by several physicians, who speak of it as a useful emetic and cathartic. (*Journ. of the Phil. Col. of Pharm.*, iv. 283.) Dr. Tully, of New Haven, has found it useful in catarrh, asthma, rheumatism, syphilis, and worms. W.

ASCLEPIAS SYRIACA. *U. S. Secondary.*

Common Silk-weed.

The root of Asclepias Syriaca. *U. S.*

Asclepias. See ASCLEPIAS TUBEROSA.

A. Syriaca. Willd. *Sp. Plant.* i. 1265. The silk-weed has simple stems, from three to five feet high, with opposite, lanceolate-oblong, petiolate leaves, downy on their under surface. The flowers are large, of a pale purple colour, sweet-scented, and arranged in nodding umbels, which are two or three in number. The nectary is bidentate. The pod or follicle is covered with sharp prickles, and contains a large quantity of silky seed-down, which has been sometimes used as a substitute for fur in the manufacture of hats, and for feathers in beds and pillows.

This species of Asclepias is very common in the United States, growing in sandy fields, on the road sides, and on the banks of streams, from New England to Virginia. It flowers in July and August. Like the preceding species, it gives out a white juice when wounded, and has hence received the name of *milk-weed*, by which it is frequently called. This juice has a faint smell, a sub-acrid taste, and an acid reaction. According to Schultz, 80 parts of it contain 69 of water, 3·5 of a wax-like fatty matter, 5 of caoutchouc, 0·5 of gum, 1 of sugar with salts of acetic acid, and 1 of other salts. (*Pharm. Central Blatt*, 1844, p. 302.) Dr. C. List has found the chief solid ingredient of the juice to be a peculiar crystalline substance, of a resinous character, closely allied to lactucone, and which he proposes to call *asclepione*. To obtain it, the juice is coagulated by heat, filtered so as to separate the liquid portion, and then digested with ether, which dissolves the asclepione, and yields it by evaporation. To purify it, the residue must be treated repeatedly with anhydrous ether, which leaves another substance undissolved. It is white, crystalline, tasteless, inodorous, fusible, insoluble in water and alcohol, soluble in ether, oil of turpentine, and concentrated acetic acid. A strong hot solution of potassa does not affect it. Its constituents are carbon, hydrogen, and oxygen, and its formula $C_{40}H_{34}O_6$. (List, *Liebig's Annalen*, Jan. 1849.)

Dr. Richardson, of Massachusetts, found the root possessed of anodyne properties. He gave it with advantage to an asthmatic patient, and in a case of typhus fever attended with catarrh. In both instances it appeared to promote expectoration, and to relieve pain, cough, and dyspnœa. He gave a drachm of the powdered bark of the root, in divided doses, during the day, and employed it also in strong infusion. In a letter to one of the authors dated Jan. 22d, 1850, Dr. A. E. Thomas, of Rocky Spring, Mississippi, stated that he had employed the root in scrofula with great success, and in dyspepsia with advantage. He found it cathartic and alterative, but observed no anodyne property. He was induced to try it by having noticed that it was much used by the planters in scrofula and other diseases, and by the recommendation of Dr. McLean, of Kentucky, who had employed it in scrofula for twenty years, with the most satisfactory results.* W.

ASCLEPIAS TUBEROSA. *U. S. Secondary.*

Butterfly-weed.

The root of Asclepias tuberosa. *U. S.*

Asclepias. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Asclepiadaceæ. *Gen. Ch. Calyx* small, five parted. *Corolla* rotate, five parted, mostly reflexed. *Staminal crown* (or nectary) simple, five-leaved; leaflets opposite

* In a letter subsequently received from Dr. McLean himself, this account of the virtues of the asclepias root is confirmed. Dr. McLean has also found it an excellent alterative in hepatic affections; but he seems to be of the opinion that the root he employed was from a different species of Asclepias, and one not described in this Dispensatory. (*Note to the tenth edition.*)

the anthers, with a subulate averted process at the base. *Stigmas* with the five angles (corpuscles) opening by longitudinal chinks. *Pollinia* five distinct pairs. *Torrey.*

Asclepias tuberosa. Willd. *Sp. Plant.* i. 1273; Bigelow, *Am. Med. Bot.* ii. 59; Barton, *Med. Bot.* i. 239. The root of the butterfly-weed or *pleurisy-root* is perennial, and gives origin to numerous stems, which are erect, ascending, or procumbent, round, hairy, of a green or reddish colour, branching at the top, and about three feet in height. The leaves are scattered, oblong lanceolate, very hairy, of a deep rich green colour on their upper surface, paler beneath, and supported usually on short footstalks. They differ, however, somewhat in shape according to the variety of the plant. In the variety with decumbent stems, they are almost linear, and in another variety cordate. The flowers are of a beautiful reddish-orange colour, and disposed in terminal or lateral corymbose umbels. The fruit is an erect lanceolate follicle, with flat ovate seeds connected to a longitudinal receptacle by long silky hairs.

This plant differs from other species of Asclepias in not emitting a milky juice when wounded. It is indigenous, growing throughout the United States from Massachusetts to Georgia, and, when in full bloom, in the months of June and July, exhibiting a splendid appearance. It is most abundant in the Southern States. The root is the only part used in medicine.

This is large, irregularly tuberous, branching, often somewhat fusiform, fleshy, externally brown, internally white and striated, and, in the recent state, of a sub-acrid nauseous taste. When dried it is easily pulverized, and its taste is bitter, but not otherwise unpleasant.

Medical Properties and Uses. The root of Asclepias tuberosa is diaphoretic and expectorant, without being stimulant. In large doses it is often also cathartic. In the Southern States it has long been employed by regular practitioners in catarrh, pneumonia, pleurisy, consumption, and other pectoral affections; and appears to be decidedly useful, if applied in the early stages, or, after sufficient depletion, when the complaint is already formed. Its popular name of *pleurisy root* expresses the estimation in which it is held as a remedy in that disease. It has also been used advantageously in diarrhœa, dysentery, and acute and chronic rheumatism. Dr. Lockwood speaks highly of its efficacy in promoting the eruption in exanthematous fevers. (*Buffalo Med. Journ.*, March, 1848.) Much testimony might be advanced in proof of its possessing very considerable diaphoretic powers. It is said also to be gently tonic, and has been popularly employed in pains of the stomach arising from flatulence and indigestion.

From twenty grains to a drachm of the root in powder may be given several times a day; but as a diaphoretic it is best administered in decoction or infusion, made in the proportion of an ounce to a quart of water, and given in the dose of a teacupful every two or three hours till it operates. W.

ASSAFŒTIDA. *U. S., Lond., Ed., Dub.*

Assafetida.

The concrete juice of the root of Narthex Assafœtida. *U. S.* The gum-resin from the sliced root. *Lond.* The gum-resinous exudation. *Dub.* Gummy-resinous exudation of Ferula Assafœtida, and probably Ferula persica. *Ed.*

Assafœtida, *Fr.;* Stinkasant, Teufelsdreck, *Germ.;* Assafetida, *Ital.;* Asafetida, *Span.;* Ungoozeh, *Persian;* Hilteet, *Arab.*

NARTHEX. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Apiaceæ or Umbelliferæ.

Gen. Ch. Umbels compound. *Involucres* none. *Calyx* obsolete. *Fruit* thin, compressed at the back, with a dilated border. *Ridges* three only, dorsal. *Vittæ* one to each dorsal furrow, and two to the laterals. *Albumen* thin, flat. *Lindley.*

Narthex Assafœtida. Falconer, *Royle's Mat. Med.* Am. ed., p. 407.—*Ferula Assafœtida.* Willd. *Sp. Plant.* i. 1413; Kœmpfer, *Amœnitat. Exotic.* 535, t. 536. This plant was first described by Kœmpfer, who wrote from actual observation. By him and others after him it was considered as belonging to the genus Ferula; but Dr. Falconer, from a careful examination of the plant in its native site, as well as of specimens cultivated in the Saharunpore Botanic Garden, came to the conclusion that, though allied to Ferula, it belongs to a distinct genus, which he denominated Narthex, and which is now generally admitted by botanists. The root is perennial, fleshy, tapering, simple or divided, a foot or more in length, about three inches thick at top, where it is invested above the soil with numerous small fibres, dark-gray and transversely corrugated on the outside, internally white, and abounding in an excessively fetid, opaque, milky juice. The leaves, which spring from the root, are numerous, large and spreading, nearly two feet long, light-green above, paler beneath, and of a leathery texture. They are three-parted, with bipinnatifid segments, and oblong-lanceolate, obtuse, entire or variously sinuate, decurrent lobes, forming a narrow winged channel upon the divisions of the petiole. From the midst of the leaves rises a luxuriant, herbaceous stem, from six to nine feet high, two inches in diameter at the base, simple, erect, round, smooth, striated, solid, and terminating in a large head of compound umbels, with from ten to twenty rays, each surmounted by a roundish partial umbel. The flowers are pale yellow, and the fruit oval, thin, flat, foliaceous, and reddish-brown. The plant is said to differ, both in its leaves and product, according to the situation and soil in which it grows.

It is a native of Persia, Affghanistan, and other neighbouring regions; and flourishes abundantly in the mountainous provinces of Laar and Chorassan, where its juice is collected. Burns, in his travels into Bokhara, states that the young plant is eaten with relish by the people, and that sheep crop it greedily. Some suppose, but without proof, that other species of Ferula contribute to the production of the assafetida of commerce; and *F. Persica* is admitted among its probable sources by the Edinburgh College. This plant grows also in Persia, and has a strong odour of the drug.

The oldest plants are most productive, and those under four years old are not considered worth cutting. At the season when the leaves begin to fade, the earth is removed from about the top of the root, and the leaves and stem, being twisted off near their base, are thrown with other vegetable matters over the root, in order to protect it from the sun. After some time the summit of the root is cut off transversely, and the juice which exudes having been scraped off, another thin slice is removed, in order to present a fresh surface for exudation. This process is repeated at intervals till the root ceases to afford juice, and perishes. During the whole period of collection, which occupies nearly six weeks, the solar heat is as much as possible excluded. The juice collected from numerous plants is put together, and allowed to harden in the sun. The fruit is said to be sent to India, where it is highly esteemed as a medicine by the native practitioners.

Assafetida is brought to this country either from India, whither it is conveyed from Bushire and down the Indus, or by the route of Great Britain. It sometimes comes in mats, but more frequently in cases, the former containing eighty or ninety, the latter from two hundred to four hundred pounds. It is sometimes also imported in casks.

Properties.—As found in the shops, assafetida is in irregular masses, softish when not long exposed, of a yellowish or reddish-brown colour externally, exhibiting when broken an irregular whitish, somewhat shining surface, which soon becomes red on exposure, and ultimately passes into a dull yellowish-brown. This change of colour is characteristic of assafetida, and is ascribed to the influence of air and light upon its resinous ingredient. The masses appear as if composed of distinct portions agglutinated together, sometimes of white, almost pearly tears, embedded in a darker, softer, and more fetid paste. Occasionally the *tears* are found separate, though very rarely in the commerce of this country. They are roundish, oval, or irregular, and generally flattened, from the size of a pea to that of a large almond, sometimes larger, yellowish or brownish externally and white within, and not unlike ammoniac tears, for which they might be mistaken except for their odour, which, however, is weaker than that of the masses.

The odour of assafetida is alliaceous, extremely fetid, and tenacious; the taste, bitter, acrid, and durable. The effect of time and exposure is to render it more hard and brittle, and to diminish the intensity of its smell and taste, particularly the former. Kœmpfer assures us, that one drachm of the fresh juice diffuses a more powerful odour through a close room than one hundred pounds of the drug as usually kept in the stores. Assafetida softens by heat without melting, and is of difficult pulverization. Its sp. gr. is 1·327. (*Berzelius.*) It is inflammable, burning with a clear, lively flame. It yields all its virtues to alcohol, and forms a clear tincture, which becomes milky on the addition of water. Macerated in water it produces a turbid red solution, and triturated with that fluid gives a white or pink-coloured milky emulsion of considerable permanence. In 100 parts, Pelletier found 65 parts of resin, 19·44 of gum, 11·66 of bassorin, 3·60 of volatile oil, with traces of supermalate of lime. Brandes obtained 4·6 parts of volatile oil, 47·25 of a bitter resin soluble in ether, 1·6 of a tasteless resin insoluble in ether, 1·0 of extractive, 19·4 of gum containing traces of potassa and lime united with sulphuric, phosphoric, acetic, and malic acids, 6·4 of bassorin, 6·2 of sulphate of lime, 3·5 of carbonate of lime, 0·4 of oxide of iron and alumina, 0·4 of malate of lime with resin, 6·0 of water, and 4·6 of impurities consisting chiefly of sand and woody fibre. The odour of the gum-resin depends on the *volatile oil*, which may be procured by distillation with water or alcohol. It is lighter than water, colourless when first distilled, but becoming yellow with age, of an exceedingly offensive odour, and of a taste at first flat, but afterwards bitter and acrid. It contains, according to Stenhouse, from 15·75 to 23 per cent. of sulphur. Hlasiwetz considers it as a mixture in variable proportions of the sulphuret and bisulphuret of a compound radical, consisting of carbon and hydrogen ($C_{12}H_{11}$). It boils at about 280°, but suffers decomposition, yielding sulphuretted hydrogen. When long exposed to the air it becomes slightly acid, and acquires a somewhat different odour. (*Chem. Gaz.*, No. 178, p. 108, from *Liebig's Annalen.*) The volatile oil and the bitter resin are the active principles.

Impurities and Adulterations. Assafetida is probably not often purposely adulterated, but it frequently comes of inferior quality, and mixed with various impurities, such as sand and stones. Portions which are very soft, dark brown or blackish, with few or no tears, and indisposed to assume a red colour when freshly broken, should be rejected. We have been informed that a case seldom comes without more or less of this inferior assafetida, and of many it forms the larger proportion. It is sold chiefly for horses. Chevallier states that a factitious substance, made of garlic juice and white pitch with a little assafetida, has occurred in commerce.

Medical Properties and Uses. The effects of assafetida on the system are those of a moderate stimulant, powerful antispasmodic, efficient expectorant, and feeble laxative. Some consider it also emmenagogue and anthelmintic. Its volatile oil is undoubtedly absorbed; as its peculiar odour may be detected in the breath and the secretions. As an antispasmodic simply, it is employed in the treatment of hysteria, hypochondriasis, convulsions of various kinds, spasm of the stomach and bowels unconnected with inflammation, and in those numerous irregular nervous disorders which accompany derangement of the different organs, or result from mere debility of the nervous system. From the union of expectorant with antispasmodic powers, it is highly useful in spasmodic pectoral affections, such as hooping-cough, asthma, and certain infantile coughs and catarrhs, complicated with nervous disorder, or with a disposition of the system to sink. In catarrhus senilis; the secondary stages of peripneumonia notha, croup, measles, and catarrh; in pulmonary consumption; in fact, in all cases of disease of the chest in which there is want of due nervous energy, and in which inflammation is absent or has been sufficiently subdued, assafetida may be occasionally prescribed with advantage. In the form of enema, it is useful in typhoid diseases with inordinate accumulation of air in the bowels, and in other cases of tympanitic abdomen. The same form is most convenient in the hysteric paroxysm, and other kinds of convulsion. In most cases its laxative tendency is advantageous, but sometimes must be counteracted by opium. It may often be usefully combined with purgative medicines in constipation with flatulence.

It appears to have been known in the East from very early ages, and, notwithstanding its repulsive odour, is at present much used in India and Persia as a condiment. Persons soon habituate themselves to its smell, which they even learn to associate pleasantly with the agreeable effects experienced from its internal use. Children with hooping-cough sometimes become fond of it.

The medium dose is ten grains, which may be given in pill or emulsion. (See *Mistura Assafœtidæ.*) The tincture is officinal, and is much used. When given by injection, the gum-resin should be triturated with warm water. From half a drachm to two drachms may be administered at once in this way. As assafetida is not apt to affect the brain injuriously, it may be given very freely when not contra-indicated by the existence of inflammatory action.

Off. Prep. Assafœtida Præparata; Emplastrum Assafœtidæ; Enema Assafœtidæ; Mistura Assafœtidæ; Pilulæ Aloës et Assafœtidæ; Pilulæ Assafœtidæ; Pilulæ Galbani Compositæ; Spiritus Ammoniæ Fœtidus; Tinctura Assafœtidæ; Tinct. Castorei Ammoniata. W.

AURANTII CORTEX. *U. S., Lond.*

Orange Peel.

The outer rind of the fruit of *Citrus vulgaris* or *Citrus Aurantium. U. S.* The outer rind of the fruit of Citrus Bigaradia. *Lond.*

Off. Syn. AURANTII CORTEX. Rind of the fruit of Citrus vulgaris. AURANTII OLEUM. Volatile oil of the flowers of Citrus vulgaris, and sometimes of Citrus Aurantium. *Ed.;* CITRUS AURANTIUM. The fruit. AURANTIUM. Citrus Bigaradia. *The rind of the fruit. The volatile oil. Dub.*

Ecorce d'orange, *Fr.;* Pomeranzenschale, *Germ.;* Scorze del frutto dell'arancio, *Ital.;* Corteza de naranja, *Span.*

CITRUS. *Sex. Syst.* Polyadelphia Icosandria.—*Nat. Ord.* Aurantiaceæ.

Gen. Ch. Calyx five-cleft. *Petals* five, oblong. *Anthers* twenty, the filaments united into different parcels. *Berry* nine-celled. *Willd.*

This very interesting genus is composed of small evergreen trees, with ovate or oval-lanceolate, and shining leaves, odoriferous flowers, and fruits which usually combine beauty of colour with a fragrant odour and grateful taste. They are all natives of warm climates. Though the species are not numerous, great diversity exists in the character of the fruit; and many varieties, founded upon this circumstance, are noticed by writers. In the splendid work on the natural history of the *Citrus* by Risso and Poiteau, 169 varieties are described under the eight following heads :—1. sweet oranges, 2. bitter and sour oranges, 3. bergamots, 4. limes, 5. shaddocks, 6. lumes, 7. lemons, and 8. citrons. Of these it is difficult to decide which have just claims to the rank of distinct species, and which must be considered merely as varieties. Those employed in medicine may be arranged in two sets, of which the orange, *C. Aurantium*, and the lemon, *C. Medica*, are respectively the types, the former characterized by a winged, the latter by a naked or nearly naked petiole. The form and character of the fruit, which are not entirely constant, serve as the basis of the subdivisions. *C. Decumana*, which yields the shaddock, agrees with *C. Aurantium* in the form of its petiole.

Citrus Aurantium. Willd. *Sp. Plant.* iii. 1427 ; Woodv. *Med. Bot.* p. 532, t. 188. The orange tree grows to the height of about fifteen feet. Its stem is round, very much branched, and covered with a smooth, shining, greenish-brown bark. In the wild state, and before inoculation, it is often furnished with axillary spines. The leaves are ovate, pointed, entire, smooth, and of a shining pale-green colour. When held between the eye and the light, they exhibit numerous small transparent vesicles, filled with essential oil; and, when rubbed between the fingers, are highly fragrant. Their footstalks are about an inch long, and have wings or lateral appendages. The flowers, which have a delightful odour, are large, white, and attached by short peduncles, singly or in clusters, to the smallest branches. The calyx is saucer-shaped, with pointed teeth. The petals are oblong, concave, white, and beset with numerous small glands. The filaments are united at their base in three or more distinct portions, and support yellow anthers. The germen is roundish, and bears a cylindrical style, terminated by a globular stigma. The fruit is a spherical berry, often somewhat flattened at its base and apex, rough, of a yellow or orange colour, and divided internally into nine vertical cells, each containing from two to four seeds, surrounded by a pulpy matter. The rind of the fruit consists of a thin exterior layer, abounding in vesicles filled with a fragrant essential oil, and of an interior one which is thick, white, fungous, insipid, and inodorous. There are two varieties of *C. Aurantium*, considered by some as distinct species. They differ chiefly in the fruit, which in one is sweet, in the other sour and bitterish. The first retains the original title, the second is called *Citrus vulgaris* by De Candolle and Citrus Bigaradia by Risso. The Seville orange is the product of the latter.

This beautiful evergreen, in which the fruit is mingled, in every stage of its growth, with the blossoms and foliage, is one of those productions of the tropics which have been applied to the most numerous purposes both of utility and ornament. A native of China and India, it was introduced into Europe at a very early period, was transplanted to America soon after its first settlement, and is now found in every civilized country where the climate is favourable to its cultivation. In colder countries, it is one of the most cherished ornaments of the hot-house, though in this situation its beauties are not fully developed, and its fruit does not attain perfection. It flourishes in the most southern portions of our own country, especially near St. Augustine in Florida,

where very fine oranges are produced. The tree also grows in the gardens about New Orleans, but is sometimes destroyed by frosty winters. The fruit is brought to us chiefly from the South of Europe and the West Indies. The Havana oranges have the sweetest and most agreeable flavour.

Various parts of the orange tree are used in medicine. The leaves, which are bitter and aromatic, are employed in some places in the state of infusion as a gently stimulant diaphoretic. The fresh flowers impart to water distilled from them their peculiar fragrance; and the preparation thus obtained is much esteemed in the South of Europe for its antispasmodic virtues. It is recognised as officinal by the London and Edinburgh Colleges.

Aurantii Flores Aqua. *Lond.* Aurantii Aqua. *Ed.* Orange-flower water is not prepared in this part of the United States, though the flowers might be imported for the purpose, if previously incorporated with one-third or one-quarter of their weight of common salt. It is made in Italy and France, and the flowers of the bitter orange are preferred, as yielding the most fragrant product. It is nearly colourless, though usually of a pale yellowish tint. From being kept in copper bottles, it sometimes contains metallic impurity. This is chiefly carbonate of lead, derived from the lead used as a solder in making the bottles. The Edinburgh College, therefore, directs that it should not be affected by sulphuretted hydrogen, which, if either lead or copper were present, would cause a dark precipitate. Much colour, an offensive odour, or mouldiness, indicates impurity derived from the flowers in distillation. Orange-flower water is used exclusively as a perfume.

An oil is also obtained from the flowers by distillation, which is called *neroli* in France, and is much used in perfumery, and in the composition of *liqueurs*. It is an ingredient of the famous Cologne water. That obtained from the flowers of the Seville or bitter orange (*C. vulgaris*) is deemed the sweetest. It was introduced into the Edinburgh Pharmacopœia, with the title of *Aurantii Oleum*, to serve for the preparation of orange-flower water. Soubeiran considers this oil rather as a product of the distillation, than as pre-existing in the flowers. The fact may thus be explained, that orange-flower water, made by dissolving even the finest neroli in water, has not the precise odour of that procured by distillation from the flowers.

The fruit is applied to several purposes. Small unripe oranges, about the size of a cherry or less, previously dried, and rendered smooth by a turning lathe, are sometimes employed to maintain the discharge from issues. They are preferred to peas on account of their agreeable odour, and by some are thought to swell less with the moisture; but this is denied by others, and it is asserted that they require to be renewed at the end of twenty-four hours. These fruits are sometimes kept in the shops under the name of *orange berries*. They are of a grayish or greenish-brown colour, fragrant odour, and bitter taste, and are said to be used for flavouring cordials. A volatile oil is obtained from them by distillation, known to the French by the name of *essence de petit grain*, and employed for similar purposes with that of the flowers. The oil, however, which now goes by this name, is said to be distilled chiefly from the leaves, and those of the bitter orange yield the best. The Dublin College recognises the ripe fruit. The juice of the Seville orange is sour and bitterish, and forms with water a refreshing and grateful drink in febrile diseases. It is employed in the same manner as lemon-juice, which it resembles in containing citric acid, though in much smaller proportion. The sweet orange is more pleasant to the taste, and is extensively used as a light refrigerant article of diet in inflammatory diseases, care being taken to reject the membranous portion. The rind of the mature fruit is the only part directed in the U. S Pharmacopœia. The outer portion is that con-

sidered officinal; as the inner is destitute of activity, and by its affinity for moisture renders the peel liable to become mouldy. The best mode of separating the outer rind, when its desiccation and preservation are desired, is to pare it from the orange in narrow strips with a sharp knife, as we pare an apple. When the object is to apply the fresh rind to certain pharmaceutic purposes, as to the preparation of the *confection of orange peel*, it is best separated by a grater. The dried peel, sold in the shops, is usually that of the Seville orange, and is brought chiefly from the Mediterranean.

Properties. Orange peel has a grateful aromatic odour, and a warm bitter taste, which depend upon the volatile oil contained in its vesicles. The rind of the Seville orange is much more bitter than that of the other variety. Both yield their sensible properties to water and alcohol. The oil may be obtained by expression from the fresh grated rind, or by distillation with water. It is imported into the United States in tinned copper cans. It has properties resembling those of the oil of lemons, but spoils more rapidly on exposure to the air, acquiring a terebinthinate odour. The perfumers use it in the preparation of Cologne water, and for other purposes; and it is also employed by the confectioners. This oil is recognised by the Dublin College.

Medical Properties and Uses. Orange peel is a mild tonic, carminative, and stomachic, but is seldom used alone. It is chiefly employed to communicate a pleasant flavour to other medicines, to correct their nauseating properties, and to assist their stimulant impression upon the stomach. It is a frequent and useful addition to bitter infusions and decoctions, as those of gentian, quassia, columbo, and especially Peruvian bark. It is obviously improper to subject orange peel to long boiling; as the volatile oil, on which its virtues chiefly depend, is thus driven off. The dose in substance is from half a drachm to a drachm three times a day. Large quantities are sometimes productive of mischief, especially in children, in whom violent colic and even convulsions are sometimes induced by it. We have known the case of a child, in which death resulted from eating the rind of an orange.

When orange peel is used simply for its agreeable flavour, the rind of the sweet orange is preferable; as a tonic, that of the Seville orange.

Off. Prep. Confectio Aurantii Corticis; Infusum Aurantii Compositum; Infusum Gentianæ Comp.; Spiritus Armoraciæ Comp.; Syrupus Aurantii Corticis; Tinctura Aurantii; Tinct. Cinchonæ Comp.; Tinct. Gentianæ Comp.; Vinum Gentianæ. W.

AVENÆ FARINA. *U. S.*

Oatmeal.

Meal prepared from the seeds of Avena sativa. *U. S.*

Off. Syn. AVENA. Avena sativa. *Semen tunicis nudatum. Lond.;* AVENA. Seeds of Avena sativa. *Ed.;* AVENA SATIVA. The seeds. *Dub.* Farine d'avoine, *Fr.;* Hafermehl, *Germ.;* Farina dell'avena, *Ital.;* Harina de avena, *Span.*

AVENA. *Sex. Syst.* Triandria Digynia.—*Nat. Ord.* Graminaceæ.

Gen. Ch. Calyx two-valved, many flowered, with a twisted awn on the back. *Willd.*

Avena sativa. Willd. *Sp. Plant.* i. 446. The common oat is so well known that a minute description would be superfluous. It is specifically distinguished by its "loose panicle, its two-seeded glumes, and its smooth seeds, one of which is awned." It was known to the ancients, and is now cultivated in all civilized countries; but its original locality has not been

satisfactorily ascertained. It grows wild in Sicily, and is said to have been seen by Anson in the Island of Juan Fernandez, on the coast of Chili.

This grain, though cultivated chiefly for horses, is very nourishing, and is largely consumed as food by the inhabitants of Scotland, the North of Ireland, Brittany, and some other countries. The seeds deprived of their husk are called *groats*, and are directed by the London College; but are not officinal on this side of the Atlantic. It is only the meal, prepared by grinding the seeds, that is kept in our shops.

Oatmeal contains, according to Vogel, in 100 parts, 59 of starch, 4·30 of a grayish substance resembling rather coagulated albumen than gluten, 8·25 of sugar and a bitter principle, 2·50 of gum, 2 of fixed oil, and 23·95 of fibrous matter including loss. An elaborate analysis of oats, deprived of the husk, made by Professor J. P. Norton, of Yale College, gave as the average of four varieties of the grain, 65·11 per cent. of starch, 2·24 of sugar, 2·23 of gum, 6·55 of oil, 16·51 of a nitrogenous body analogous to casein, though differing from it in some respects, 1·42 of albumen, 1·68 of gluten, 2·17 of epidermis, and 2·09 of alkaline salts, with allowance for loss and error. Professor Norton thinks there may have been some error in the proportion of the nitrogenous compounds, in consequence of the difficulty of separating them from starch; and concludes, from the quantity of nitrogen obtained by ultimate analysis, that these compounds must amount to at least 8 per cent. (*Am. Journ. of Sci. and Arts*, 2d ser., iii. 330.) Oatmeal has no smell, is very slightly but not unpleasantly bitter, and yields most of its nutritive matter with facility to boiling water.

Gruel made with oatmeal affords a nutritious, bland, and easily digested aliment, admirably adapted to inflammatory diseases; and, from its somewhat laxative tendency, preferable in certain cases to the purely mucilaginous or amylaceous preparations. It is very often administered after brisk cathartics, in order to render them easier, and at the same time more efficient in their action. It is sometimes also used in the form of enema; and the meal, boiled with water into a thick paste, forms an excellent emollient cataplasm. *Oatmeal gruel* may be prepared by boiling an ounce of the meal with three pints of water to a quart, straining the decoction, allowing it to stand till it cools, and then pouring off the clear liquor from the sediment. Sugar and lemon-juice may be added to improve its flavour; and raisins are not unfrequently boiled with the meal and water for the same purpose. W.

AZEDARACH. *U. S. Secondary.*

Azedarach.

The bark of the root of Melia Azedarach. *U. S.*

Melia. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Meliaceæ.

Gen. Ch. Calyx five-toothed. *Petals* five. *Nectary* cylindrical, toothed, bearing the *anthers* in the throat. *Drupe* with a five-celled nut. *Willd.*

Melia Azedarach. Willd. *Sp. Plant.* ii. 558; Michaux, *N. Am. Sylv.* iii. 4. This is a beautiful tree, rising thirty or forty feet in height, with a trunk fifteen or twenty inches in diameter. When standing alone, it attains less elevation, and spreads itself out into a capacious summit. Its leaves are large, and doubly pinnate, consisting of smooth, acuminate, denticulate, dark green leaflets, which are disposed in pairs with an odd one at the end. The flowers, which are of a lilac colour and delightfully fragrant, are in beautiful axillary clusters near the extremities of the branches. The fruit is a round drupe, about as large as a cherry, and yellowish when ripe.

This species of Melia is variously called *pride of India, pride of China,* and *common bead tree.* It is a native of Syria, Persia, and the North of India, and is cultivated as an ornament in various parts of the eastern and western continents. It is abundant in our Southern States, where it adorns the streets of cities, and the environs of dwellings, and in some places has become naturalized. North of Virginia it does not flourish, though small trees may sometimes be seen in sheltered situations. Its flowers appear early in the spring. The fruit is sweetish, and, though said by some to be poisonous, is eaten by children without inconvenience, and is reputed to be powerfully vermifuge. But the bark of the root is the part chiefly employed. It is preferred in the recent state, and is, therefore, scarcely to be found in the shops at the North. It has a bitter, nauseous taste, and yields its virtues to boiling water.

Medical Properties and Uses. This bark is cathartic and emetic, and in large doses is said to produce narcotic effects similar to those of spigelia, especially if gathered at the season when the sap is mounting. It is considered in the Southern States an efficient anthelmintic, and appears to enjoy, in some places, an equal degree of confidence with the pinkroot. It is thought also to be useful in those infantile remittents which resemble verminose fevers, without being dependent on the presence of worms. The form of decoction is usually preferred. A quart of water is boiled with four ounces of the fresh bark to a pint, of which the dose for a child is a tablespoonful every two or three hours, till it affects the stomach or bowels. Another plan is to give a dose morning and evening for several successive days, and then to administer an active cathartic. W.

BALSAMUM PERUVIANUM. *U. S., Lond., Ed.*

Balsam of Peru.

The juice of Myrospermum Peruiferum. *U. S.* Balsam prepared from the bark. *Lond.* Fluid balsamic exudation. *Ed.*

Baume de Perou, *Fr.;* Peruvianischer Balsam, *Germ.;* Balsamo del Peru, *Ital.;* Balsamo negro, *Span.*

MYROSPERMUM. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Leguminosæ. *De Cand.*

Gen. Ch. Calyx campanulate, five-toothed, persistent. *Petals* five, the upper one largest. *Stamens* ten, free. *Ovary* stipitate, oblong, membranous, with from two to six ovules; the style originating near the apex, filiform, lateral. *Legume* with the stalk naked at the base, broadly winged above, samaroid, indehiscent, one-celled, one or two seeded, laterally somewhat pointed by the style. *Seed* covered over with balsamic juice. *Cotyledons* thick, flat. *De Candolle.*

Botanists now agree in uniting the genera *Myroxylon* and *Toluifera* of Linnæus, and *Myrospermum* of Jacquin, into one, and follow De Candolle in adopting the last mentioned title. In relation to the particular species which yields the balsam now under consideration, there has been much uncertainty. After the death of Linnæus, specimens of a plant were sent to the younger Linnæus by Mutis, from New Granada, which was said by this botanist to yield the balsam of Peru. A description of the plant was published in the *Supplementum Plantarum* with the name of *Myroxylon Peruiferum;* and pharmacologists have generally referred the balsam to it. But considerable doubt has existed as to the identity of the species; nor have these doubts been satisfactorily settled up to the present time. Specimens of a plant were

received by Dr. Pereira from Central America, which, there is no reason to doubt, is the real source of Peruvian balsam. Upon comparing these with the specimen of Mutis's plant preserved in the Herbarium of the Linnæan Society, he found a sufficiently close resemblance in the leaves; but unfortunately this specimen is not perfect; and a certain conclusion does not seem to be attainable. A species of Myrospermum was described by Ruiz in his Quinologia, as the true Peruvian balsam plant, which he believed to be identical with Myroxylon Peruiferum of Linn., and named accordingly. But this identity is denied by Kunth and De Candolle, who consider Ruiz's plant to be the *Myrospermum pubescens.* (*Prodrom.* ii. 95.) Lambert, in his *Illustrations of the Genus Cinchona*, translated the description of Ruiz, and gave a figure of the plant (p. 97); but, according to Dr. Pereira, he drew the figure from Pavon's specimens contained in the British Museum, which were not those of Ruiz's plant, and were marked in Pavon's own hand writing *Myroxylon balsamiferum.* With this figure the real plant corresponds most closely; and it would appear, therefore, not to be the *M. Peruiferum* of Ruiz, the *M. pubescens* of Kunth and De Candolle. In this uncertainty, we shall give a brief account of the plant described and figured by Pereira, with the designation of "Myrospermum of *Sonsonate,*" leaving its proper botanical place to be determined by further observation.

The Myrospermum of Sonsonate, for which Dr. Royle proposes the name of *Myrospermum Pereira,* in honour of the late Dr. Pereira (*Manual of Mat. Med.*, 2d ed. p. 414), is a handsome tree, with a straight, round, lofty stem, a smooth ash-coloured bark, and spreading branches at the top. The leaves are alternate, petiolate, and unequally pinnate. The leaflets are from five to eleven, shortly petiolate, oblong, oval-oblong, or ovate, about three inches long by somewhat less than an inch and a half in breadth, rounded at the base, and contracting abruptly at top into an emarginate point. When held up to the light, they exhibit, in lines parallel with the primary veins, beautiful rounded and linear pellucid spots. The common and partial petioles and midribs are smooth to the naked eye, but, when examined with a microscope, are found to be furnished with short hairs. The fruit, including the winged foot-stalk, varies from two to four inches in length. At its peduncular extremity it is rounded or slightly tapering; at the top is enlarged, rounded, and swollen, with a small point at the side. The mesocarp, or main investment of the fruit, is fibrous, and contains in distinct receptacles a balsamic juice, which is most abundant in two long receptacles or vittæ, one upon each side.

This tree grows in Central America, in the State of Saint Salvador, upon the Pacific Coast. The balsam is collected from it exclusively by the aborigines, within a small district denominated the Balsam Coast, extending from Acajutla to Port Libertad. Incisions are made into the bark, which is slightly burned, so as to cause the juice to flow. Cotton or woollen rags are then inserted into the apertures, and, after saturation, are removed and replaced by others. When sufficient is collected, the rags are boiled in water in large jars, and the liquid allowed to stand; whereupon the water rises to the top and is poured off, leaving the balsam, which is put into calabashes or bladders. (*Pharm. Journ. and Trans.*, xi. 205.) It is then taken for sale to the neighbouring town of Sonsonate, where it is purified by subsidence and straining, and put into jars for exportation. The annual average produce is said to be about 25,000 pounds.

A substance called *white balsam* is procured from the fruit by expression. This has been confounded by some with the balsam of Tolu, but is wholly distinct. It is of a semifluid or soft solid consistence, somewhat granular,

and, on standing, separates into a white resinous crystalline deposit, and a superior translucent more fluid portion. The smell, though quite distinct from that of the balsams of Tolu and Peru, is not disagreeable. Dr. Stenhouse has obtained from it a peculiar resinous body, readily crystallizable, and remarkably indifferent in its chemical affinities, which he denominates *myroxocarpin.* (*Pharm. Journ. and Trans.*, x. 290.)

Another substance obtained from the same tree, and much used in Central America, is a tincture of the fruit, made by digesting it in rum. It is called *balsamito* by the inhabitants, and is said to be stimulant, anthelmintic, and diuretic. It is also used as an external application to gangrenous or indolent ulcers, and as a wash to the face to remove freckles. Neither the white balsam nor the balsamito reaches the markets of this country.

The balsam of Peru was named from its place of exportation; and it was long thought to be a product of Peru. It is now shipped partly from the Pacific coast, and partly from Balize or other ports on the Atlantic side, whither it is brought across the country. It was Guibourt who first made known the fact of its exclusive production in Central America. As imported it is usually in tin canisters, with a whitish scum upon its surface, and more or less deposit, which is dissolved with the aid of heat.

It is said to be adulterated in Europe with castor oil, copaiba, &c. (see *Pharm. Journ. and Trans.*, xii. 549); and a factitious substance has been sold in this country for the genuine balsam, prepared by dissolving balsam of Tolu in alcohol. This may be distinguished by taking fire readily, and burning with a blue flame. (*N. Y. Journ. of Pharm.*, i. 133.)

Properties. Balsam of Peru is viscid like syrup or honey, of a dark reddish-brown colour, a fragrant odour, and a warm bitterish taste, leaving when swallowed a burning or prickling sensation in the throat. Its sp. gr. is from 1·14 to 1·16. When exposed to flame it takes fire, diffusing a white smoke and a fragrant odour. Containing resin, volatile oil, and either benzoic or cinnamic acid, it is properly considered a balsam, though probably somewhat altered by heat. Alcohol in large proportion entirely dissolves it. Boiling water extracts the acid. From 1000 parts of the balsam, Stolze obtained 24 parts of a brown nearly insoluble resinous matter, 207 of resin readily soluble, 690 of oil, 64 of benzoic acid, 6 of extractive matter, and a small proportion of water. The oil he considers to be of a peculiar nature, differing from the volatile, the fixed, and the empyreumatic oils. Frémy gives the following views of the composition of the balsam. The acid is *cinnamic* and not benzoic acid. The oily substance is named by him *cinnameine.* It is decomposed by caustic potassa into cinnamic acid, which unites with the alkali, and a light oily fluid called *peruvine.* The resin is a hydrate of cinnameine, and increases at the expense of the latter principle as the balsam hardens. Cinnameine often holds in solution a crystalline substance called *metacinnameine*, which is isomeric with hydruret of *cinnamyl*, and by its oxidation gives rise to the cinnamic acid. When none exists in the balsam, it is presumed to have been wholly converted into that acid.

Medical Properties and Uses. This balsam is a warm, stimulating tonic and expectorant, and has been recommended in chronic catarrhs, certain forms of asthma, phthisis, and other pectoral complaints attended with debility. It has also been used in gonorrhœa, leucorrhœa, amenorrhœa, chronic rheumatism, and palsy. At present, however, it is little employed by American physicians. As an external application it has been found beneficial in chronic indolent ulcers. The dose is half a fluidrachm. It is best administered diffused in water by means of sugar and the yolk of eggs or gum Arabic.

Off. Prep. Tinctura Benzoini Composita. W.

BALSAMUM TOLUTANUM. *U. S., Lond., Ed., Dub.*

Balsam of Tolu.

The juice of Myrospermum Toluiferum. *U. S.* Concrete balsam, from incisions in the bark. *Lond.* Concrete balsamic exudation. *Ed., Dub.*

Baume de Tolu, *Fr.;* Tolubalsam, *Germ.;* Balsamo del Tolu, *Ital.;* Balsamo de Tolu, *Span.*

MYROSPERMUM. See BALSAMUM PERUVIANUM.

For a long time the tree from which this balsam is derived retained the name of *Toluifera Balsamum*, given to it by Linnæus; but it is now admitted that the genus *Toluifera* was formed upon insufficient grounds; and botanists agree in referring the Tolu balsam tree to the genus *Myroxylon*, or, as it is now denominated, *Myrospermum*. Ruiz, one of the authors of the Flora Peruviana, considered it identical with *Myroxylon Peruiferum;* but M. Achille Richard determined that it was a distinct species, and gave it the appropriate specific name of *Toluiferum*, which is now recognised by the Pharmacopœias. Sprengel and Humboldt also consider it a distinct species of Myroxylon. According to Richard, who had an opportunity of examining specimens brought from South America by Humboldt, the leaflets of *M. Peruiferum* are thick, coriaceous, acute, blunt at the apex, and all equal in size; while those of *M. Toluiferum* are thin, membranous, obovate, with a lengthened and acuminate apex, and the terminal one is longest. *M. Peruiferum* is found in Peru and the southern parts of New Granada; *M. Toluiferum* grows in Carthagena, and abounds especially in the neighbourhood of Tolu. The wood of the latter species, according to Humboldt, is of a deep-red colour, has a delightful balsamic odour, and is much used for building.

The balsam is procured by making incisions into the trunk. The juice is received in vessels of various kinds, in which it concretes. It is brought from Carthagena in calabashes or baked earthen jars, and sometimes in glass vessels. G. L. Ulex gives as a test of the purity of the balsam that, if heated in sulphuric acid, it dissolves without disengagement of sulphurous acid, and yields a cherry-red liquid. (*Archiv. der Pharm.*, Jan. 1853.)

Properties. As first imported, balsam of Tolu has a soft, tenacious consistence, which varies considerably with the temperature. By age it becomes hard and brittle like resin. It is shining, translucent, of a reddish or yellowish-brown colour, a highly fragrant odour, and a warm, somewhat sweetish and pungent, but not disagreeable taste. Exposed to heat, it melts, inflames, and diffuses an agreeable odour while burning. It is entirely dissolved by alcohol and the volatile oils. Boiling water extracts its acid. Distilled with water it affords a small proportion of volatile oil; and, if the heat be continued, an acid matter sublimes. Mr. Hatchett states that, when dissolved in the smallest quantity of solution of potassa, it loses its own characteristic odour, and acquires that of the clove pink. Its ingredients are resin, cinnamic acid, and volatile oil, the proportions of which vary in different specimens. The acid was formerly thought to be benzoic; but was proved by Frémy to be the cinnamic. The existence of the former acid in the balsam was denied by that chemist; and, though Deville subsequently obtained benzoic acid from it, yet, according to Kopp, this did not pre-exist in the balsam, but resulted from changes produced in the resin by heat, or the reaction of strong alkaline solutions. The pure volatile oil is a hydrocarbon ($C_{10}H_8$), which is denominated by Kopp *tolene*. According to the same chemist, the resinous matter is of two kinds, one very soluble in alcohol, and

the other but slightly so. (*Journ. de Pharm.*, 3*e sér.* xi. 426.) Guibourt observed that the balsam contains more acid, and is less odorous in the solid form; and thinks that the acid is increased at the expense of the oil. Trommsdorff obtained 88 per cent. of resin, 12 of acid, and only 0·2 of volatile oil. According to Mr. Heaver, the balsam yields by distillation about one-eighth of its weight of pure cinnamic acid. The acid distils over in the form of a heavy oil, which condenses into a white crystalline mass. It may be freed from empyreumatic oil by pressure between folds of bibulous paper, and subsequent solution in boiling water, which deposits it in minute colourless crystals, upon cooling. (See *Am. Journ. of Pharm.*, xv. 77.) According to Frémy, the constitution of this balsam is closely analogous to that of the balsam of Peru, being composed of cinnameine, cinnamic acid, and resin.

Medical Properties and Uses. Balsam of Tolu is a stimulant tonic, with a peculiar tendency to the pulmonary organs. It is given with some advantage in chronic catarrh and other pectoral complaints, in which a gently stimulating expectorant is demanded; but should not be prescribed until after the reduction of inflammatory action. Independently of its medical virtues, its agreeable flavour renders it a popular ingredient in expectorant mixtures. Old and obstinate coughs are said to be sometimes greatly relieved by the inhalation of the vapour, proceeding from an ethereal solution of this balsam. From ten to thirty grains may be given at a dose, and frequently repeated. The best form of administration is that of emulsion, made by triturating the balsam with mucilage of gum Arabic and loaf sugar, and afterwards with water.

Off. Prep. Syrupus Tolutanus; Tinctura Benzoini Composita; Tinctura Tolutani. W.

BARIUM.

Barium.

This is the metallic radical of the earth baryta, and the basis of several officinal compounds. It was first obtained in 1808 by Sir H. Davy, who describes it as a difficultly fusible metal, of a dark-gray colour, effervescing violently with water, and considerably heavier than sulphuric acid. Its eq. is 68·7, and symbol Ba. When exposed to the air, it instantly becomes covered with a crust of baryta, and, when gently heated, burns with a deep red light. The only officinal compounds of barium are the chloride of barium, and the carbonate and sulphate of the protoxide (baryta).

Baryta may be obtained from the native carbonate by intense ignition with carbonaceous matter; or from the native sulphate, by ignition with charcoal, which converts it into sulphuret of barium, subsequent solution of the sulphuret in nitric acid, and strong ignition of the nitrate formed to dissipate the acid. As thus obtained, it is an anhydrous solid, caustic, alkaline, difficultly fusible, and of a grayish-white colour. Its sp. gr. is about 4. It acts on the animal economy as a poison. When sprinkled with water it slakes like lime, becomes hot, and is reduced to the state of a white pulverulent hydrate, containing one eq. of water. The same hydrate is formed in mass, when the anhydrous earth is made into a paste with water, and exposed to a red heat in a platinum crucible. The excess of water is expelled, and the hydrate, undergoing fusion, may be poured out and allowed to congeal. Baryta dissolves in water, and forms the re-agent called *baryta-water*. A boiling saturated solution, as it cools, yields crystals of baryta, containing much water of crystallization.

Baryta consists of one eq. of barium 68·7, and one of oxygen 8=76·7. Its symbol is, therefore, BaO. B.

BARYTÆ CARBONAS. *U. S., Ed., Dub.*

Carbonate of Baryta.

Carbonate de baryte, *Fr.;* Kohlensaurer Baryt, *Germ.;* Barite carbonate, *Ital.;* Carbonato de barito, *Span.*

The officinal carbonate of baryta is the native carbonate, a mineral discovered in 1783 by Dr. Withering, in honour of whom it is called *Witherite.* It is rather a rare mineral. It is found in Sweden and Scotland, but most abundantly in the lead mines of the North of England. It occurs usually in grayish, or pale yellowish-gray, fibrous masses, but sometimes crystallized. Its sp. gr. varies from 4·2 to 4·4. It is generally translucent, but sometimes opaque. It effervesces with acids, and, before the blowpipe, melts into a white enamel without losing its carbonic acid. It is distinguished from the carbonate of strontia, with which it is most liable to be confounded, by its greater specific gravity, and by the absence of a reddish flame upon the burning of alcohol impregnated with its muriatic solution. If the carbonate of baryta contain strontia, the test of the reddish flame will detect its presence. On the animal economy it acts as a poison.

When pure, carbonate of baryta is entirely soluble in muriatic acid. If any sulphate of baryta be present, it will be left undissolved. If neither ammonia nor sulphuretted hydrogen produce discoloration or a precipitate in the muriatic solution, the absence of alumina, iron, copper, and lead is shown. Lime may be detected by adding to the muriatic solution an excess of sulphuric acid, which will throw down the baryta as a sulphate, and afterwards testing the clear liquid with carbonate of soda, which, if lime be present, will produce a precipitate of carbonate of lime.

Carbonate of baryta consists of one eq. of carbonic acid 22, and one of baryta 76·7=98·7. Its only officinal use is to make the chloride of barium.

Off. Prep. Barii Chloridum. B.

BARYTÆ SULPHAS. *Ed., Dub.*

Sulphate of Baryta.

Heavy spar, Baroselenite; Sulfate de baryte, *Fr.;* Schwefelsaurer Baryt, *Germ.;* Barite solfata, *Ital.*

The native sulphate of baryta is used in pharmacy with the same view as the native carbonate; namely, to obtain the chloride of barium. The U. S. Pharmacopœia directs for this purpose the carbonate of baryta; while the Ed. and Dub. Colleges give a separate formula for the use of either the carbonate or sulphate, at the option of the operator. (See *Barii Chloridum.*)

Sulphate of baryta is a heavy, lamellar, brittle mineral, varying in sp. gr. from 4·4 to 4·6. It is generally translucent, but sometimes transparent or opaque, and its usual colour is white or flesh-red. When crystallized, it is usually in very flat rhombic prisms. Before the blowpipe it strongly decrepitates, and melts into a white enamel, which, in the course of ten or twelve hours, falls to powder. It is thus partially converted into sulphuret of barium, and, if applied to the tongue, will give a taste like that of putrid eggs, arising from the formation of sulphuretted hydrogen. This salt, on account of its great insolubility, is not poisonous. When ground to fine powder, it is sometimes mixed with white lead; but it impairs the quality of that pigment. It consists of one eq. of acid 40, and one of baryta 76·7=116·7.

Off. Prep. Barii Chloridum. B.

BELLADONNA. *U. S., Lond., Ed., Dub.*

Belladonna.

The leaves of Atropa Belladonna. *U. S., Lond., Ed.* The leaves and root. *Dub.*

Belladone, *Fr.;* Gemeine Tollkirsche, Wolfskirsche, *Germ.;* Belladonna, *Ital.;* Belladona, Belladama, *Span.*

ATROPA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Solanaceæ.

Gen. Ch. Corolla bell-shaped. *Stamens* distant. *Berry* globular, two-celled. *Willd.*

Atropa Belladonna. Willd. *Sp. Plant.* i. 1017; Woodv. *Med. Bot.* p. 230, t. 82. Carson, *Illust. of Med. Bot.* ii. 19, pl. lxv. The belladonna, or *deadly nightshade*, is an herbaceous perennial plant, with a fleshy creeping root, from which rise several erect, round, purplish, branching stems, to the height of about three feet. The leaves, which are attached by short footstalks to the stem, are in pairs of unequal size, oval, pointed, entire, of a dusky green colour on their upper surface, and paler beneath. The flowers are large, bell-shaped, pendent, of a dull reddish colour, and supported upon solitary peduncles, which rise from the axils of the leaves. The fruit is a roundish berry with a longitudinal furrow on each side, at first green, afterwards red, ultimately of a deep purple colour, bearing considerable resemblance to a cherry, and containing, in two distinct cells, numerous seeds, and a sweetish violet-coloured juice. The calyx adheres to the base of the fruit.

The plant is a native of Europe, where it grows in shady places, along walls, and amidst rubbish, flowering in June and July, and ripening its fruit in September. It grows vigorously, under cultivation, in this country, and retains all its activity, as shown by the observations of Mr. Alfred Jones. (*Am. Journ. of Pharm.*, xxiv. 106.) All parts of it are active. The leaves are the only part directed by the United States, London, and Edinburgh Pharmacopœias; the root also is ordered by the Dublin College. The former should be collected in June or July, the latter in the autumn or early in the spring, and from plants three years old or more.

Properties. The *dried leaves* are of a dull greenish colour, with a very faint, narcotic odour, and a sweetish, subacrid, slightly nauseous taste. The *root* is long, round, from one to several inches in thickness, branched and fibrous, externally when dried of a reddish-brown colour, internally whitish, of little odour, and a feeble sweetish taste. Both the leaves and root, as well as all other parts of the plant, impart their active properties to water and alcohol. Brandes rendered it probable that these properties reside in a peculiar alkaline principle, which he supposed to exist in the plant combined with an excess of malic acid, and appropriately named *atropia*. Besides malate of atropia, Brandes found in the dried herb two azotized principles, a green resin (chlorophylle), wax, gum, starch, albumen, lignin, and various salts. The alkaline principle was afterwards detected by M. Runge; and the fact of its existence was established beyond question by Geiger and Hesse, who obtained it from an extract prepared from the stems and leaves of the plant. It was first, however, procured in a state of purity by Mein, a German apothecary, who extracted it from the root. Lübekind has described, under the name of *belladonnin*, a volatile alkaline principle, wholly distinct from atropia, which he obtained from belladonna; but it yet remains to be seen whether this was not the product of the process. (See *Am. Journ. of Pharm.*, xiii. 127.)

ATROPIA is placed by the London College in its Materia Medica catalogue. It crystallizes in white, silky prisms; is inodorous and of a bitter taste; dissolves easily in absolute alcohol and ether, but very slightly in water, and more freely in all these liquids hot than cold; melts at 194° F., and at 284° is volatilized, a portion being unchanged, but the greater part destroyed. It restores the colour of litmus paper reddened by acids; forms soluble and uncrystallizable salts with sulphuric, nitric, muriatic, and acetic acids; and, in a very dilute solution, produces, when applied to the eye, a speedy and durable dilatation of the pupil. Like the other vegetable alkalies, it consists of nitrogen, carbon, hydrogen, and oxygen, its formula being $NC_{34}H_{23}O_6$.*

Medical Properties and Uses. The action of belladonna is that of a powerful narcotic, possessing also diaphoretic and diuretic properties, and somewhat disposed to operate upon the bowels. Among its first obvious effects, when taken in the usual dose, and continued for some time, are dryness and stricture of the fauces and neighbouring parts, with slight uneasiness or gid-

* The following is the process employed by Mein for procuring atropia. The roots of plants two or three years old were selected. Of these, in extremely fine powder, 24 parts were digested, for several days, with 60 parts of alcohol of 86 or 90 per cent. The liquid having been separated by strong expression, the residue was treated anew with an equal quantity of alcohol; and the tinctures, poured together and filtered, were mixed with one part of hydrate of lime, and frequently shaken for 24 hours. The copious precipitate which now formed was separated by filtering; and diluted sulphuric acid was added drop by drop to the filtered liquor, till slightly in excess. The sulphate of lime having been separated by a new filtration, the alcoholic liquid was distilled to one-half, then mixed with 6 or 8 parts of pure water, and evaporated with a gentle heat till the whole of the alcohol was driven off. The residual liquid was filtered, cautiously evaporated to one-third, and allowed to cool. A concentrated aqueous solution of carbonate of potassa was then gradually added, so long as the liquid continued to be rendered turbid; and the mixture was afterwards suffered to rest some hours. A yellowish resinous substance, which opposes the crystallization of the atropia, was thus precipitated. From this the liquid was carefully decanted, and a small additional quantity of the solution of the carbonate was dropped into it, till it no longer became turbid. A gelatinous mass now gradually formed, which, at the end of twelve or twenty-four hours, was agitated in order to separate the mother waters, then thrown upon a filter, and dried by folds of unsized paper. The substance thus obtained, which was atropia in an impure state, was dissolved in five times its weight of alcohol; and the solution, having been filtered, was mixed with six or eight times its bulk of water. The liquor soon became milky, or was rendered so by evaporating the excess of alcohol, and, in the course of twelve or twenty-four hours, deposited the atropia in the form of light yellow crystals, which were rendered entirely pure and colourless by washing with a few drops of water, drying on blotting paper, and again treating with alcohol as before. From twelve ounces of the root, Mein obtained by this process twenty grains of the pure alkali. (*Journ. de Pharm.*, xx. 87.)

M. Rabourdin, of Orleans, in France, prepares atropia by means of chloroform in the following manner. To each litre (about 2 pints) of the expressed juice of the fresh leaves, deprived of its albumen by heat and filtration, or to a filtered solution of 60 grammes (about 15 drachms) of extract in 200 grammes of distilled water, four grammes of potassa, and thirty grammes of chloroform are added, the whole is shaken for a minute, and then set aside. In half an hour, the chloroform, holding the atropia in solution, is seen at the bottom of the vessel, resembling a greenish oil. The supernatant liquor is decanted, and small portions of water successively added and removed, until it is no longer rendered turbid. The chloroformic solution is then distilled by means of a salt bath, until all the chloroform has passed. The residue is treated with a little water acidulated with sulphuric acid, which dissolves the atropia, leaving a green resinous matter. The solution is then filtered, the atropia precipitated by carbonate of potassa in slight excess, and the precipitate dissolved in rectified alcohol, which, upon evaporation, yields it in beautiful groups of needles. (*Gaz. Méd. de Paris*, Oct. 19, 1850.)

An account of the effects of numerous re-agents upon the muriate of atropia, by Dr. A. Von Planta, may be found in the American Journal of Pharmacy (xxiii. 38), taken originally from Liebig's Annalen.

diness of the head, and more or less dimness of vision. In medicinal doses, it may also occasion dilatation of the pupil, decided frontal headache, slight delirium, colicky pains and purging, and a scarlet efflorescence on the skin; but this last effect is very rare. The practitioner should watch for these symptoms as signs of the activity of the medicine, and should gradually increase the dose till some one of them is experienced in a slight degree, unless the object at which he aims should be previously attained; but so soon as they occur, the dose should be diminished, or the use of the narcotic suspended for a time. In large quantities, belladonna is capable of producing the most deleterious effects. It is in fact a powerful poison, and many instances are recorded, in which it has been accidentally swallowed or purposely administered with fatal consequences. All parts of the plant are poisonous. It is not uncommon, in countries where the belladonna grows wild, for children to pick and eat the berries, allured by their fine colour and sweet taste. Soon after the poison has been swallowed, its peculiar influence is experienced in dryness of the mouth and fauces, burning in the throat and stomach, great thirst, difficult deglutition, nausea and ineffectual retching, loss of vision, vertigo, and intoxication or delirium, attended with violent gestures and sometimes with fits of laughter, and followed by a comatose state. The pupil is dilated and insensible to light, the face red and tumid, the mouth and jaws spasmodically affected, the stomach and bowels insusceptible of impressions, in fact the whole nervous system prostrate and paralyzed. A feeble pulse, cold extremities, subsultus tendinum, deep coma or delirium, and sometimes convulsions, precede the fatal termination. Dissection discloses appearances of inflammation in the stomach and intestines; and it is said that the body soon begins to putrefy, swells, and becomes covered with livid spots, while dark blood flows from the mouth, nose, and ears. The poisonous effects of *atropia* are of the same character, but more quickly induced, showing themselves violently in fifteen or twenty minutes, while those of the belladonna itself are seldom experienced in less than half an hour. In a case recorded by Dr. James Andrew, two-thirds of a grain occasioned the most alarming symptoms, which continued for several days, though the patient ultimately recovered under treatment. (*Ed. Month. Journ. of Med. Sci.*, xiv. 34.) Severe poisonous effects are said to have followed the administration of one-tenth of a grain; and the application of a solution to the conjunctiva has caused alarming constitutional symptoms. To obviate the poisonous influence of belladonna, the most effectual method is to evacuate the stomach as speedily as possible, by means of emetics or the stomach pump, and afterwards to cleanse the bowels by purgatives and enemata. The shocks of an electro-magnetic battery have been found useful in the comatose state. (*N. Y. Journ. of Med.*, N. S., v. 172.) The infusion of galls may possibly be useful as an antidote; and, if the experiments of M. Runge can be relied on, lime-water or the alkaline solutions would render the poisonous matter which might remain in the stomach inert.

Belladonna has been used as a medicine from early times. The leaves were first employed externally to discuss scirrhous tumours, and heal cancerous and other ill-conditioned ulcers; and were afterwards administered internally for the same purpose. Much evidence of their usefulness in these affections is on record, and even Dr. Cullen has spoken in their favour; but this application of the medicine has fallen into disuse. It is at present more esteemed in nervous diseases. It has been highly recommended in hooping-cough, in the advanced stages of which it is undoubtedly sometimes beneficial. In neuralgia it is one of the most effectual remedies in our possession; and it may be em-

ployed to give relief in other painful affections. Hufeland recommends it in the convulsions dependent on scrofulous irritation. It has been prescribed also in nervous colic, chorea, epilepsy, hydrophobia, tetanus, mania, delirium tremens, paralysis, amaurosis, incontinence of urine, rheumatism, gout, dysmenorrhœa, obstinate intermittents, scarlatina, dropsy, and jaundice; and, in such of these affections as have their seat chiefly in the nervous system, it may sometimes do good. It is said to have been effectually employed in several cases of strangulated hernia. It has acquired considerable credit as a preventive of scarlatina; an application of the remedy first suggested by the famous author of the *homœopathic* doctrine; but its efficiency in this way is at best doubtful.

Applied to the eye, belladonna has the property of dilating the pupil exceedingly, and for this purpose is employed by oculists previously to the operation for cataract. Dilatation usually comes on in about an hour, is at its greatest height in three or four hours, and continues often for one or two days, or even longer. In cases of partial opacity of the crystalline lens, confined to the centre of that body, vision is temporarily improved by a similar use of the remedy; and it may also perhaps be beneficially employed, when, from inflammation of the iris, there is danger of a permanent closure of the pupil. For these purposes, a strong infusion of the plant, or a solution of the extract, may be dropped into the eye, or a little of the extract itself rubbed upon the eyelids. The same application has been recommended in morbid sensibility of the eye. The decoction or extract, applied to the neck of the uterus, is asserted to have hastened tedious labour dependent on rigidity of the os tincæ; and spasmodic stricture of the urethra, neck of the bladder, and sphincter ani, anal fissures, and painful uterine affections, have been relieved by the local use of the extract, either smeared upon bougies, or administered by injection. In the latter mode it has relieved strangulated hernia. It is asserted also to be useful in paraphimosis. The inhalation of the vapour from a decoction of the leaves or extract has been recommended in spasmodic asthma. For this purpose, two drachms of the leaves, or fifteen grains of the aqueous extract are employed to the pint of water. Relief is said to have been obtained in phthisis by smoking the leaves, infused when fresh in a strong solution of opium, and then dried.

Belladonna may be given in substance, infusion, or extract. The dose of the powdered leaves is for children from the eighth to the fourth of a grain, for adults one or two grains, repeated daily, or twice a day, and gradually increased till the peculiar effects of the medicine are experienced. An infusion may be prepared by adding a scruple of the dried leaves to ten fluidounces of boiling water, of which from one to two fluidounces is the dose for an adult. The extract is more used in the United States than any other preparation. (See *Extractum Belladonnæ.*)

From its quicker action, more uniform strength, and greater cleanliness, atropia has been recently substituted for extract of belladonna for external use. Of a solution made by dissolving one grain in four fluidrachms of distilled water, by means of a few drops of acetic acid, a single drop applied to the inner surface of the lower lid, causes dilatation of the pupil in fifteen or twenty minutes. As an application in neuralgia, one grain may be mixed with a drachm of lard. The dose for internal use, to begin with, is about one-thirtieth of a grain, which may be gradually increased. But it is almost too powerful for prudent employment in this way; especially, as the effects of belladonna can be readily obtained from the extract.

Off. Prep. Atropiæ Sulphas; Extractum Belladonnæ; Extract. Belladonnæ Alcoholicum; Tinctura Belladonnæ. W.

BENZOINUM. *U. S., Lond., Ed., Dub.*

Benzoin.

The concrete juice of Styrax Benzoin. *U. S.* The balsam from incisions in the bark, hardened in the air. *Lond.* Concrete balsamic exudation. *Ed.* The concrete exudation. *Dub.*

Benjoin, *Fr.;* Benzoe, *Germ.;* Belzoino, *Ital.;* Benjui, *Span.*

The botanical source of benzoin was long uncertain. At one time it was generally supposed in Europe to be derived from the *Laurus Benzoin* of this country. This error was corrected by Linnæus, who, however, committed another, in ascribing the drug to *Croton Benzoë*, a shrub which he afterwards described under the name of *Terminalia Benzoin.* Mr. Dryander was the first who ascertained the true benzoin tree to be a *Styrax;* and his description, published in the 77th vol. of the English Philosophical Transactions, has been copied by most subsequent writers.

Styrax. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Styraceæ.

Gen. Ch. Calyx inferior. *Corolla* funnel-shaped. *Drupe* two-seeded. *Willd.*

Styrax Benzoin. Willd. *Sp. Plant.* ii. 623; Woodv. *Med. Bot.* p. 294, t. 102. This is a tall tree of quick growth, sending off many strong round branches, covered with a whitish downy bark. Its leaves are alternate, entire, oblong, pointed, smooth above, and downy beneath. The flowers are in compound, axillary clusters, nearly as long as the leaves, and usually hang all on the same side upon short slender pedicels.

The benzoin, or *benjamin tree*, is a native of Sumatra, Java, Borneo, Laos, and Siam. (*Ainslie.*) By wounding the bark near the origin of the lower branches, a juice exudes, which hardens upon exposure, and constitutes the *benzoin* of commerce. A tree is thought of a proper age to be wounded at six years, when its trunk is about seven or eight inches in diameter. The operation is performed annually, and the product on each occasion from one tree never exceeds three pounds. The juice which first flows is the purest, and affords the whitest and most fragrant benzoin. It is exported chiefly from Acheen in Sumatra, and comes into the western markets in large masses packed in chests and casks, and presenting externally the impression of the reed mats in which they were originally contained.

Two kinds of benzoin are distinguishable in the market, one consisting chiefly of whitish tears united by a reddish-brown connecting medium, the other of brown or blackish masses, without tears. The first is the most valuable, and has been called *benzoë amygdaloides*, from the resemblance of the white grains to fragments of blanched almonds; the second is sometimes called *benzoë in sortis*—benzoin in sorts—and usually contains numerous impurities. Between these two kinds there is every gradation. We have seen specimens consisting exclusively of yellowish-white homogeneous fragments, which, when broken, presented a smooth, white, shining surface. These were no doubt identical in constitution with the tears of the larger masses.

Properties. Benzoin has a fragrant odour, with very little taste; but, when chewed for some time, leaves a sense of irritation in the mouth and fauces. It breaks with a resinous fracture, and presents a mottled surface of white and brown or reddish-brown; the white spots being smooth and shining, while the remainder, though sometimes shining and even translucent, is usually more or less rough and porous, and often exhibits impurities. In the inferior kinds, the white spots are very few or entirely wanting. Benzoin is easily pulverized, and, in the process of being powdered, is apt to excite sneezing.

Its sp. gr. is from 1·063 to 1·092. When heated, it melts and emits thick, white, pungent fumes, which excite cough when inhaled, and consist chiefly of benzoic acid. It is wholly soluble, with the exception of impurities, in alcohol, and is precipitated by water from the solution, rendering the liquor milky. It imparts to boiling water a notable proportion of benzoic acid. Lime-water and the alkaline solutions partially dissolve it, forming benzoates, from which the acid may be precipitated by the addition of another, having stronger affinity for the base. Its chief constituents are resin and benzoic acid; and it therefore belongs to the balsams. The white tears and the brownish connecting medium are said by Stolze to contain very nearly the same proportion of acid, which, according to Bucholz, is 12·5 per cent., to Stolze 19·8 per cent. In a more recent examination by Kopp, the white tears were found to contain from 8 to 10 per cent. of acid, and the brown 15 per cent. (*Journ. de Pharm.*, 3e *sér.*, iv. 46.) The resin is of three different kinds, one extracted from the balsam with the benzoic acid by a boiling solution of carbonate of potassa in excess, another dissolved by ether from the residue, and the third affected by neither of these solvents. Besides benzoic acid and resin, the balsam contains a minute proportion of extractive, and traces of volatile oil. Benzoin is stated to have the property of retarding the oxidation of fatty matters, and thus preventing rancidity.

Medical Properties and Uses. Benzoin, like the other balsams, is stimulant and expectorant, and was formerly employed in pectoral affections; but, except as an ingredient of the compound tincture of benzoin, it has fallen into almost entire disuse. Trousseau and Pidoux recommend it strongly, in the way of fumigation, in chronic laryngitis. Either the air of the chamber may be impregnated with its vapour by placing a small portion upon some live coals, or the patient may inhale the vapour of boiling water to which the balsam has been added. It is employed in pharmacy for the preparation of benzoic acid (see *Acidum Benzoicum*); and the milky liquor resulting from the addition of water to its alcoholic solution is sometimes used as a cosmetic, under the impression that it renders the skin soft. In the East Indies it is burnt by the Hindoos as a perfume in their temples.*

Off. Prep. Acidum Benzoicum. Tinctura Benzoini Composita. W.

BISMUTHUM. *U.S., Lond., Ed., Dub.*

Bismuth.

Etain de glace, Bismuth, *Fr.;* Wissmuth, *Germ.;* Bismutte, *Ital.;* Bismut, *Span.*

Bismuth occurs usually in the metallic state, occasionally as a sulphuret, and rarely as an oxide. It is found principally in Saxony. It occurs also in

* A styptic liquid, prepared by a Roman pharmaceutist named *Pagliari*, and kept secret for a time, has acquired some reputation among the French army surgeons. It is made by boiling, for six hours, eight ounces of tincture of benzoin (containing about two ounces of the balsam), a pound of alum, and ten pounds of water, in a glazed earthen vessel, stirring constantly, and supplying the loss with hot water. The liquor is then strained and kept in stopped bottles. It is limpid, styptic, of an aromatic smell, and said to have the property of causing an instantaneous coagulation of the blood. (See *Am. Journ. of Med. Sci.*, N. S., xxv. 199.)—*Note to the tenth edition.*

Fumigating pastiles are made from 16 parts of benzoin, 4 of balsam of Tolu, 4 of yellow saunders, 1 of labdanum, 48 of charcoal, 2 of nitre, 1 of tragacanth, 2 of gum Arabic, and 12 of cinnamon water, by reducing the solid ingredients to powder, and mixing the whole into a plastic mass, which is to be formed into cones, flattened at the base, and dried first in the air, and then in a stove. (Soubeiran, *Trait. de Pharm.*, 3e ed. i. 463.)

Cornwall, and has been found at Monroe in Connecticut. It is obtained almost entirely from the native bismuth, which is heated by means of wood or charcoal, whereby the metal is fused and separated from its gangue. Almost all the bismuth of commerce comes from Saxony.

Bismuth was first distinguished as a metal by Agricola in 1520. Before that period it was confounded with lead. It is a brittle, pulverizable, brilliant metal, of a crystalline texture, and of a white colour with a slight reddish tint. Its crystals are in the form of cubes. It undergoes but a slight tarnish in the air. Its sp. gr. is 9·8, melting point 476°, eq. number 213, and symbol Bi. At a high temperature, in close vessels, it volatilizes, and may be distilled over. When heated in the open air to a full red heat, it takes fire, and burns with a faint blue flame, forming an oxide of a yellow colour. This is the *teroxide*, and consists of one eq. of bismuth 213, and three of oxygen 24=237. Formerly the equivalent of this metal was deemed to be 71; but the best authorities now make it three times that number, and, consequently, the former protoxide becomes a teroxide. Bismuth is acted on feebly by muriatic acid, but violently by nitric acid, which dissolves it with a copious extrication of red fumes. Sulphuric acid when cold has no action on it, but at a boiling heat effects its solution with the extrication of sulphurous acid. As it occurs in commerce, it is generally contaminated with a little arsenic. It may be purified from all contaminating metals, by dissolving the bismuth of commerce in diluted nitric acid, precipitating the clear solution by adding it to water, and reducing the white powder thus obtained with black flux. The same precipitate is obtained by adding ammonia to the nitric solution; and, if the supernatant liquor be blue, the presence of copper is indicated. If the precipitate be yellowish, iron is present.

Pharmaceutical Uses, &c. Bismuth, in an uncombined state, is not used in medicine, but is employed pharmaceutically to obtain the subnitrate of bismuth, the only medicinal preparation formed from this metal. In the arts it is used to form a white paint for the complexion, called *pearl white;* and as an ingredient of the best pewter.

Off. Prep. Bismuthi Subnitras. B.

BROMINIUM. *U. S.*

Bromine.

Brome, *Fr.;* Brom, *Germ.;* Bromo, *Ital.*

Bromine is an elementary body, possessing many analogies to chlorine and iodine. It was discovered in 1826 by Balard, a chemist of Montpellier, in the bittern of sea-salt works, in which it exists as a bromide of magnesium. Since then it has been found in the waters of the ocean, in certain marine animals and vegetables, in various aquatic plants, as the water-cress, in numerous salt springs, and, in two instances, in the mineral kingdom—in an ore of zinc, and in the cadmium of Silesia. It has also been detected by M. Mène in the coal-gas liquor of the Paris gas-works. In the United States it was first obtained by Professor Silliman, who found it in the bittern of the salt works at Salina, in the State of New York. It was discovered in the salt springs, near Freeport, Pennsylvania, by Dr. David Alter, who has been engaged for several years in manufacturing it on a large scale. The bittern of the salt springs of this locality is said to afford nine drachms of bromine to the gallon. Bromine has been detected also in the waters of the Saratoga Springs.

Preparation. Bromine may be prepared by passing a current of chlorine through bittern, and then agitating it strongly with a portion of ether. The

chlorine decomposes the bromide of magnesium present in the bittern, forming a chloride of magnesium; and the disengaged bromine dissolves in the ether, to which it communicates a hyacinth-red colour. The ethereal solution of bromine is next decanted, and treated with a concentrated solution of caustic potassa, whereby the bromine is converted into bromide of potassium and bromate of potassa. In the mean time the ether loses its colour and becomes pure, and may be again employed for dissolving fresh portions of bromine. A sufficient quantity of the salts above mentioned having been obtained in this way, their solution is evaporated to dryness, and the dry mass calcined at a red heat, in order to convert the bromate of potassa into bromide of potassium. The bromide is next decomposed by distilling it with sulphuric acid and deutoxide of manganese, from a retort furnished with a bent tube plunging into water contained in a bottle. The acid combines with potassium, and with oxygen derived from the deutoxide of manganese, so as to form sulphate of potassa, and the liberated bromine distils over, and condenses under the water.

Properties. Bromine is a volatile liquid, of a dark-red colour when viewed in mass, but hyacinth-red in thin layers. Its taste is very caustic, and its smell strong and disagreeable, having some resemblance to that of chlorine. Its density is very nearly 3. At 4° below zero it becomes a hard, brittle, crystalline solid, having a dark leaden colour, and a lustre nearly metallic. It boils at about 117°, forming a reddish vapour resembling that of nitrous acid, and of the sp. gr. 5·39. It evaporates readily, a single drop being sufficient to fill a large flask with its peculiar vapour.

Bromine is sparingly soluble in water, to which it communicates an orange colour, more soluble in alcohol, and still more so in ether. Its alcoholic and ethereal solutions lose their colour in a few days, and become acid from the generation of hydrobromic acid. It bleaches vegetable substances like chlorine, destroys the colour of sulphate of indigo, and decomposes organic matters. Its combination with starch has a yellow colour. It corrodes the skin and gives it a deep yellow stain. Bromine is intermediate in its affinities between chlorine and iodine; since its combinations are decomposed by chlorine, while, in its turn, it decomposes those of iodine. Its eq. number is 78·4 and its symbol Br. It forms acids with both oxygen and hydrogen, called bromic and hydrobromic acids, which are analogous in properties and composition to the corresponding compounds of chlorine and iodine.

Commercial bromine sometimes contains as much as 6 or 8 per cent. of *bromide of carbon*, as ascertained by M. Poselger. He discovered the impurity by submitting some bromine to distillation, during the progress of which the boiling point rose to 248°. The residuary liquid at this temperature was colourless, and, when freed from a little bromine, proved to be the bromide of carbon in the form of an oily, aromatic liquid.

In testing for bromine in mineral or saline waters, the water is evaporated in order to crystallize most of the salts. The solution, after having been filtered, is placed in a narrow tube, and a few drops of strong chlorine water are added. If this addition produces an orange colour, bromine is present. The water examined, in order that the test may succeed, must be free from organic matter, and the chlorine not added in excess. Bromine may be detected in marine vegetables by carbonizing them in a covered crucible, exhausting the charcoal, previously pulverized, with boiling distilled water, precipitating any alkaline sulphuret present in the solution by sulphate of zinc, and then adding successively a few drops of nitric acid and a portion of ether, shaking the whole together. If bromine be present, it will be set free and dissolve in the ether, to which it will communicate an orange colour. (*Dupasquier.*) According to Reynoso, a more delicate test is furnished by oxidized water, which liberates bromine from its compounds, without reacting

on it when free. The mode of proceeding is as follows. Put a piece of deutoxide of barium in a test tube, and add to it successively distilled water, pure muriatic acid, and ether. The materials are here present for generating oxidized water, and so soon as bubbles are seen to rise to the surface, the substance suspected to contain bromine is added, and the whole shaken together. If a bromide be present, the muriatic will give rise to hydrobromic acid, and the oxidized water acting on this, will set free the bromine, which will dissolve in the ether, and give it a yellow tint.

Medical Properties. Bromine, from its analogy to iodine, was early tried as a remedy, and the result has demonstrated its value as a therapeutic agent. It acts like iodine, by stimulating the lymphatic system and promoting absorption. It has been employed in bronchocele, scrofulous tumours and ulcers, amenorrhœa, chronic diseases of the skin, and hypertrophy of the ventricles. For a list of the diseases in which bromine and its preparations have been tried, the reader is referred to the Essay of Dr. Glover in the *Ed. Med. and Surg. Journ.* for Oct. 1842, an abstract of which is given in the *Med. Exam.* v. 712. Magendie recommends it in cases in which iodine does not operate with sufficient activity, or has lost its effect by habit. The form in which it is employed is aqueous solution, the dose of which, containing one part of bromine to forty of distilled water, is about six drops taken several times a day. When used as a wash for ulcers, from ten to forty minims of bromine may be added to a pint of water. Of its compounds the bromides of potassium, iron, and mercury, have been chiefly tried as medicines.

Bromine, in an overdose, acts as an irritant poison. The best antidote, according to Mr. Alfred Smee, is ammonia. A case of poisoning by this substance, which proved fatal in seven hours and a half, is related by Dr. J. R. Snell, of Long Island, N. Y. The amount swallowed was about an ounce, and the symptoms generally were those produced by the irritant poisons, such as violent inflammation of the lips, mouth, tongue, and œsophagus, attended with incessant burning pain, and followed, in two hours and a half, by prostration, which became more and more extreme until the patient expired. (*New York Journ. of Med.* for Sept. 1850.)

Off. Prep. Potassii Bromidum. B.

BUCHU. *U. S., Lond., Dub.*

Buchu.

The leaves of Barosma crenata, and other species of Barosma. *U. S.* The leaves of Barosma crenulata, and B. serratifolia. *Lond.* The leaves of Barosma crenata. *Dub.*

Off. Syn. BUCKU. Leaves of various species of Barosma. *Ed.*

This medicine consists of the leaves of different plants growing at the Cape of Good Hope, formerly ranked in the genus *Diosma*, but transferred by botanists to the genus *Barosma*, so named from the strong odour of the leaves (βαρυς and οσμη). *B. crenata*, *B. crenulata*, and *B. serratifolia* are described by Lindley as medicinal species. The leaves of these and other Barosmas, and of some *Agathosmas*, are collected by the Hottentots, who value them on account of their odour, and, under the name of *bookoo* or *buchu*, rub them, in the state of powder, upon their greasy bodies.

BAROSMA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Rutaceæ.

Gen. Ch. Calyx five-cleft or five-parted. Disk lining the bottom of the calyx generally with a short scarcely prominent rim. *Petals* five, with short claws. *Filaments* ten; the five opposite the petals sterile, petaloid; the other five longer, subulate. *Style* as long as the petals. *Stigma* minute, five-lobed.

Fruit composed of five cocci, covered with glandular dots at the back. (*Condensed from Lindley.*) These plants are all small shrubs, with opposite leaves and peduncled flowers.

Barosma crenata. Lindley, *Flor. Med.* p. 213.—*Diosma crenata.* De Cand. *Prodrom.* i. 714; Woodv. *Med. Bot.* 3*d ed.* v. 52. This is a slender shrub, with smooth, somewhat angular branches, of a purplish colour. The leaves are opposite, ovate or obovate, acute, serrated and glandular at the edge, coriaceous, and full of small pellucid dots on the under surface. The flowers are white or of a reddish tint, and stand solitarily at the end of short, lateral, leafy shoots. The leaves of this species are now most largely imported.

Properties. The leaves, as found in the shops, are from three quarters of an inch to an inch long, from three to five lines broad, elliptical, lanceolate-ovate, or obovate, sometimes slightly pointed, sometimes blunt at the apex, very finely notched and glandular at the edges, smooth and of a green colour on the upper surface, dotted and paler beneath, and of a firm consistence. Their odour is strong, diffusive, and somewhat aromatic; their taste bitterish, and analogous to that of mint. These properties will distinguish them from senna, with which they might be confounded upon a careless inspection. They are sometimes mixed with portions of the stalks and fruit. Analyzed by Cadet de Gassicourt, they were found to contain in 1000 parts, 6·65 parts of a light, brownish-yellow, and highly odorous volatile oil, 211·7 of gum, 51·7 of extractive, 11 of chlorophylle, and 21·51 of resin. Water and alcohol extract their virtues, which probably depend on the volatile oil and extractive. The latter is precipitated by infusion of galls.

Medical Properties and Uses. Buchu is gently stimulant, with a peculiar tendency to the urinary organs, producing diuresis, and, like all similar medicines, exciting diaphoresis when circumstances favour this mode of action. The Hottentots have long used it in a variety of diseases. From these rude practitioners the remedy was borrowed by the resident English and Dutch physicians, by whose recommendation it was employed in Europe, and has come into general use. It is given chiefly in complaints of the urinary organs, such as gravel, chronic catarrh of the bladder, morbid irritation of the bladder and urethra, disease of the prostate, and retention or incontinence of urine from a loss of tone in the parts concerned in its evacuation. It has also been recommended in dyspepsia, chronic rheumatism, cutaneous affections, and dropsy. From twenty to thirty grains of the powder may be given two or three times a day. The leaves are also used in infusion, in the proportion of an ounce to a pint of boiling water, of which the dose is one or two fluidounces. A tincture has been employed as a stimulant embrocation in local pains. A fluid extract may be prepared by a process similar to that for fluid extract of valerian (see *Extracta Fluida*), eight ounces of the coarsely powdered leaves being used for procuring a pint of the extract. The odour of mint becomes very strong in this fluid extract when kept for some months. The dose is about a fluidrachm.

Off. Prep. Infusum Buchu; Tinctura Buchu. W.

CALAMINA. *U. S.*

Calamine.

Native impure carbonate of zinc. *U. S.*

Lapis calaminaris, *Lat.;* Calamine, *Fr.;* Galmei, *Germ.;* Giallamina, Pietra calaminaria, *Ital.;* Calamina, *Span.*

The term *calamine* is applied by mineralogists indiscriminately to two minerals, scarcely distinguishable by their external characters, the *carbonate*

and *silicate* of zinc. The term, however, in the pharmaceutical sense, refers to the native impure *carbonate* only. The silicate is sometimes called *electric calamine.*

Properties, &c. Calamine is found in various localities, but occurs most abundantly in Germany and England. It is found also in the United States. It usually occurs in compact or earthy masses, or concretions, of a dull appearance, readily scratched by the knife, and breaking with an earthy fracture; but sometimes it is found crystallized. Its colour is very variable; being, in different specimens, grayish, grayish-yellow, reddish-yellow, and, when impure, brown, or brownish-yellow. Its sp. gr. varies from 3·4 to 4·4. Before the blowpipe it does not melt, but becomes yellow and sublimes. When of good quality, it is almost entirely soluble in the dilute mineral acids; and, unless it has been previously calcined, emits a few bubbles of carbonic acid. If soluble in sulphuric acid, it can contain but little carbonate of lime, and no sulphate of baryta. Ammonia, added to the sulphuric solution, throws down a precipitate of the oxide, mixed with the subsulphate, and takes it up again when added in excess. If copper be present, the ammonia will give rise to a blue colour; and, in case of the presence of iron, the alkali will throw down the sesquioxide, not soluble in an excess of the precipitant. The officinal calamine is distinguished from the electric calamine, which is a silicate of zinc, by dissolving in warm nitric acid without gelatinizing, and by not being rendered electric by heat.

Impurities. According to Mr. Robert Brett, calamine, as sold in the English shops, is frequently a spurious mixture containing only traces of zinc. He analyzed six specimens, and found them to contain from 78 to 87·5 per cent. of sulphate of baryta, the rest consisting of sesquioxide of iron, carbonate of lime, sulphate (sulphuret?) of lead, and mere traces of zinc. When acted on by muriatic acid, the spurious calamine, in powder, evolved sulphuretted hydrogen, and was only in small part dissolved, the great bulk of it remaining behind as sulphate of baryta. (*Amer. Journ. of Pharm.*, ix. 173, from the *Brit. Annals of Med.*) The results of Mr. Brett have been confirmed by Dr. R. D. Thomson, Mr. D. Murdock, and Mr. E. Moore. Dr. Thomson thinks the spurious calamine is manufactured of sulphate of baryta and chalk, coloured with Armenian bole. (*Pharm. Journ. and Trans.*, iv. 31.) Mr. Jacob Bell, of London, holds the more probable opinion that it is the native sulphate of baryta, somewhat coloured with iron, which is a mineral having some resemblance to calamine. Mr. Midgley states, indeed, that the miners in England distinguish two calamines, *brass calamine*, which is sold to the makers of brass, and *baryta calamine*, which is really the native amorphous sulphate of baryta, and which is furnished to the druggists in the place of the genuine native carbonate of zinc. Even the genuine calamine of the shops is impure, containing iron and copper, and various earthy matters. That which has been calcined to render it more readily pulverizable, contains little or no carbonic acid. In view of these facts, the revisers of the U. S. Pharmacopœia of 1850 have deemed it proper to introduce, as a new officinal, the *pure* carbonate of zinc, obtained by precipitation. (See *Zinci Carbonas Precipitatus.*)

Composition. The crystallized variety is anhydrous, and consists of one eq. of carbonic acid 22, and one of protoxide of zinc 40·3=62·3. The compact and earthy varieties are said to contain one eq. of water.

Calamine must be brought to the state of impalpable powder before being used in medicine. In this state it forms *prepared calamine*, under which head its medical properties will be noticed. (See *Calamina Præparata.*)

Off. Prep. Calamina Præparata. B.

CALAMUS. *U. S. Secondary.*

Sweet Flag.

The rhizoma of Acorus Calamus. *U. S.*

Off. Syn. CALAMUS AROMATICUS. Rhizoma of Acorus Calamus, var. *a*, vulgaris. *Ed.*

Acorus vrai, Acorus odorant, *Fr.;* Kalmuswurzel, *Germ.;* Calamo aromatico, *Ital., Span.*

ACORUS. *Sex. Syst.* Hexandria Monogynia.—*Nat. Ord.* Acoraceæ.

Gen. Ch. *Spadix* cylindrical, covered with florets. *Corolla* six-petalled, naked. *Style* none. *Capsule* three-celled. *Willd.*

Acorus Calamus. Willd. *Sp. Plant.* ii. 199; Barton, *Med. Bot.* ii. 63. The sweet flag, or calamus, has a perennial, horizontal, jointed, somewhat compressed root (rhizome), from half an inch to an inch thick, sometimes several feet in length, sending off numerous round and yellowish or whitish radicles from its base, and bunches of brown fibres resembling coarse hair from its joints, internally white and spongy, externally whitish with a tinge of green, variegated with triangular shades of light brown and rose colour. The leaves are all radical, sheathing at the base, long, sword-shaped, smooth, green above, but, near their origin from the root, of a red colour, variegated with green and white. The scape or flower-stem resembles the leaves, but is longer, and from one side, near the middle of its length, sends out a cylindrical spadix, tapering at each end, about two inches in length, and crowded with greenish-yellow flowers. These are without calyx, and have six small, concave, membranous, truncated petals. The fruit is an oblong capsule, divided into three cells, and containing numerous oval seeds.

This is an indigenous plant, growing throughout the United States, in low, wet, swampy places, and along the sides of ditches and streams, and flowering in May and June. It is also a native of Europe and Western Asia; and a variety is found in India. The European plant differs slightly from the American. The leaves as well as root have an aromatic odour; but the latter only is employed. It should be collected late in the autumn, or in the spring. After removal from the ground, the roots are washed, freed from their fibres, and dried with a moderate heat. By the process of drying they lose nearly one-half their diameter, but are improved in odour and taste.

Properties. The roots, as found in the shops, are in pieces of various lengths, somewhat flattened, externally wrinkled and of a yellowish-brown colour, and presenting on their under surface numerous minute circular spots, indicating the points at which the radicles were inserted. Their texture is light and spongy, their colour internally whitish or yellowish-white, and their fracture short and rough. A variety imported from Germany consists exclusively of the interior portion of the root. The pieces are usually long, slender, irregularly quadrangular, and of a grayish-white colour; and are prepared by paring off the outer coat with a knife.

The odour of calamus is strong and fragrant; its taste warm, bitterish, pungent, and aromatic. Its active principles are taken up by boiling water. From 100 parts of the fresh root of the European plant, Trommsdorff obtained 0·1 of volatile oil, 2·3 of a soft resin, 3·3 of extractive with a little chloride of potassium, 5·5 of gum with some phosphate of potassa, 1·6 of starch analogous to inulin, 21·5 of lignin; and 65·7 of water. Sixteen ounces of the dried root afforded to Neumann about two scruples of volatile oil. The oil is at first yellow, but ultimately becomes red, and has the smell and taste of calamus. The extractive matter has an acrid and sweetish taste. The root is sometimes attacked by worms, and deteriorates by keeping.

The root of the Indian variety is said to be less thick than the European, and to have a stronger and more pleasant taste and smell.

Medical Properties and Uses. Calamus is a stimulant tonic, possessing the ordinary virtues of the aromatics. It may be taken with advantage in pain or uneasiness of the stomach or bowels arising from flatulence, and is a useful adjuvant to tonic or purgative medicines, in cases of torpor or debility of the alimentary canal. It was probably known to the ancients, and is supposed to have been the ἄχορον of the Greeks; but the *calamus aromaticus* of Dioscorides was a different product, having been derived, according to Dr. Royle, from a species of Andropogon. The medicine is at present much neglected, though well calculated to answer as a substitute for more costly aromatics. The dose in substance is from a scruple to a drachm. An infusion, made in the proportion of an ounce of the root to a pint of boiling water, is sometimes given in the dose of a wineglassful or more. W.

CALCIUM.

Calcium.

This is the metallic radical of lime (protoxide of calcium), and, consequently, forms the basis of all calcareous substances. It is obtained by electrolyzing lime in contact with mercury, and distilling off the mercury from the amalgam of calcium formed; or by passing the vapour of potassium at a red heat over lime, contained in an iron tube, filled with hydrogen. It is a white metal, resembling silver in colour, and requiring a high temperature for its fusion. When sufficiently heated it burns with a white light, unites with oxygen, and forms lime. Its sp. gr. has not been exactly ascertained, but is known to be greater than that of sulphuric acid. Its equivalent number is 20·5, and symbol Ca.

Calcium is a very abundant element in nature, existing in the mineral kingdom, chiefly as a carbonate, in the form of limestone, marble, chalk, and calcareous spar; and as a phosphate and carbonate in organized beings, as an essential part of the bones and shells of animals. It is officinal, in combination, as lime and chloride of calcium, and as a carbonate, phosphate, and hypochlorite of lime. B.

CALCII CHLORIDUM. *U. S., Lond., Dub.*

Chloride of Calcium.

Off. Syn. CALCIS MURIAS. *Ed.*

Muriate of lime, Hydrochlorate of lime; Chlorure de calcium, Hydrochlorate de chaux, *Fr.;* Chlorcalcium, Salzsaurer Kalk, *Germ.*

Chloride of calcium consists of chlorine, united with calcium, the metallic radical of lime. It is placed in the List of the Materia Medica in the U. S. and London Pharmacopœias; but processes for preparing it are given by the Edinburgh and Dublin Colleges. It may be readily formed by saturating muriatic acid with chalk or marble, evaporating to dryness, and heating to redness. The muriatic acid, by reacting with the lime, forms chloride of calcium and water, the latter of which is dissipated at a red heat. In making this preparation, the Edinburgh College uses white marble in fragments, and obtains the chloride in crystals, by evaporating the solution resulting from the saturation to one-half, and setting it aside in a cold place. The process of the Dublin Pharmacopœia of 1850 is as follows, Imperial measure being used.

"Take of Chalk, in small fragments, two pounds [*avoird.*]; Pure Muriatic Acid two pints and a half; Distilled Water six pints; Slaked Lime, as much as

is sufficient. Into the Acid, first diluted with the Water, introduce the Chalk in successive portions, and when the effervescence has ceased, boil for ten minutes. Add now, stirring well, a very slight excess of slaked Lime, and throw the whole upon a calico filter. Acidulate the filtered solution slightly by adding a few drops of muriatic acid; then evaporate to dryness, and expose the residuum to a low red heat in a Hessian crucible. Finally, reduce the product rapidly to a coarse powder in a warm mortar, and enclose it in a well stopped bottle."

Properties. Chloride of calcium, in the fused or anhydrous state, as it is directed or understood to be in the U. S., London, and Dublin Pharmacopœias, is a colourless, slightly translucent, hard and friable solid, of an acrid, bitter, saline taste, extremely deliquescent, very soluble in water, and readily soluble in rectified spirit. On account of its avidity for water, the fused salt is used for drying gases, and for bringing alcohol to its highest degree of concentration. The crystallized salt, as directed by the Edinburgh College, is also very deliquescent, and has the form of colourless, transparent, striated, six-sided prisms. The crystals, on exposure to heat, first dissolve in their water of crystallization, and, after this has evaporated, undergo the igneous fusion. With ice or snow they form a powerful frigorific mixture. Solution of chloride of calcium, when pure, yields no precipitate with ammonia, chloride of barium, or ferrocyanuret of potassium dissolved in a large quantity of water. The non-action of these tests severally shows the absence of magnesia, sulphuric acid, and iron.

Chloride of calcium exists in solution in the water of the ocean and of many springs. It is usually associated with common salt and chloride of magnesium, from which it is separated with difficulty. It consists of one eq. of chlorine 35·42, and one of calcium 20·5 = 55·92. When crystallized, it contains six eqs. of water = 54.

Chloride of calcium is used medicinally in solution only. In this state it is named officinally *Liquor Calcii Chloridi*, under which title its medicinal properties are given. As a chemical agent it is employed by the Edinburgh College for purifying ether and spirit of nitric ether, by the Dublin for preparing morphia, and by the London in making chloroform.

Off. Prep. Calcis Carbonas Præcipitatum; Liquor Calcii Chloridi; Morphiæ Murias; Pulvis Antimonialis, *Dub.* B.

CALX. *U. S., Lond., Ed.*

Lime.

Lime recently prepared by calcination. *U. S., Lond.*

Off. Syn. CALX RECENS USTA. *Fresh-burned Lime; Quicklime. Dub.*

Quicklime; Chaux, Chaux vive, *Fr.;* Kalk, *Germ.;* Calce, *Ital.;* Calviva, *Span.*

Lime, which ranks among the alkaline earths, is a very important pharmaceutical agent, and forms the principal ingredient in several standard preparations. The Edinburgh College gives a process for its preparation; but in the United States, London, and Dublin Pharmacopœias, it is placed exclusively in the list of the Materia Medica.

Lime is a very abundant natural production. It is never found pure, but mostly combined with acids, as with carbonic acid in chalk, marble, calcareous spar, limestone, and shells; with sulphuric acid in the different kinds of gypsum; with phosphoric acid in the bones of animals; and with silica in a great variety of minerals.

Preparation. Lime is prepared by calcining, with a strong heat, some form of the native carbonate. The carbonic acid is thus expelled, and the lime remains behind. When the lime is intended for nice chemical operations, it should be obtained from pure white marble, or from oyster shells. For the purposes of the arts it is procured from common limestone, by calcining it in kilns of peculiar construction. When obtained in this way, it is generally impure, being of a grayish colour, and containing alumina, silica, sesquioxide of iron, and occasionally a little magnesia and oxide of manganese.

The officinal lime of the United States, London, and Dublin Pharmacopœias is the lime of commerce, and, therefore impure. That obtained by the process of the Edinburgh College is purer. The Edinburgh directions are to expose white marble, broken into small fragments, in a covered crucible, to a full red heat for three hours; or till the residuum, when slaked and suspended in water, no longer effervesces on the addition of muriatic acid.

Properties. Lime is a grayish-white solid, having a strong, caustic, alkaline taste, and the sp. gr. 2·3. It is very refractory in the fire, having been fused only by the compound blowpipe of Dr. Hare. Exposed to the air, it absorbs moisture and carbonic acid, and falls into a white powder. In this state, it is a mixture of carbonate and hydrate. On account of its liability to change by being kept, lime intended for pharmaceutical purposes should be recently burnt. It acts upon vegetable colours as a strong alkaline base. Upon the addition of water, it cracks and falls into powder, with the evolution of heat. If it dissolve in muriatic acid without effervescence, the fact shows the absence of carbonic acid, and that the lime has been well burnt. If any silica be present, it will remain undissolved by the muriatic acid. If the solution give no precipitate with ammonia, the absence of iron and alumina is shown.

Lime is but sparingly soluble in water, requiring at 60° about seven hundred times its weight of that liquid for complete solution. Contrary to the general law, it is less soluble in hot than in cold water. The solution is called lime-water. (See *Liquor Calcis.*) When lime is mixed in excess with water, so as to form a thick liquid, the mixture is called *milk of lime.*

Lime is the protoxide of calcium, and consists of one eq. of calcium 20·5, and one of oxygen 8=28·5. (See *Calcium.*) It is distinguished from the other alkaline earths by forming a very deliquescent salt (*chloride of calcium*) by reaction with muriatic acid, and a sparingly soluble one with sulphuric acid. All acids, acidulous, ammoniacal, and metallic salts, borates, alkaline carbonates, and astringent vegetable infusions are incompatible with it.

Medical Properties. Lime acts externally as an escharotic, and was formerly applied to ill-conditioned ulcers. Mixed with potassa, it forms an officinal caustic. (See *Potassa cum Calce.*) As an internal remedy it is always administered in solution. (See *Liquor Calcis.*)

Pharm. Uses. Lime is used as a chemical agent to prepare Æther Sulphuricus, *Dub.;* Alcohol, *Ed., Dub.;* Ammoniæ Aqua Fortior; Chloroformum; Ferri Pulvis; Liquor Ammoniæ; Liquor Potassæ; Liquor Sodæ; Potassæ Sulphas; Quiniæ Sulphas; Spiritus Ætheris Nitrici; Spiritus Ammoniæ; Strychnia; Sulphur Præcipitatum.

Off. Prep. Calcii Chloridum; Liquor Calcis; Potassa cum Calce.

B.

CALX CHLORINATA. *U. S., Lond., Ed., Dub.*

Chlorinated Lime.

A compound resulting from the action of chlorine on hydrate of lime, and containing at least twenty-five per cent. of chlorine. *U. S.*

Chloride of lime, Hypochlorite of lime, Oxymuriate of lime, Bleaching powder; Calcis chloridum, Calcis hypochloris, *Lat.;* Chlorure de chaux, *Fr.;* Chlorkalk, *Germ.;* Cloruro de calce, *Ital.*

This compound was originally prepared and brought into notice as a bleaching agent, in 1798, by the late Mr. Tennant of Glasgow. Subsequently it was found to have valuable properties as a medicine and disinfectant, and, accordingly, it has been successively introduced into the London, Edinburgh, United States, and Dublin Pharmacopœias.

The following is an outline of the process for preparing chlorinated lime on the large scale. An oblong square chamber is constructed, generally of siliceous sandstone, the joints being secured by a cement of pitch, rosin, and dry gypsum. At one end it is furnished with an air-tight door, and on each side with a glass window, to enable the operator to inspect the process during its progress. The slaked or hydrated lime is sifted, and placed on wooden trays eight or ten feet long, two broad, and one inch deep. These are piled within the chamber to a height of five or six feet on cross-bars, by which they are kept about an inch asunder, in order to favour the circulation of the gas over the lime. The chlorine is generated in a leaden vessel nearly spherical, the lower portion of which is surrounded with an iron case, leaving an interstice two inches wide, intended to receive steam for the purpose of producing the requisite heat. In the leaden vessel are five apertures. The first is in the centre of the top, and receives a tube which descends nearly to the bottom, and through which a vertical stirrer passes, intended to mix the materials, and furnished, at the lower end, with horizontal cross-bars of iron, or of wood sheathed with lead. The second is for the introduction of the common salt and manganese. The third admits a syphon-shaped funnel, through which the sulphuric acid is introduced. The fourth is connected with a pipe to lead off the chlorine. The fifth, which is near the bottom, receives a discharge pipe, passing through the iron case, and intended for drawing off the residuum of the operation. The pipe leading off the chlorine terminates under water, in a leaden chest or cylinder, where the gas is washed from muriatic acid. From this intermediate vessel, the chlorine finally passes, by means of a pretty large leaden pipe, through the ceiling of the chamber containing the lime. The process of impregnation generally lasts four days, this time being necessary to form a good bleaching powder. If it be hastened, heat will be generated, which will favour the production of chloride of calcium, with a proportional diminution of chloride of lime.

The proportions of the materials employed for generating the chlorine vary in different manufactories. Those generally adopted are 10 cwt. of common salt, mixed with from 10 to 14 cwt. of deutoxide of manganese; to which are added, in successive portions, from 12 to 14 cwt. of strong sulphuric acid, diluted before being used until its sp. gr. is reduced to about 1·65, which will be accomplished by adding about one-third of its weight of water. In manufactories in which sulphuric acid is also made, the acid intended for this process is brought to the sp. gr. of 1·65 only, whereby the expense of further concentration is saved.

Properties. Chlorinated lime is a dry or but slightly moist, grayish-white, pulverulent substance, possessing an acrid, hot, bitter, astringent taste, and an odour resembling that of chlorine. It possesses powerful bleaching properties. When perfectly saturated with chlorine, it dissolves almost entirely in water; but, as ordinarily prepared, a large proportion is insoluble, consisting of hydrate of lime. When exposed to heat, it gives off oxygen and some chlorine, and is converted into chloride of calcium. It is incompatible with the mineral acids, with carbonic acid, and the alkaline carbonates. The

acids evolve chlorine copiously, and the alkaline carbonates cause a precipitate of carbonate of lime. (See *Liquor Sodæ Chlorinatæ.*)

Chlorinated lime acts as a powerful oxidizing agent, the oxygen being derived from decomposed water, the hydrogen of which unites with the chlorine to form muriatic acid. It has a powerful action also on organic matter, converting sugar, starch, cotton, linen, and similar substances into formic acid, which unites with the lime. (*W. Bastick.*)

Composition. According to Dr. Ure, the bleaching powder consists of hydrate of lime and chlorine, united in variable proportions, not correspondent to equivalent quantities. According to Brande, Grouvelle, and Phillips, the compound obtained when chlorine ceases to be absorbed, consists of one eq. of chlorine and two of hydrate of lime, resolvable, by water, into one eq. of hydrated chloride of lime which dissolves, and one of hydrate of lime which is left. Dr. Thomson, however, asserts that the compound has been so much improved in quality, that good samples consist of single equivalents of chlorine and lime, and are almost entirely soluble in water. Its ultimate constituents, exclusive of the elements of water, may, therefore, be considered to be one eq. of chlorine, one of calcium, and one of oxygen. Three views are taken of the manner in which these elements are united to form the bleaching powder. The first makes it a chloride of lime, the second, hypochlorite of lime with chloride of calcium, and the third, oxychloride of calcium. By doubling the elements present, it is easily shown by symbols, that the several views taken do not change the ultimate composition of the compound; for $2(CaO,Cl)=CaO,ClO+CaCl$ or $2Ca\left\{\begin{matrix}O\\Cl\end{matrix}\right.$.

The simplest view of the nature of the bleaching powder is that which supposes it to be a compound of chlorine and lime. The view which makes it a hypochlorite is that of Balard, and is supported by the fact that the compound smells of hypochlorous acid. On the other hand, if it contain chloride of calcium it ought to deliquesce; unless it can be shown that the metallic chloride is in such a state of combination as to prevent this result. The third view, that it is an oxychloride, which assimilates its nature to that of the deutoxide of calcium, is held by Millon. According to this chemist, the quantity of chlorine, taken up by a metallic protoxide, is regulated by the nature of its peroxide. The peroxide of calcium is a deutoxide (CaO_2); and Millon contends that, in forming the bleaching powder, the lime takes up but one eq. of chlorine, corresponding to the second eq. of oxygen in the deutoxide, thus generating the compound $Ca\left\{\begin{matrix}O\\Cl\end{matrix}\right.$. Again, the peroxide of potassium is represented by KO_3, and Millon states that the bleaching compound which potassa (KO) forms with chlorine, is $K\left\{\begin{matrix}O\\Cl_2\end{matrix}\right.$. If further observation should show that the number of equivalents of chlorine, necessary to convert a protoxide into a bleaching compound, is always equal to the number of equivalents of oxygen required to convert it into a peroxide, it will go far to prove the correctness of Millon's views.

On the supposition that the bleaching powder is a hypochlorite of lime with chloride of calcium, the mode of its formation is thus explained. Two eqs. of chlorine, by uniting separately with the elements of one eq. of lime, form one eq. of chloride of calcium, and one of hypochlorous acid, the latter of which combines with an additional eq. of lime, to form hypochlorite of lime.

Impurities and Tests. Chlorinated lime may contain a great excess of lime, from imperfect impregnation with the gas. This defect will be shown by the large proportion insoluble in water. If it contain much chloride of calcium, it will be quite moist, which is always a sign of inferior quality. If

long and insecurely kept, it deteriorates from the gradual formation of chloride of calcium and carbonate of lime. Several methods have been proposed for determining its bleaching power, which depends solely on the proportion of loosely combined chlorine. Walter proposed to add a solution of the bleaching powder to a standard solution of sulphate of indigo, in order to ascertain its decolorizing power; but the objection to this test is that the indigo of commerce is very variable in its amount of colouring matter. Dr. Ure has proposed muriatic acid to disengage the chlorine over mercury; but this test is liable to the fallacy that it will disengage carbonic acid as well as chlorine; and it has been shown by some unpublished experiments of Prof. Procter of this city, that the amount of disengaged gaseous matter is not in proportion to the decolorizing power. Dalton proposed, as a test, to add a solution of the bleaching powder to one of the sulphate of protoxide of iron, slightly acidulated with muriatic or sulphuric acid, until the odour of chlorine is perceived. Chlorine is not disengaged until the iron is sesquioxidized, and the stronger the bleaching powder, the sooner this will be accomplished. A more delicate way of ascertaining when all the iron is sesquioxidized, is to test a drop of the liquid with one of a solution of ferridcyanuret of potassium (red prussiate of potassa). So long as any protoxide of iron remains in the liquid, this salt will occasion a blue precipitate (*Turnbull's Prussian blue*), but not afterwards. This test for chlorinated lime has been adopted in the U. S. Pharmacopœia of 1850, and is applied as follows. "When 40 grains of it, triturated with a fluidounce of distilled water, are well shaken with a solution of 78 grains of crystallized sulphate of protoxide of iron, and 10 drops of sulphuric acid, in two fluidounces of distilled water, a liquid is formed which does not yield a blue precipitate with ferridcyanuret of potassium (red prussiate of potassa)." The chlorinated lime of the U. S. Pharmacopœia is directed to contain at least twenty-five per cent. of chlorine. If it be to this extent chlorinated, 40 grains will contain enough chlorine to cause the sesquioxidation of all the protoxide of iron in 78 grains of crystallized sulphate of iron; but if impregnated with chlorine to a less extent, some of the protoxide will remain unchanged, and, consequently, a blue precipitate will be formed with the ferridcyanuret.

The following is the test given by the Edinburgh College. "Fifty grains are nearly all soluble in two fluidounces of water, forming a solution of the density 1·027, and of which one hundred measures, treated with an excess of oxalic acid, give off much chlorine, and, if then boiled and allowed to rest twenty-four hours, yield a precipitate which occupies nineteen measures of the liquid." The principle of this test is to infer the amount of lime, and, therefore, of chlorine present from the bulk of the oxalate of lime precipitated; and assuming the chlorinated lime to be dry, and, therefore, free from chloride of calcium, it would follow that the quantity of oxalate of lime, thrown down by oxalic acid from the part of the powder soluble in water, would be proportional to the lime present, and, therefore, to the chlorine combined with it. But it is well known that chloride of calcium is a common impurity in chlorinated lime; and, whenever present, the precipitated oxalate of lime would be increased in amount, without indicating a proportional increase of chlorine united with lime.

Medical Properties and Uses. Chlorinated lime, externally applied, is a desiccant and disinfectant, and has been used with advantage, in solution, as an application to ill-conditioned ulcers, burns, chilblains, and cutaneous eruptions, especially itch; as a gargle in putrid sorethroat; and as a wash for the mouth to disinfect the breath, and for ulcerated gums. Internally, it is a stimulant and astringent. It has been employed by Dr. Reid in the epidemic typhoid fever of Ireland; by the same practitioner in dysentery, both by the

mouth and injection, with the effect of correcting the fetor, and improving the appearance of the stools; by Cima, both internally and externally in scrofula; and by Dr. Varlez of Brussels in ophthalmia. Dr. Pereira has used a weak solution very successfully in the purulent ophthalmia of infants. In the febrile cases Dr. Reid found it to render the tongue cleaner and moister, to check diarrhœa, and induce sleep. The dose internally is from three to six grains, dissolved in one or two fluidounces of water, filtered, and sweetened with syrup. It should never be given in pills. As it occurs of variable quality, and must be used in solution more or less dilute, according to the particular purpose to which it is to be applied, it is impossible to give any very precise directions for its strength as an external remedy. From one to four drachms of the powder added to a pint of water, and the solution filtered, will form a liquid within the limits of strength ordinarily required. For the cure of itch, M. Derheims has recommended a much stronger solution—three ounces of the chloride to a pint of water, the solution being filtered, and applied several times a day as a lotion, or constantly by wet cloths. When applied to ulcers, their surface may be covered with lint dipped in the solution. When used as an ointment, to be rubbed upon scrofulous enlargements of the lymphatic glands, it may be made of a drachm of the chloride to an ounce of lard. Chlorinated lime is less eligible for some purposes than the solution of chlorinated soda. (See *Liquor Sodæ Chlorinatæ.*)

In consequence of its powers as a disinfectant, chlorinated lime is a very important compound in its application to medical police. It possesses the property of preventing or arresting animal and vegetable putrefaction, and, perhaps, of destroying pestilential and infectious miasms. It may be used with advantage for preserving bodies from exhaling an unpleasant odour before interment in the summer season. In juridical exhumations its use is indispensable; as it effectually removes the disgusting and insupportable fetor of the corpse. The mode in which it is applied in these cases, is to envelop the body with a sheet completely wet with a solution, made by adding about a pound of the chloride to a bucketful of water. It is employed also for disinfecting dissecting rooms, privies, common sewers, docks, and other places which exhale offensive effluvia. In destroying contagion and infection, it appears to be highly useful. Hence hospitals, alms-houses, jails, ships, &c., may be purified by its means. In short, all places deemed infectious from having been the receptacle of virulent disease, may be more or less disinfected by its use, after having undergone the ordinary processes of cleansing.

Chlorinated lime acts exclusively by its chlorine, which, being loosely combined, is disengaged by the slightest affinities. All acids, even the carbonic, disengage it; and, as this acid is a product of animal and vegetable decomposition, noxious effluvia furnish the means, to a certain extent, of their own disinfection. But the stronger acids disengage the chlorine far more readily, and, among these, sulphuric acid is the most convenient. Accordingly, the powder may be dissolved in a very dilute solution of this acid, or a small quantity of the acid may be added to an aqueous solution ready formed, if a more copious evolution of chlorine is desired than that which takes place from the mere action of the carbonic acid of the atmosphere.

Chlorinated lime may be advantageously applied to the purpose of purifying offensive water, a property which makes it invaluable on long voyages. When used for this purpose, from one to two ounces of the chloride may be mixed with about sixty-five gallons of the water. After the purification has been effected, the water must be exposed for some time to the air and allowed to settle, before it is fit to drink.

Off. Prep. Calcis Chlorinatæ Liquor; Chloroformum; Liquor Sodæ Chlorinatæ. B.

CAMPHORA. *U. S., Lond., Ed., Dub.*

Camphor.

A peculiar concrete substance derived from Camphora officinarum, and purified by sublimation. *U. S., Lond.* The camphor. *Ed., Dub.*

Camphre, *Fr.;* Kampher, *Germ.;* Canfora, *Ital.;* Alcanfor, *Span.*

The name of camphor has been applied to various concrete, white, odorous, volatile products, found in different aromatic plants, and resulting probably from some chemical change in their volatile oil. But commercial camphor is derived exclusively from two plants, the *Camphora officinarum* of Nees or *Laurus Camphora* of Linnæus, and the *Dryobalanops Camphora;* the former of which yields our officinal camphor, the latter, a product much valued in the East, but unknown in the commerce of this country and of Europe. A considerable quantity of camphor, said to be identical with the officinal, was a few years since obtained upon the Tenasserim coast, in further India, by subliming the tops of an annual plant, growing abundantly in that region, and thought to be a species of Blumia. This product, however, has not yet been introduced into general commerce. (*Am. Journ. of Pharm.*, xvi. 56.) The Rev. Mr. Mason, an American missionary at Burmah, states in a letter to Mr. Vaux of Philadelphia, that some of the Chinese settlers informed him that the same plant abounds in China, and that camphor is made from it there. (*Proceed. of the Acad. of Nat. Sci. of Phil.*, May 13th, 1851, p. 201.) The following observations apply to the officinal camphor.

Camphora. *Sex. Syst.* Enneandria Monogynia. — *Nat. Ord.* Lauraceæ.

Gen. Ch. Flowers hermaphrodite, panicled, naked. *Calyx* six-cleft, papery, with a deciduous limb. *Fertile stamens* nine, in three rows; the inner with two stalked, compressed glands at the base; anthers four-celled; the outer turned inwards, the inner outwards. Three *sterile stamens* shaped like the first, placed in a whorl alternating with the stamens of the second row; three others stalked, with an ovate glandular head. *Fruit* placed on the obconical base of the calyx. *Leaves* triple-nerved, glandular in the axils of the principal veins. Leaf buds scaly. (Lindley, *Flora Medica*, 332.)

Among the species composing the genus Laurus of Linn., such striking differences have been observed in the structure of the flower and fruit, that botanists have been induced to arrange them in new genera. The camphor, cinnamon, and sassafras trees have been separated from the proper laurels by Nees, and made the types of distinct genera, which have been adopted by most recent writers, and may be considered as well established.

Camphora officinarum. Nees, *Laurin.* 88; Carson, *Illust. of Med. Bot.* ii. 29, pl. lxxiv. — *Laurus Camphora.* Willd. *Sp. Plant.* ii. 478; Woodv. *Med. Bot.* p. 681, t. 236. The camphor tree is an evergreen of considerable size, having the aspect of the linden, with a trunk straight below, but divided above into many branches, which are covered with a smooth, greenish bark. Its leaves, which stand alternately upon long footstalks, are ovate-lanceolate, entire, smooth and shining, ribbed, of a bright yellowish-green colour on their upper surface, paler on the under, and two or three inches in length. The flowers are small, white, pedicelled, and collected in clusters, which are supported by long axillary peduncles. The fruit is a red berry resembling that of the cinnamon. The tree is a native of China, Japan, and other parts of eastern Asia. It has been introduced into the botanical gardens of Europe, and is occasionally met with in our own conservatories.

The leaves have when bruised the odour of camphor, which is diffused

through all parts of the plant, and is obtained from the root, trunk, and branches by sublimation. The process is not precisely the same in all places. The following is said to be the one pursued in Japan. The parts mentioned, particularly the roots and smaller branches, are cut into chips, which are placed, with a little water, in large iron vessels, surmounted by earthen capitals, furnished with a lining of rice-straw. A moderate heat is then applied, and the camphor, volatilized by the steam, rises into the capital, where it is condensed upon the straw. In China, the comminuted plant is said to be first boiled with water until the camphor adheres to the stick used in stirring, when the strained liquor is allowed to cool; and the camphor which concretes, being alternated with layers of earth, is submitted to sublimation.

Commercial History. Camphor, in the *crude* state, is brought to this country chiefly from Canton. It comes also from Batavia, Singapore, Calcutta, and frequently from London. All of it is probably derived originally from China and Japan. Two commercial varieties are found in the market. The cheapest and most abundant is the *Chinese camphor*, most of which is produced in the island of Formosa, and thence taken to Canton. It comes in chests lined with lead, each containing about 130 pounds. It is in small grains or granular masses, of a dirty white colour, and frequently mixed with impurities. It has occurred in commerce adulterated with muriate of ammonia. The other variety is variously called *Japan*, *Dutch*, or *tub* camphor, the first name being derived from the place of its origin, the second from the people through whom it is introduced into commerce, and the third from the recipient in which it is often contained. It comes usually from Batavia, to which port it is brought from Japan. Like the former variety, it is in grains or granular masses; but the grains are larger and of a pinkish colour, and there are fewer impurities, so that it yields a larger product when refined.

Crude camphor, as brought from the East, is never found in the shop of the apothecary. It must be refined before it can be used for medicinal purposes. The process for refining camphor was first practised in Europe by the Venetians, who probably derived it from the Chinese. It was afterwards transferred to the Dutch, who long enjoyed a monopoly of this business; and it is only within a few years that the process has been generally known. It is now practised largely in this country, and the camphor refined in our domestic establishments is equal to any that was formerly imported. Crude camphor is mixed with about one-fiftieth of quicklime, and exposed, in an iron vessel placed in a sand-bath, to a gradually increasing heat, by which it is melted, and ultimately converted into vapour, which condenses in a suitable recipient.* Refined in this manner, it is usually in the form of large circular cakes, one or two inches thick, slightly convex on one side and concave on the other, and perforated in the centre.

* We are informed that the process is conducted in the following manner, in the laboratories of Philadelphia. The vessels in which the camphor is put are of cast iron, circular, from 12 to 15 inches or more in diameter, and 4 inches deep, with perpendicular sides, and a ledge at top on which the cover rests. This consists of sheet iron, with a hole through the centre about an inch in diameter, over which a small hollow cone of sheet iron is placed loosely. The crude camphor, mixed with the lime, the object of which is said to be to combine with the moisture present, which interferes with the due solidification of the camphor vapour, is placed in the iron vessels described, of which from 20 to 50 are arranged in a long sand-bath. Heat is then applied until the camphor melts, after which it is kept as nearly uniform as possible, so that the vaporization may take place regularly, without violent ebullition. The vapour condenses on the lower surface of the lid; and care is taken, by the occasional removal of the iron cone, and clearing of the opening by means of a knife, to allow the escape of any accidental excess of the vapour.—*Note to the ninth edition.*

Properties. Camphor has a peculiar, strong, penetrating, fragrant odour; and a bitter, pungent taste, attended with a slight sense of coolness. It is beautifully white and pellucid, somewhat unctuous to the touch, friable, and yet possessed of a degree of tenacity which renders its reduction to a fine powder very difficult, unless the cohesion of its particles be overcome by the addition of a minute proportion of alcohol, or other volatile liquid for which it has an affinity. It may be obtained in powder also by precipitating its alcoholic solution with water, or by grating and afterwards sifting it. The fracture of camphor is shining, and its texture crystalline. Its sp. gr. varies from 0·9857 to 0·996. When thrown in small fragments on the surface of water, it assumes singular circulatory movements, which cease upon the addition of a drop of oil. Its volatility is so great that, even at ordinary temperatures, it is wholly dissipated if left exposed to the air. When it is confined in bottles, the vapour condenses upon the inner surface, and, when allowed to stand for a long time in large bottles partially filled, sometimes forms large and beautiful crystals. It melts at 288° F. and boils at 400°. (*Turner.*) In close vessels it may be sublimed unchanged. When allowed to concrete slowly from the state of vapour, it assumes the form of hexagonal plates. It is not altered by air and light. It readily takes fire, and burns with a brilliant flame, giving out much smoke, and leaving no residue. Water triturated with camphor dissolves, according to Berzelius, not more than a thousandth part; which, however, is sufficient to impart a decided odour and taste to the solvent. By the intervention of sugar or magnesia, a much larger proportion is dissolved. (See *Aqua Camphoræ.*) Carbonic acid also increases the solvent power of water. Ordinary alcohol will take up seventy-five per cent. of its weight of camphor, which is precipitated upon the addition of water. Berzelius states that 100 parts of alcohol, of the sp. gr. 0·806, dissolve 120 parts at 50° F. It is soluble also without change in ether, the volatile and fixed oils, strong acetic acid, and diluted mineral acids. It is extremely soluble in chloroform. By means of the spirit of nitric ether, it is rendered somewhat more soluble in water. By strong sulphuric and nitric acids it is decomposed; the former carbonizing and converting it into artificial tannin, the latter, with the aid of repeated distillation, giving rise to a peculiar acid called *camphoric.* Alkalies produce very little effect upon it. Resins unite with it, forming a soft tenacious mass, in which the odour of the camphor is sometimes almost extinguished, and frequently diminished; and a similar softening effect results when it is triturated with the concrete oils.* Exposed to a strong

* As this property of camphor may have a bearing injuriously or otherwise on pharmaceutical processes, it is desirable that the operator as well as prescriber should be aware of the degree of effect produced by different resinous substances which may be mixed with camphor. M. Planche has found that mixtures, formed by triturating powdered camphor with powdered *dragon's blood, guaiac, assafetida,* or *galbanum,* assume, and preserve indefinitely the pilular consistence; with *benzoin, tolu, ammoniac,* and *mastic,* though at first of a pilular consistence, afterwards become soft by exposure to the air; with *sagapenum* and *animé,* assume a permanently semi-liquid form; with *olibanum, opopanax, gamboge, euphorbium, bdellium, myrrh,* and *amber,* remain pulverulent though somewhat grumous; and with *tacamahac, resin of jalap, sandarac,* and *resinoid matter of cinchona,* preserve the form of powder indefinitely. The same experimenter observed that camphor loses its odour entirely, when mixed with *assafetida, galbanum, sagapenum, animé,* and *tolu;* retains a feeble odour with *dragon's blood, olibanum, mastic, benzoin opopanax, tacamahac, guaiac,* and *ammoniac;* while, with the other resinous substances above mentioned, it either has its odour increased, or retains it without material change. (*Journ. de Pharm.*, xxiv. 226.)

In mixing camphor with other substances in the form of powder, it is best first to pulverize the camphor with the aid of a little alcohol, then to pulverize the other substances together, and lastly to mix the two powders gently; much rubbing with the

heat in close vessels, camphor is resolved into a volatile oil and charcoal. It is closely analogous in character to the essential oils. According to Dumas, it consists of a radical called *camphene* united with oxygen. Camphene, which is represented by pure oil of turpentine, is composed of ten eqs. of carbon 60, and eight of hydrogen 8=68. With one eq. of oxygen it forms camphor, with four eqs. of the same body, hydrated camphoric acid, and with half an eq. of hydrochloric acid, artificial camphor.*

pestle having the effect of consolidating the granules of the camphor. (Procter, in *Mohr and Redwood's Pharmacy*, Am. ed., p. 492.)

* *Sumatra Camphor. Borneo Camphor. Dryobalanops Camphor.* It has long been known that a variety of camphor is produced in the Islands of Sumatra and Borneo, by a forest tree, which, not having been seen by botanists, remained until a recent period undetermined. It was at length, however, described by Colebrooke, and is now recognised in systematic works as *Dryobalanops Camphora*, or *D. aromatica*. It is a very large tree, often exceeding one hundred feet in height, with a trunk six or seven feet in diameter, and ranking among the tallest and largest trees of India.* It is found in Sumatra and Borneo, and is abundant on the N. W. coast of the former island. The camphor exists in concrete masses, which occupy longitudinal cavities or fissures in the heart of the tree, from a foot to a foot and a half long, at certain distances apart. The younger trees are generally less productive than the old. The only method of ascertaining whether a tree contains camphor is by incision. A party proceeds through the forest, wounding the trees, till they find one which will answer their purpose; and hundreds may be examined before this object is attained. When discovered, the tree is felled and cut into logs, which are then split, and the camphor removed by means of sharp-pointed instruments. It is stated that the masses are sometimes as thick as a man's arm; and that the product of a middling sized tree is nearly eleven pounds; of a large one, double that quantity. The trees which have been wounded, and left standing, often produce camphor seven or eight years afterwards. The Dryobalanops yields also a fragrant straw-coloured liquid, called in the East Indies *oil of camphor*, and highly valued as an external application in rheumatism and other painful affections. It is said to be found in trees too young to produce camphor, and is supposed to constitute the first stage in the development of this substance; as it occupies the cavities in the trunk, which are afterwards filled with the camphor. It has been stated to hold a large portion of this principle in solution, and to yield an inferior variety by artificial concretion; but this was not true of a specimen in the possession of Dr. Christison. A specimen examined by Professor Procter deposited a small quantity of the camphor at a temperature near the zero of Fahrenheit. By mixing its vapour with oxygen gas, or by subjecting it to the action of nitric acid, it may be combined with oxygen and converted into camphor of the same character as that deposited by refrigeration. (*Am. Journ. of Pharm.*, x. 18.) The whole tree is pervaded more or less by the camphor or the oil; as the wood retains a fragrant smell, and, being on this account less liable to the attacks of insects, is highly esteemed for carpenters' work. The camphor-wood trunks, occasionally brought to this country from the East Indies, are probably made out of the wood of the Dryobalanops.

It has been supposed that this variety of camphor is occasionally brought into the markets of Europe and America. But this is a mistake; as the whole produce of the islands is engrossed by the Chinese, by whom it is so highly valued that it commands at Canton, according to Mr. Crawford, seventy-eight times, according to Mr. Reeves, one hundred times the price of ordinary camphor. A specimen in our possession, which was sent to this country from Canton as a curiosity, and kindly presented to us by Dr. Joseph Carson, is in tabular plates of the size of a finger nail or smaller, of a foliaceous crystalline texture, white, somewhat translucent, of an odour analogous to that of common camphor, and yet decidedly distinct, and less agreeable. It has also a camphorous taste. It is more compact and brittle than ordinary camphor; and, though the pieces will often float for a time when thrown on water, yet they sink when thoroughly moistened, and deprived of adhering air. According to Dr. Christison, its

* For a particular description of this tree, see a paper by Dr. W. H. De Vriese, of Leyden, in the *American Journal of Pharm.*, xxiv. 329, taken from Hooker's Journal of Botany. In this paper it is stated, on the authority of Dr. Junghuhn, who witnessed the process of collection, that the camphor is deposited in very small quantities in minute fissures between the fibres, from which it is scraped off by small splinters of wood, or by the nail; and the thickest and oldest trees seldom yield more than two ounces. This account as to the productiveness of the tree differs greatly from that of Colebrooke, as stated in the note above.—*Note to the tenth edition.*

Medical Properties and Uses. Camphor does not seem to have been known to the ancient Greeks and Romans. Europe probably derived it from the Arabians, by whom it was employed as a refrigerant. Much difference of opinion has prevailed as to its mode of action, some maintaining its immediate sedative influence, others considering it as a direct and decided stimulant. Its operation appears to be primarily and chiefly directed to the cerebral and nervous systems; and the circulation, though usually affected to a greater or less extent, is probably involved, for the most part, through the agency of the brain. It acts, also, to a certain extent, as a direct irritant of the mucous membranes with which it is brought into contact, and may thus in some measure secondarily excite the pulse. The effects of the medicine vary with the quantity administered. In moderate doses it produces, in a healthy individual, mental exhilaration, increased heat of skin, and occasional diaphoresis. The pulse is usually increased in fulness, but little, if at all, in force or frequency. According to the experiments of certain Italian physicians, it has a tendency to the urinary and genital organs, producing a burning sensation along the urethra, and exciting voluptuous dreams (*N. Am. Med. and Surg. Journ.*, ix. 442); and these experiments have been confirmed by the observations of Dr. Reynolds in a case of poisoning by camphor (*Brit. Am. Journ. of Med.*, June, 1846). Cullen, however, states that he has employed it fifty times, even in large doses, without having ever observed any effect upon the urinary passages. By many it is believed to allay irritations of the urinary and genital apparatus, and to possess antaphrodisiac properties. In its primary operation, it allays nervous irritation, quiets restlessness, and produces a general placidity of feeling, which renders it highly useful in certain forms of disease attended with derangement of the nervous functions. In larger doses, it displays a more decided action on the brain, producing more or less giddiness and mental confusion, with a disposition to sleep; and, in morbid states of the system, relieving pain and allaying spasmodic action. In immoderate doses it occasions nausea, vomiting, anxiety, faintness, vertigo, delirium, insensibility, coma, and convulsions, which may end in death. The pulse, under these circumstances, is at first reduced in frequency and force (Alexander, *Experimental Essays*, p. 227); but, as the action advances, it sometimes happens that symptoms of strong sanguineous determination to the head become evident, in the flushed countenance, inflamed and fiery eyes, and highly excited pulse (Quarin). In three cases of poisoning by camphor, reported by Schaaf of Strasburg, the symptoms produced were violent and incessant convulsions, paleness and coolness of the surface, vomiting and frequent micturition, and finally stupor or coma. The patients were children, and the youngest, a girl of about eighteen months, died from the effects of the poison, of which she took about ten grains. (*Monthly J. of Med. Sci.*, Oct. 1850, p. 377.) There can be no doubt that camphor is absorbed; as its odour is observed in the breath and perspiration, and, according to Dr. Reynolds, in the urine also, though the contrary has been asserted.

By its moderately stimulating powers, its diaphoretic tendency, and its influence over the nervous system, camphor is admirably adapted to the treatment of diseases of a typhoid character, which combine with the enfeebled condition of the system, a frequent irritated pulse, a dry skin, and much nervous derangement, indicated by restlessness, watchfulness, tremors, subsultus, and

sp. gr. is 1009. It is easily pulverized without the addition of alcohol. It is, moreover, much less disposed to rise in vapour, and to condense on the inside of the bottle containing it. Like ordinary camphor, it is fusible, volatilizable, very slightly soluble in water, and freely soluble in alcohol and in ether. We have never met with it in the drug stores.

low muttering delirium. With a view to its anodyne and narcotic influence, it is also used in diseases of an inflammatory character; as in our ordinary remittents, and the phlegmasiæ, particularly rheumatism, when the increased vascular action is complicated with derangement of the nervous system. In such cases, however, it should never be given until after proper depletion, and even then should be combined with such medicines as may obviate the slight stimulation it produces, and increase its tendency to the skin; as, for instance, tartarized antimony, ipecacuanha, or nitre. In a great number of spasmodic and nervous disorders, and complaints of irritation, camphor has been very extensively employed. The cases of this nature to which experience has proved it to be best adapted, are dysmenorrhœa, puerperal convulsions and other nervous affections of the puerperal state, and certain forms of mania, particularly nymphomania, and that arising from the abuse of spirituous liquors. In some of these cases, advantage may be derived from combining it with opium. Camphor has also been employed internally to allay the irritation of the urinary organs produced by cantharides.

It is much used locally as an anodyne, usually dissolved in alcohol, oil, or acetic acid, and frequently combined with laudanum. In rheumatic and gouty affections, and various internal spasmodic and inflammatory complaints, it often yields relief when applied in this way. The ardor urinæ of gonorrhœa may be alleviated by injecting an oleaginous solution of camphor into the urethra; and the tenesmus from ascarides and dysentery, by administering the same solution in the form of enema. Twenty or thirty grains of camphor, added to a poultice, and applied to the perineum, allays the chordee, which is a painful attendant upon gonorrhœa. The vapour of camphor has been inhaled into the lungs with benefit in asthma and spasmodic cough; and a lump of it held to the nose is said to relieve the coryza of commencing catarrh. It has been employed for the same purpose, and for nervous headache, in the form of powder snuffed up the nostrils. It enters into the composition of certain tooth-powders; but is asserted, when employed in this way, to injure the enamel of the teeth.

Camphor may be given in substance, in the form of bolus or pill, or diffused in water by trituration with various substances. The form of pill is objectionable; as in this state the camphor is with difficulty dissolved in the gastric liquors, and, floating on the top, is apt to excite nausea, or pain and uneasiness at the upper orifice of the stomach. Orfila states that, when given in the solid form, it is capable of producing ulceration in the gastric mucous membrane. The emulsion is almost always preferred. This is made by rubbing up the camphor with loaf sugar, gum Arabic, and water; and the suspension will be rendered more complete and permanent by the addition of a little myrrh. Milk is sometimes used as a vehicle, but is objectionable, from its liability to become speedily sour. The aqueous solution is often employed where only a slight impression is desired. For this purpose, the *Aqua Camphoræ* of the United States Pharmacopœia is preferable to the solution effected by simply pouring boiling water upon a lump of camphor, which is sometimes prescribed under the name of *camphor tea*. When chloroform is not inadmissible, an elegant preparation may be made by dissolving camphor in that liquid, in the proportion of two drachms of the former to a fluidrachm of the latter, and then mixing the solution with water by the intervention of the yolk of an egg, as suggested by Messrs. T. and H. Smith.

The medium dose of camphor is from five to ten grains; but, to meet various indications, it may be diminished to a single grain, or increased to a scruple. The injurious effects of an overdose are said to be best counteracted, after clearing out the stomach, by the use of opium.

Off. Prep. Acidum Aceticum Camphoratum; Aqua Camphoræ; Ceratum Hydrargyri Compositum; Ceratum Plumbi Subacetatis; Linimentum Camphoræ; Liniment. Camphoræ Comp.; Liniment. Hydrargyri; Liniment. Opii; Liniment. Saponis Camphoratum; Liniment. Terebinthinæ; Mistura Camphoræ; Mist. Camphoræ cum Magnesiâ; Tinctura Camphoræ; Tinct. Opii Camphorata; Tinct. Saponis Camphorata. W.

CANELLA. *U. S., Lond., Ed., Dub.*

Canella.

The bark of Canella alba. *U. S., Lond., Ed., Dub.*

Canelle blanche, *Fr.;* Weisser Zimmt, Canell, *Germ.;* Canella bianca, *Ital.;* Canela blanca, *Span.*

CANELLA. *Sex. Syst.* Dodecandria Monogynia.—*Nat. Ord.* Meliaceæ. *De Cand.* Canelleæ. *Lindley.*

Gen. Ch. Calyx three-lobed. *Petals* five. *Anthers* sixteen, adhering to an urceolate nectary. *Berry* one-celled with two or four seeds. *Willd.*

Canella alba. Willd. *Sp. Plant.* ii. 851; Woodv. *Med. Bot.* p. 694, t. 237; Carson, *Illust. of Med. Bot.* i. 24, pl. 16. This is the only species of the genus. It is an erect tree, rising sometimes to the height of fifty feet, branching only at the top, and covered with a whitish bark, by which it is easily distinguished from other trees in the woods where it grows. The leaves are alternate, petiolate, oblong, obtuse, entire, of a dark green colour, thick and shining like those of the laurel, and of a similar odour. The flowers are small, of a violet colour, and grow in clusters upon divided footstalks, at the extremities of the branches. The fruit is an oblong berry, containing one, two, or three black, shining seeds.

Canella alba is a native of Jamaica and other West India Islands. The bark of the branches, which is the part employed in medicine, having been removed by an iron instrument, is deprived of its epidermis, and dried in the shade. It comes to us in pieces partially or completely quilled, occasionally somewhat twisted, of various sizes, from a few inches to two feet in length, from half a line to two or even three lines in thickness, and, in the quill, from half an inch to an inch and a half in diameter.

Properties. Canella is of a pale orange-yellow colour externally, yellowish-white on the inner surface, with an aromatic odour somewhat resembling that of cloves, and a warm, bitterish, very pungent taste. It is brittle, breaking with a short fracture, and yielding, when pulverized, a yellowish-white powder. Boiling water extracts nearly one-fourth of its weight; but the infusion, though bitter, has comparatively little of the warmth and pungency of the bark. It yields all its virtues to alcohol, forming a bright yellow tincture, which is rendered milky by the addition of water. By distillation with water it affords a large proportion of a yellow or reddish, fragrant, and very acrid volatile oil. It contains, moreover, according to the analysis of MM. Petroz and Robinet, mannite, a peculiar very bitter extractive, resin, gum, starch, albumen, and various saline substances. Meyers and Reiche obtained twelve drachms of the volatile oil from ten pounds of the bark. They found it to consist of two distinct oils, one lighter and the other heavier than water. According to the same chemists, the bark contains 8 per cent. of mannite, and yields 6 per cent. of ashes. (See *Am. Journ. of Pharm.*, xvi. 75.) Canella has been sometimes confounded with Winter's bark, from which, however, it differs both in sensible properties and composition. (See *Wintera.*)

Medical Properties and Uses. Canella is possessed of the ordinary properties of the aromatics, acting as a local stimulant and gentle tonic, and pro-

ducing upon the stomach a warming cordial effect, which renders it useful as an addition to tonic or purgative medicines in debilitated states of the digestive organs. It is scarcely ever prescribed except in combination. In the West Indies it is employed by the negroes as a condiment, and has some reputation as an antiscorbutic.

Off. Prep. Pulvis Aloës et Canellæ; Tinctura Gentianæ Composita; Vinum Aloës; Vinum Gentianæ; Vinum Rhei. W.

CANNA. *Ed.*

Canna Starch.

Fecula of the root of an imperfectly determined species of Canna. *Ed.*

Off. Syn. "CANNA EDULIS. The root is supposed to furnish the fecula called *tous les mois.*" *Dub.*

Under the French name of *tous les mois*, a variety of fecula was a few years since introduced into the markets of Europe and this country. It is said to be prepared in the West India island of St. Kitts, by a tedious and troublesome process, from the root or rhizome of *Canna coccinea*, although this botanical origin is altogether uncertain.

Canna starch is in the form of a light, beautifully white powder, of a shining appearance, very unlike the ordinary forms of fecula. Its granules are said to be larger than those of any other variety of starch in use, being from the 300th to the 200th of an inch in length. Under the microscope they appear ovate or oblong, with numerous regular unequally distant rings; and the circular hylum, which is sometimes double, is usually situated at the smaller extremity. (*Pereira.*) This fecula has the ordinary chemical properties of starch, and forms, when prepared with boiling water, a nutritious and wholesome food for infants and invalids. It may be prepared in the same manner as *arrow-root*, and is said to form even a stiffer jelly with boiling water. (See *Maranta.*) W.

CANTHARIS. *U. S., Lond., Ed., Dub.*

Spanish Flies.

Cantharis vesicatoria. *U. S., Lond., Ed., Dub.*

Cantharide, *Fr.;* Spanische Fliege, Kanthariде, *Germ.;* Cantarelle, *Ital.;* Cantharidas, *Span.*

The term *Cantharis* was employed by the ancient Greek writers to designate many coleopterous insects. Linnæus gave the title to a genus in which the officinal blistering fly was not included, and placed this insect in the genus *Meloë.* This latter, however, has been divided by subsequent naturalists into several genera. Geoffroy made the Spanish fly the prototype of a new one which he called *Cantharis*, substituting *Cicindela* as the title of the Linnæan genus. Fabricius altered the arrangement of Geoffroy, and substituted *Lytta* for *Cantharis* as the generic title. The former was adopted by the London College, and at one time was in extensive use; but the latter, having been restored by Latreille, is now recognised in the European and American Pharmacopœias, and is universally employed. By this naturalist the vesicating insects were grouped in a small tribe corresponding very nearly with the Linnæan genus Meloë, and distinguished by the title *Cantharideæ.* This tribe he divided into eleven genera, among which is Cantharis. Two others of these genera, *Meloë* properly so called, and *Mylabris*, have been employed as vesicatories. *Mylabris cichorii* is thought to be one of the in-

sects described by Pliny and Dioscorides under the name of cantharides, and is to this day employed in Italy, Greece, the Levant, and Egypt; and another species, *M. pustulata*, is applied to the same purpose in China. *Meloë proscarabæus* and *M. majalis* have been occasionally substituted for cantharides in Europe, and *M. trianthemæ* is used in the upper provinces of Hindostan. Several species of Cantharis, closely analogous in medical properties, are found in various parts of the world; but *C. vesicatoria* is the only one recognised by the Pharmacopœias of France and Great Britain. A second species, *C. vittata*, has been introduced into that of the United States, and will be noticed under a distinct head. At present we shall confine our observations to *C. vesicatoria*, or the common Spanish fly.

CANTHARIS. *Class* Insecta. *Order* Coleoptera. *Linn.*—*Family* Trachelides. *Tribe* Cantharideæ. *Latreille.*

Gen. Ch. Tarsi entire; *nails* bifid; *head* not produced into a rostrum; *elytra* flexible, covering the whole abdomen, linear semicylindric; *wings* perfect; *maxillæ* with two membranous *laciniæ*, the external one acute within, subuncinate; *antennæ* longer than the head and thorax, rectilinear; first joint largest, the second transverse, very short; *maxillary palpi* larger at tip. *Say.*

Cantharis vesicatoria. Latreille, *Gen. Crust. et Insect., tom.* ii. p. 220. This insect is from six to ten lines in length, by two or three in breadth, and of a beautiful shining golden-green colour. The head is large and heart-shaped, bearing two thread-like, black, jointed feelers; the thorax short and quadrilateral; the wing-sheaths long and flexible, covering brownish membranous wings. When alive, the Spanish flies have a strong, penetrating, fetid odour, compared to that of mice, by which swarms of them may be detected at a considerable distance. They attach themselves preferably to certain trees and shrubs, such as the white poplar, privet, ash, elder, and lilac, upon the leaves of which they feed. The countries in which they most abound are Spain, Italy, and the South of France; but they are found to a greater or less extent in all the temperate parts of Europe, and in the West of Asia. In the state of larva, they live in the ground and gnaw the roots of plants. They usually make their appearance in swarms upon the trees in May and June, when they are collected. The time preferred for the purpose is in the morning at sun-rise, when they are torpid from the cold of the night, and easily let go their hold. Persons with their faces protected by masks, and their hands with gloves, shake the trees, or beat them with poles; and the insects are received as they fall upon linen cloths spread underneath. They are then plunged into vinegar diluted with water, or exposed in sieves to the vapour of boiling vinegar, and, having been thus deprived of life, are dried either in the sun, or in apartments heated by stoves. This mode of killing the flies by the steam of vinegar is as ancient as the times of Dioscorides and Pliny. In some places they are gathered by smoking the trees with burning brimstone. It has been proposed by M. Lutrand to destroy them by the vapour of chloroform. When perfectly dry, they are introduced into casks or boxes, lined with paper and carefully closed, so as to exclude as much as possible the atmospheric moisture.

Cantharides come chiefly from Spain, Italy, Sicily, and other parts of the Mediterranean. Considerable quantities are also brought from St. Petersburg, derived originally, in all probability, from the southern provinces of Russia, where the insect is very abundant. The Russian flies are more esteemed than those from other sources. They may be distinguished by their greater size, and their colour approaching to that of copper.

Properties. Dried Spanish flies preserve the form and colour, and, to a certain extent, the disagreeable odour of the living insect. They have an acrid,

burning, and urinous taste. Their powder is of a grayish-brown colour, interspersed with shining green particles, which are the fragments of the feet, head, and wing-cases. If kept perfectly dry, in well-stopped glass bottles, they will retain their activity for a great length of time. A portion which had been preserved by Van Swieten for thirty years, in a glass vessel, was found still to possess vesicating properties. But, exposed to a damp air, they quickly undergo putrefaction; and this change takes place more speedily in the powder. Hence, the insects should either be kept whole, and powdered as they are wanted for use, or, if kept in powder, should be well dried immediately after pulverization, and preserved in air-tight vessels. They should never be purchased in powder, as, independently of the consideration just mentioned, they may in this state be more easily adulterated. But, however carefully managed, cantharides are apt to be attacked by mites, which feed on the interior soft parts of the body, reducing them to powder, while the harder exterior parts are not affected. An idea was at one time prevalent, that the vesicating property of the insect was not injured by the worm, which was supposed to devour only the inactive portion. But this has been proved to be a mistake. M. Farines, an apothecary of Perpignan, has satisfactorily shown that, though the hard parts left by these mites possess some vesicating power, and the powder produced by them still more, yet the sound flies are much stronger than either. Camphor, which has been recommended as a preservative, does not prevent the destructive agency of the worm.* It is also stated by M. Farines that, when the flies are destroyed by the vapour of pyroligneous acid, instead of common vinegar, they acquire an odour which contributes to their preservation. Cantharides will bear a very considerable heat without losing the brilliant colour of their elytra; nor is this colour extracted by water, alcohol, ether, or the oils; so that the powder might be deprived of all its active principles, and yet retain the exterior characters unaltered. The wing cases resist putrefaction for a long time, and the shining particles have been detected in the human stomach months after interment.

So early as 1778, Thouvenel attempted to analyze cantharides, and the attempt was repeated by Dr. Beaupoil in 1803; but no very interesting or valuable result was obtained till the year 1810, when Robiquet discovered in them a crystalline substance, which appears to be the vesicating principle of the insect, and to which Dr. Thomson gave the name of *cantharidin*. The constituents, according to Robiquet, are, 1. a green oil, insoluble in water, soluble in alcohol, and inert as a vesicatory; 2. a black matter, soluble in water, insoluble in alcohol, and inert; 3. a yellow viscid matter, soluble in water and alcohol, and without vesicating powers; 4. cantharidin; 5. a fatty matter insoluble in alcohol; 6. phosphates of lime and magnesia, acetic acid, and in the fresh insect a small quantity of uric acid. Orfila afterwards discovered a volatile principle, upon which the fetid odour of the fly depends. It is separable by distillation with water. *Cantharidin* is a white substance

* It appears from the experiments of M. Nivet that, though camphor does not preserve the entire fly from the attacks of the larvæ of the *Anthrenus*, it actually destroys the mites of the Cantharis so often found in the powder, and may, therefore, be introduced with advantage, in small lumps, into bottles containing powdered cantharides. (*Journ. de Pharm.*, xix. 604.) Carbonate of ammonia has also been recommended as a preservative. Pereira has found that a few drops of strong acetic acid, added to the flies, are very effectual. Perhaps, however, the best means of preserving them, whether whole or in powder, would be the application of the process of Apert, which consists in exposing them, for half an hour, confined in glass bottles, to the heat of boiling water, which destroys the eggs of the insect, without impairing the virtues of the flies. (*Ibid.*, xxii. 246.) Of course, the access of water to the flies should be carefully avoided. Lutrand recommends chloroform as the best preservative that he has tried. (*Journ. de Pharm. et de Chim.*, xviii. 214.)

in the form of crystalline scales, of a shining micaceous appearance, insoluble in water, nearly so in cold alcohol, but soluble in ether, chloroform, the oils, and in hot alcohol and acetic acid, which deposit it upon cooling.* It is fusible and volatilizable by heat without decomposition, and its vapour condenses in acicular crystals. It is obtained by macerating powdered flies in ether for several days; introducing the mixture into a percolation apparatus; adding, after the liquid has ceased to pass, fresh portions of ether, till it comes away nearly colourless; displacing the whole of the menstruum still remaining in the mass by pouring water upon it; distilling the filtered liquor so as to recover the ether; then allowing the residue to cool; and, finally, purifying the cantharidin which is deposited, by treating it with boiling alcohol and animal charcoal. Alcohol of 34°, or a mixture of alcohol and ether, may be substituted for the ether itself; but the last-mentioned fluid is preferable, as it dissolves less of the green oil, the separation of which from the cantharidin is the most difficult part of the process. By this plan, M. Thierry obtained from 1000 parts of powdered flies, 4 parts of pure cantharidin. Notwithstanding the insolubility of this principle in water and cold alcohol, the decoction and tincture of cantharides have the peculiar medicinal properties of the insect; and Lewis ascertained that both the aqueous and alcoholic extracts acted as effectually in exciting vesication as the flies themselves, while the residue was in each case inert. Cantharidin consequently exists in the insect, so combined with the yellow matter as to be rendered soluble in water and cold alcohol. It has been found also in Cantharis vittata, Mylabris cichorii, and different species of Meloë.†

Adulterations. These are not common. Occasionally other insects are added, purposely, or through carelessness. These may be readily distinguished by their different shape or colour. Flies exhausted of their cantharidin by ether are said to have been substituted for the genuine. An account has been published of considerable quantities of variously coloured glass beads having been found in a parcel of the drug; but this would be too coarse a fraud to be extensively practised. Pereira states that powdered flies are sometimes adulterated with euphorbium.

Medical Properties and Uses. Internally administered, cantharides are a powerful stimulant, with a peculiar direction to the urinary and genital organs. In moderate doses, this medicine sometimes acts as a diuretic, and generally excites some irritation in the urinary passages, which, if its use be persevered in, or the dose increased, often amounts to violent strangury, attended with excruciating pain, and the discharge of bloody urine. In still larger quan-

* The solubilities of cantharidin have been examined with great care by Professor Procter, with the following results. It is insoluble in water. Cold alcohol dissolves it slightly, hot alcohol freely. It is more soluble in ether, which also dissolves it more freely hot than cold. Chloroform, cold or hot, is its best solvent; and acetone ranks next to it in this respect. Olive oil, at 250° F., dissolves one-twentieth of its weight, and oil of turpentine, boiling hot, one-seventieth; and both deposit the greater portion on cooling. The olive oil solution after deposition vesicates, the terebinthinate does not. Strong acetic, sulphuric, and nitric acids dissolve it, with the aid of heat, and deposit it unchanged on cooling. It is also dissolved by solutions of potassa and soda, and to a small extent by strong solution of ammonia. (*Am. Journ. of Pharm.*, xxiv. 296.) —*Note to the tenth edition.*

† Professor Procter informs us that he has succeeded, by means of chloroform, in isolating cantharidin with great facility. He treats the flies with chloroform by percolation, displacing the last portions by means of alcohol, and allows the resulting solution to evaporate spontaneously. Cantharidin is thus obtained in crystals mixed with the green oil, the greater portion of which may be removed by bibulous paper. The residuary crystals are dissolved in a mixture of ether and alcohol, which, by the spontaneous evaporation of the ether, yields the cantharidin nearly pure.—*Note to the ninth edition.*

tities, it produces, in addition to these effects, obstinate and painful priapism, vomiting, bloody stools, severe pains in the whole abdominal region, excessive salivation with a fetid cadaverous breath, hurried respiration, a hard and frequent pulse, burning thirst, exceeding difficulty of deglutition, sometimes a dread of liquids, frightful convulsions, tetanus, delirium, and death. Orfila has known twenty-four grains of the powder to prove fatal. Dissection reveals inflammation and ulceration of the mucous coat of the whole intestinal canal. According to M. Poumet, if the intestines be inflated, dried, cut into pieces, and examined in the sun between two pieces of glass, they will exhibit small shining yellow or green points, strongly contrasting with the matter around them. (*Journ. de Pharm.*, 3e *sér.*, iii. 167.) The poisonous effects are to be counteracted by emetics, cathartics, bleeding, and opiates by the stomach and rectum. Dr. Mulock, of Dublin, recommends the officinal solution of potassa as an antidote, having found thirty drops given every hour an effectual remedy in strangury from blisters. (*Dublin Quart. Journ. of Med. Sci.*, N. S., vi. 222.) Notwithstanding their exceeding violence, cantharides have been long and beneficially used in medicine. Either these or other vesicating insects appear to have been given by Hippocrates in cases of dropsy and amenorrhœa, in the latter of which complaints, when properly prescribed, they are a highly valuable remedy. In dropsy they sometimes prove beneficial, when the system is in an atonic condition, and the vessels of the kidneys feeble. They are also useful in obstinate gleet, leucorrhœa, and seminal weakness; and afford one of the most certain means of relief in incontinence of urine, arising from debility or partial paralysis of the sphincter of the bladder. A case of diabetes is recorded in the N. Am. Archives (vol. ii. p. 175), in which recovery took place under the use of tincture of cantharides. They are used also in certain cutaneous eruptions, especially those of a scaly character, and in chronic eczema. Dr. Irven has employed them in scurvy (*Ann. de Thérap.*, 1845); and they have been found useful internally administered in obstinate ulcers. Their unpleasant effects upon the urinary passages are best obviated by the free use of diluent drinks; and, when not consequent upon great abuse of the medicine, may almost always be relieved by an anodyne injection, composed of laudanum, with a small quantity of mucilaginous fluid. The dose of Spanish flies is one or two grains of the powder, which may be given twice a day in the form of pill. The tincture, however, is more frequently employed.

Externally applied, cantharides excite inflammation in the skin, which terminates in a copious secretion of serum under the cuticle. Even thus employed, they not unfrequently give rise to strangury or tenesmus; and this, in fact, is one of the most troublesome attendants upon their operation. It probably results from the absorption of the active principle of the fly. For various methods which have been employed for obviating strangury from blisters, see *Ceratum Cantharidis.*

The blistering fly may be employed either as a rubefacient, or to produce a blister. In the former capacity it is seldom used, except in low states of disease, where external stimulation is required to support the system; but as an epispastic it is preferred to all other substances.

Blisters are calculated to answer numerous indications. Their local effect is attended with a general excitement of the system, which renders them valuable auxiliaries to internal stimulants in low conditions of disease; and they may sometimes be safely resorted to with this view, when the latter remedies are inadmissible. The powerful impression they make on the system is sufficient, in many instances, to subvert morbid associations, and thus to allow the re-establishment of healthy action. Hence their application to the cure of remittent and intermittent fevers, in which they often prove

effectual, when so employed as to be in full operation at the period for the recurrence of the paroxysm. On the principle of revulsion, they prove useful in a vast variety of complaints. Drawing both the nervous energy and the circulating fluid to the seat of their immediate action, they relieve irritations and inflammations of internal parts; and are employed for this purpose in every disease attended with these derangements. In such cases, however, arterial excitement should always be reduced by direct depletion before the remedy is resorted to. Blisters are also capable of substituting their own action for one of a morbid nature, existing in the part to which they are directly applied. Hence their use in tinea capitis, obstinate herpes, and various cutaneous eruptions. Their local stimulation renders them useful in some cases of threatened gangrene, and in partial paralysis. From the serous discharge they occasion, much good results in erysipelas and various other local inflammations, in the immediate vicinity of which their action can be established; and the effects of an issue may be obtained by the continued application of irritants to the blistered surface. Perhaps the pain produced by blisters may be useful in some cases of nervous excitement or derangement, in which it is desirable to withdraw the attention of the patient from subjects of agitating reflection. On some constitutions they produce a poisonous impression, attended with frequent pulse, dryness of the mouth and fauces, heat of skin, subsultus tendinum, and even convulsions. What is the precise condition of system in which these effects result, it is impossible to determine. They probably arise from the absorption of the active principle of cantharides, and depend on individual peculiarities of constitution. In this respect Spanish flies are analogous to mercury; and any argument drawn from this source against the use of the one would equally apply to the other. The general good resulting from their use far overbalances any partial and uncertain evil. For some rules relative to the application of blisters, the reader is referred to the article *Ceratum Cantharidis.* Under the same head will be noticed the blistering preparations from cantharides, and among them one recently introduced under the name of *cantharidal* or *blistering collodion.*

Off. Prep. Acetum Cantharidis; Ceratum Cantharidis; Decoctum Cantharidis; Emplastrum Cantharidis; Emplast. Cantharidis Compositum; Linimentum Cantharidis; Tinctura Cantharidis; Unguentum Cantharidis; Unguent. Infusi Cantharidis. W.

CANTHARIS VITTATA. *U. S.*

Potato Flies.

Cantharis vittata. *U. S.*

Within the limits of the United States are several species of Cantharis, which have been employed as substitutes for C. vesicatoria, and found to be equally efficient. Of these, only *C. vittata* has been adopted as officinal; but, as others may be more abundant in particular districts, or in certain seasons, and are not inferior in vesicating powers, we shall briefly notice all that have been submitted to experiment.

1. *Cantharis vittata.* Latreille, *Gen. Crust. et Insect.;* Durand, *Journ. of the Phil. Col. of Pharm.*, ii. 274, fig. 4. The *potato fly* is rather smaller than *C. vesicatoria*, which it resembles in shape. Its length is about six lines. The head is of a light red colour, with dark spots upon the top; the feelers are black; the elytra or wing cases are black, with a yellow longitudinal stripe in the centre, and with a yellow margin; the thorax is also black, with three yellow lines; and the abdomen and legs, which have the same colour, are covered with a cinereous down. It inhabits chiefly the potato

plant, and makes its appearance about the end of July or beginning of August, in some seasons very abundantly. It is found on the plant in the morning and evening, but during the heat of the day descends into the soil. The insects are collected by shaking them from the plant into hot water; and are afterwards carefully dried in the sun. They are natives of the Middle and Southern States.

This species of Cantharis was first described by Fabricius in the year 1781; and was introduced to the notice of the profession by Dr. Isaac Chapman, of Bucks county, Pennsylvania, who found it equal if not superior to the Spanish fly as a vesicatory. The testimony of Dr. Chapman has been corroborated by that of many other practitioners, some of whom have even gone so far as to assert, that the potato fly is not attended in its action with the inconvenience of producing strangury. But this statement has been ascertained to be incorrect; and, as the vesicating property of all these insects probably depends upon the same proximate principle, their operation may be considered as identical in other respects. If the potato fly has been found more speedy in its effects than the Cantharis of Spain, the result is perhaps attributable to the greater freshness of the former. It may be applied to the same purposes, treated in the same manner, and given in the same dose as the foreign insect. Professor Procter has obtained cantharidin from this species.

2. *Cantharis cinerea.* Latreille, *Gen. Crust. et Insect.;* Durand, *Journ. of the Phil. Col. of Pharm.*, ii. 274, fig. 5. The *ash-coloured cantharis* closely resembles the preceding species in figure and size; but differs from it in colour. The elytra and body are black, without the yellow stripes that characterize C. vittata, and are entirely covered with a short and dense ash-coloured down, which conceals the proper colour of the insect. The feelers are black, and the first and second joints are very large in the male. This species also inhabits the potato plant, and is occasionally found on other plants, as the English bean and wild indigo. It is a native of the Northern and Middle States. All the remarks before made upon the potato fly, as to the mode of collection, properties, and medical use, apply equally well to that at present under consideration. Illiger in 1801 discovered its vesicating properties; but Dr. Gorham was the first to call public attention particularly to the subject, in a communication addressed, in the year 1808, to the Medical Society of Massachusetts. This species is often confounded with *C. vittata.*

3. *Cantharis marginata.* Latreille, *Gen. Crust. et Insect.;* Durand, *Journ. of the Phil. Col. of Pharm.*, ii. 274, fig. 6. This is somewhat larger than *C. vittata*, and of a different shape. The elytra are black, with the suture and margin ash-coloured. The head, thorax, and abdomen are black, but nearly covered with an ash-coloured down; and on the upper part of the abdomen, under the wings, are two longitudinal lines of a bright clay colour. This species is usually found, in the latter part of summer, upon the different plants belonging to the genus *Clematis*, and frequents especially the lower branches which trail along the ground. Professor Woodhouse, of Philadelphia, first ascertained the vesicating properties of this insect; but it had previously been described by Fabricius as a native of the Cape of Good Hope. Dr. Harris, of Massachusetts, found it equally efficient as a vesicatory with any other species of this genus.

4. *Cantharis atrata.* Latreille, *Gen. Crust. et Insect.;* Durand, *Journ. of the Phil. Col. of Pharm.*, ii. 274, fig. 7. The *black cantharis* is smaller than the indigenous species already described; but resembles the *C. marginata* in figure. Its length is only four or five lines. It is distinguished by its size, and by its uniform black colour. It frequents more especially the different species of *Aster* and *Solidago*, though it is found also on *Prunella vulgaris, Ambrosia trifida*, and some other plants. Mr. Durand met with con-

siderable numbers of this insect near Philadelphia, in the month of September, and they continued to appear till the middle of October. They are common in the Northern and Middle States, but are not confined exclusively to this country, being found also in Barbary. Drs. Oswood and Harris, of New England, have satisfactorily ascertained their vesicating powers. They are probably identical with the insect noticed as vesicatory by Professor Woodhouse, under the name of *Meloë niger*.

Several other species have been discovered in the United States, but not yet practically employed. Among these are *C. æneas*, a native of Pennsylvania, discovered by Mr. Say; *C. politus* and *C. aszelianus*, which inhabit the Southern States; *C. Nuttalli*, a large and beautiful insect of Missouri, first noticed by Mr. Nuttall, and said to surpass the Spanish fly in magnitude and splendour; and *C. albida*, another large species, found by Mr. Say near the Rocky Mountains. Of these *C. Nuttalli* (*Lytta Nuttalli*, Say, *Am. Entomol.*, i. 9) bids fair, at some future period, to be an object of importance in the western section of this country. The head is of a deep greenish colour, with a red spot in front; the thorax is of a golden green; the elytra, red or golden purple and somewhat rugose on their outer surface, green and polished beneath; the feet black: the thighs, blue or purplish. The exploring party under Colonel Long ascertained the vesicating powers of this insect. It was found in the plains of the Missouri, feeding on a scanty grass, which it sometimes covered to a considerable extent. In one place it was so numerous and troublesome, as to be swept away by bushels, in order that a place might be cleared for encamping. W.

CAPSICUM. *U. S., Lond., Ed., Dub.*

Cayenne Pepper.

The fruit of Capsicum annuum, and of other species of Capsicum. *U. S., Ed.* Fruit of Capsicum fastigiatum. *Lond.*

Poivre de Guinée, Poivre d'Inde, *Fr.;* Spanischer Pfeffer, *Germ.;* Pepperone, *Ital.;* Pimiento, *Span.*

Capsicum. *Sex. Syst.* Pentandria Monogynia. — *Nat. Ord.* Solanaceæ.

Gen. Ch. Corolla wheel-shaped. *Berry* without juice. *Willd.*

Numerous species of Capsicum, inhabiting the East Indies and tropical America, are enumerated by botanists, the fruit of which, differing simply in the degree of pungency, may be indiscriminately employed. *C. baccatum* or bird pepper, and *C. frutescens*, are said to yield most of the Cayenne pepper brought from the West Indies and South America; and Ainslie informs us that the latter is chiefly employed in the East Indies. The species most extensively cultivated in Europe and this country, is that recognised as officinal by the Pharmacopœias, namely, *C. annuum*. The first two are shrubby plants, the last is annual and herbaceous.

Capsicum annuum. Willd. *Sp. Plant.* i. 1052; Woodv. *Med. Bot.* p. 226, t. 80. The stem of the annual capsicum is thick, roundish, smooth, and branching; rises two or three feet in height; and supports ovate, pointed, smooth, entire leaves, which are placed without regular order on long footstalks. The flowers are solitary, white, and stand on long peduncles at the axils of the leaves. The calyx is persistent, tubular, and five-cleft; the corolla, monopetalous and wheel-shaped, with the limb divided into five spreading, pointed, and plaited segments; the filaments, short, tapering, and furnished with oblong anthers; the germen, ovate, supporting a slender style which is longer than the filaments, and terminates in a blunt stigma. The fruit is a pendulous, pod-like berry, light, smooth and shining, of a bright scarlet,

orange, or sometimes yellow colour, with two or three cells, containing a dry, loose pulp, and numerous flat, kidney-shaped, whitish seeds.

The plant is a native of the warmer regions of Asia and America, and is cultivated in almost all parts of the world. It is abundantly produced in this country, both for culinary and medicinal purposes. The flowers appear in July and August, and the fruit ripens in October. Several varieties are cultivated in our gardens, differing in the shape of the fruit. The most abundant is probably that with a large irregularly ovate berry, depressed at the extremity, which is much used in the green state for pickling. The medicinal variety is that with long, conical, generally pointed, recurved fruit, usually not thicker than the finger. Sometimes we meet with small, spherical, slightly compressed berries, not greatly exceeding a large cherry in size. When perfectly ripe and dry, the fruit is ground into powder, and brought into market under the name of *red* or *Cayenne* pepper. Our markets are also partly supplied from the West Indies. A variety of capsicum, consisting of very small, conical, exceedingly pungent berries, is imported from Liberia. In England the fruit of C. annuum is frequently called *chillies*.

Powdered capsicum is usually of a more or less bright red colour, which fades upon exposure to light, and ultimately disappears. The odour is peculiar and somewhat aromatic, stronger in the recent than in the dried fruit. The taste is bitterish, acrid, and burning, producing a fiery sensation in the mouth, which continues for a long time. The pungency appears to depend on a peculiar principle, which was obtained, though probably not in a perfectly isolated state, by Braconnot, and named *capsicin*. The fruit, freed from the seeds, was submitted to the action of alcohol, and the resulting tincture evaporated. During the evaporation a red-coloured wax separated, and the residuary liquor by farther evaporation afforded an extract, from which ether dissolved the capsicin. This was obtained by evaporating the ether. It resembles an oil or soft resin, is of a yellowish-brown or reddish-brown colour, and, when tasted, though at first balsamic, soon produces an insupportably hot and pungent impression over the whole interior of the mouth. Exposed to heat it melts, and at a higher temperature emits fumes, which, even in very small quantity, excite coughing and sneezing. It is slightly soluble in water and vinegar, and very soluble in alcohol, ether, oil of turpentine, and the caustic alkalies, which it renders reddish-brown. It constitutes, according to Braconnot, 1·9 per cent. of the fruit.* The other ingredients, as ascertained by the same chemist, are colouring matter, an azotized substance, gum, pectic acid (probably pectin), and saline matters. Red oxide of lead is sometimes added to the powdered capsicum sold in Europe. It may be detected by digesting the suspected powder in diluted nitric acid, filtering, and adding a solution of sulphate of soda, which will throw down a white precipitate if there be any oxide of lead present. Capsicum is said to be sometimes adulterated with coloured saw-dust. It is occasionally attacked by insects.

Medical Properties and Uses. Cayenne pepper is a powerful stimulant, producing when swallowed a sense of heat in the stomach, and a general glow over the body, without any narcotic effect. Its influence over the circulation, though considerable, is not in proportion to its local action. It is much employed as a condiment, and proves highly useful in correcting the flatulent tendency of certain vegetables, and aiding their digestion. Hence the advantage derived from it by the natives of tropical climates, who live chiefly on

* Professor Procter informs us that, if the substance called capsicin be dissolved in alcohol, and treated with subacetate of lead, an abundant precipitate is obtained, which when washed with alcohol is quite tasteless, while the liquid from which it was thrown down affords, upon evaporation, a brownish substance much more pungent than the capsicin itself.—*Note to the ninth edition.*

vegetable food. In the East Indies it has been used from time immemorial. From a passage in the works of Pliny, it appears to have been known to the Romans. As a medicine it is useful in cases of enfeebled and languid stomach, and is occasionally prescribed in dyspepsia and atonic gout, particularly when attended with much flatulence, or occurring in persons of intemperate habits. It has also been given as a stimulant in palsy and certain lethargic affections. To the sulphate of quinia it forms an excellent addition in some cases of intermittents, in which there is a great want of gastric susceptibility. Upon the same principle of rousing the susceptibility of the stomach, it may prove useful in low forms of fever as an adjuvant to tonic or stimulant medicines. Its most important application, however, is to the treatment of malignant sore-throat and scarlet fever, in which it is used both internally and as a gargle. The following formula was employed in malignant scarlatina, with great advantage, in the West Indies, where this application of the remedy originated. Two tablespoonfuls of the powdered pepper, with a teaspoonful of common salt, are infused for an hour in a pint of a boiling liquid composed of equal parts of water and vinegar. This is strained when cool through a fine linen cloth, and given in the dose of a tablespoonful every half hour. The same preparation is also used as a gargle. It is, however, only to the worst cases that the remedy is applied so energetically. In milder cases of scarlatina, with inflamed or ulcerated throat, much relief and positive advantage often follow the employment of the pepper in a more diluted state. Capsicum has also been advantageously used in sea sickness, in the dose of a teaspoonful, given in some convenient vehicle on the first occurrence of nausea.

Applied externally, Cayenne pepper is a powerful rubefacient, very useful in local rheumatism, and in low forms of disease, where a stimulant impression upon the surface is demanded. It has the advantage, under these circumstances, of acting speedily without endangering vesication. It may be applied in the form of cataplasm, or more conveniently and efficiently as a lotion, mixed with heated spirit. The powder or tincture, brought into contact with a relaxed uvula, often acts very beneficially. The tincture has also been used advantageously in chilblain. The ethereal extract, which has a fluid consistence, is powerfully rubefacient.

The dose of the powder is from five to ten grains, which may be most conveniently given in the form of pill. Of an infusion prepared by adding two drachms to half a pint of boiling water, the dose is about half a fluidounce. A gargle may be prepared by infusing half a drachm of the powder in a pint of boiling water, or by adding half a fluidounce of the tincture to eight fluidounces of rose-water.

Off. Prep. Infusum Capsici; Tinctura Capsici. W.

CARBO.

Carbon.

Pure charcoal; Carbone, *Fr., Ital.;* Kohlenstoff, *Germ.;* Carbon, *Span.*

Carbon is an elementary substance of great importance, and very extensively diffused in nature. It exists in large quantity in the mineral kingdom, and forms the most abundant constituent of animal and vegetable matter. In a state of perfect purity and crystallized, it constitutes the diamond, and, more or less pure, it forms the substances known under the names of plumbago or black lead, anthracite, bituminous coal, coke, animal charcoal, and vegetable charcoal. Combined with oxygen, it forms *carbonic acid*, which is a constituent of the atmosphere, and present in many natural waters, especially those which have an effervescing quality. United with oxygen and a base,

it forms the carbonates, among others *carbonate of lime*, which is one of the most abundant mineral species.

The *diamond*, or crystallized carbon, is found principally in India and Brazil. Within a few years, several diamonds have been found in the gold region of Georgia. This gem is perfectly transparent, and the hardest and most brilliant substance in nature. Its sp. gr. is about 3·5. It is fixed and unalterable in the fire, provided air be excluded; but is combustible in air or oxygen, the product being the same as when charcoal is burned, namely carbonic acid.

Next to diamond, plumbago and anthracite are the purest natural forms of carbon. *Plumbago* is the substance of which black lead crucibles and pencils are made. It is found in greatest purity, perhaps, in the mine of Borrowdale, in England; but it also occurs very pure in this country, especially near Bustleton, in Pennsylvania. It was formerly supposed to be a carburet of iron; but, in very pure specimens, it is nearly free from iron, which must, therefore, be deemed an accidental impurity. *Anthracite* occurs in different parts of the world, but particularly in the United States. Immense beds of it exist in Pennsylvania. *Bituminous coal* is a form of the carbonaceous principle, in which the carbon is associated with volatile matter of a bituminous nature. When this is driven off by the process of charring, as in the manufacture of coal gas, a kind of mineral charcoal, called *coke*, is obtained, very useful in the arts as a fuel.

Carbon may be obtained artificially, in a state approaching to purity, by several processes. One method is to expose lampblack to a full red heat in a close vessel. It may also be obtained, in a very pure state, by passing the vapour of volatile oils through an ignited porcelain tube; whereby the hydrogen and oxygen of the oil will be dissipated, and the charcoal left in the tube. A pure charcoal is procured by exposing sugar, or other vegetable substances which leave no ashes when burnt, to ignition in close vessels.

Properties. Carbon in its crystallized form has already been described as diamond. In its uncrystallized state it is an insoluble, infusible solid, generally of a black colour, and without taste or smell. It burns when sufficiently heated, uniting with the oxygen of the air, and generating a gaseous acid, called carbonic acid. Its sp. gr. in the solid state, apart from the pores which it contains when in mass, is 3·5; but with the pores included, it is only 0·44. It is a very unalterable and indestructible substance, and has great power in resisting and correcting putrefaction in other bodies. When in a state of extreme division, it possesses the remarkable power of destroying the colouring and odorous principles of most liquids. (See *Carbo Animalis.*) Its other physical properties differ according to its source, and peculiar state of aggregation. Its equivalent number is 6, and its symbol C. As a chemical element, it enjoys a very extensive range of combination. It combines in five proportions with oxygen, forming carbonic oxide, and carbonic, oxalic, mellitic, and croconic acids. (See *Aqua Acidi Carbonici* and *Oxalic Acid.*) With hydrogen it forms a number of compounds, called *carbohydrogens*, of which the most interesting, excluding hypothetical radicals, are light carburetted hydrogen, or fire damp, olefiant gas, the light and concrete oils of wine, and certain non-oxygenous volatile oils. With nitrogen it constitutes cyanogen, the compound radical of hydrocyanic or prussic acid; and united with iron in minute proportion it forms steel.

To notice all the forms of the carbonaceous principle would be out of place in this work. We shall, therefore, restrict ourselves to the consideration of those which are officinal, namely, *animal charcoal* and *wood charcoal*. These are described in the two following articles. B.

CARBO ANIMALIS. *U. S., Lond., Ed., Dub.*

Animal Charcoal.

Charcoal prepared from bones. *U. S.* Charcoal prepared from ox blood by ignition. *Lond.* Impure animal charcoal obtained commonly from bones. *Ed.*

Charbon animal, *Fr.;* Thierische Kohle, *Germ.;* Carbone animale, *Ital.;* Carbon animal, *Span.*

The animal charcoal employed in pharmacy and the arts is usually obtained from bones, by subjecting them to a red heat in close vessels, and is chiefly employed as a decolorizing agent. The residue of the ignition is a black matter, which, when reduced to powder, forms the substance properly called *bone-black*, but familiarly known under the incorrect name of *ivory-black*. Ivory by carbonization will furnish a black, which, on account of its fineness and intensely black colour, is more esteemed than the ordinary bone-black; but it is much more expensive.

Animal charcoal, in the form of bone-black, is extensively used by sugar refiners and others as a decolorizing agent; and an ammoniacal liquor, called *bone spirit*, is obtained as a secondary product, and sold to the makers of sal ammoniac. The bones are subjected to destructive distillation in iron retorts or cylinders, and, when the bone spirit ceases to come over, the residuum is charred bone, or bone-black. Bone consists of animal matter with phosphate and carbonate of lime. In consequence of a new arrangement of the elements of the animal matter, the nitrogen and hydrogen united as ammonia, and a part of the charcoal in the form of carbonic acid, distil over; while the remainder of the charcoal is left in the retort, intermingled with the calcareous salts. In this form, therefore, of animal charcoal, the carbon is mixed with phosphate and carbonate of lime; and the same is the case with the true ivory-black.

Properties. Animal charcoal, in the form of bone-black, called ivory-black in the shops, is a black powder, possessing a slightly alkaline and bitterish taste, and having a general resemblance to powdered vegetable charcoal. It is, however, more dense and less combustible than vegetable charcoal; from which, moreover, it may be distinguished by burning a small portion of it on a red hot iron, when it will leave a residuum imperfectly acted on by sulphuric acid; whereas the ashes from vegetable charcoal will readily dissolve in this acid, forming a bitterish solution.

Animal charcoal by no means necessarily possesses the decolorizing property; as this depends upon its peculiar state of aggregation. If a piece of pure animal matter be carbonized, it usually enters into fusion, and, from the gaseous matter which is extricated, becomes porous and cellular. The charcoal formed has generally a metallic lustre, and a colour resembling that of black lead. It has, however, little or no decolorizing power, even though it may be finely pulverized.

Rationale of the Effects of Charcoal as a Decolorizing Agent. The decolorizing power of charcoal was first noticed by Lowitz of St. Petersburg; and the subject was subsequently ably investigated by Bussy, Payen, and Desfosses. It is generally communicated to charcoal by igniting it in close vessels, but not always. The kind of charcoal, for example, obtained from substances which undergo fusion during carbonization, does not possess the property, even though it may be afterwards finely pulverized. The property in question is possessed to a certain extent by wood charcoal; but is developed in it in a much greater degree by burning it with some chemical sub-

stance, which may have the effect of reducing it to an extreme degree of fineness. The most powerful of all the charcoals for discharging colours are those obtained from certain animal matters, such as dried blood, hair, horns, hoofs, &c., by first carbonizing them in connection with carbonate of potassa, and then washing the product with water. Charcoal, thus prepared, seems to be reduced to its finest possible particles. The next most powerful decolorizing charcoal is *ivory* or *bone-black*, in which the separation of the carbonaceous particles is effected by the phosphate of lime present in the bone. Vegetable substances also may be made to yield a good charcoal for destroying colour, provided, before carbonization, they be well comminuted, and mixed with pumice stone, chalk, flint, calcined bones, or other similar substance in a pulverized state.

It results from the foregoing facts, that the decolorizing power of charcoal depends upon a peculiar mode of aggregation of its particles, the leading character of which is that they are isolated from one another, and thus enabled to present a greater extent of surface. It is on this principle that certain chemical substances act in developing the property in question, when they are ignited, in a state of intimate mixture, with the substance to be charred. Thus, it is perceived that there is no necessary connection between animal charcoal and the decolorizing power. Bone-black, for instance, has this property, not because it is an animal charcoal, but because, in consequence of the phosphate of lime present in the bone, the favourable state of aggregation is acquired.

The following table, abridged from one drawn up by Bussy, denotes the relative decolorizing power of different charcoals.

KINDS OF CHARCOAL.	*Decolorizing Power on Syrup.*	*Decolorizing Power on Indigo.*
Bone-black,	1	1
Bone charcoal treated with an acid,	1·6	1·8
Lampblack, not ignited,	3·3	4
Charcoal from acetate of potassa,	4·4	5·6
Blood ignited with phosphate of lime,	10	12
Lampblack ignited with carbonate of potassa,	10·6	12.2
Blood ignited with chalk,	11	18
White of egg ignited with carbonate of potassa,	15·5	34
Glue ignited with carbonate of potassa,	15·5	36
Bone charcoal, formed by depriving the bone of phosphate of lime by an acid, and subsequent ignition with carbonate of potassa,	20	45
Blood ignited with carbonate of potassa,	20	50

E. Filhol has shown that charcoal is not the only decolorizing agent; but that many substances, both simple and compound, such as iron reduced by hydrogen, sulphur, arsenic, deutoxide of manganese, sulphate and artificial sulphuret of lead, possess the same property. The property varies not only in different substances in relation to the same colouring matter, but in the same substance in respect to different colouring matters. (*Chem. Gaz.*, Apr. 15, 1852.)

Animal charcoal is capable of taking the bitter principles from bitter infusions and tinctures, according to the experiments of Weppen; as also iodine from liquids which contain it in solution, as observed by Lassaigne. Its power, however, of acting on solutions and chemical compounds, is much more decided in its purified state, as shown by both Warrington and Weppen. In this state, it takes a number of salts from their aqueous solutions, and

even converts chromate of potassa into the carbonate. (See *Carbo Animalis Purificatus.*)

Bone-black consists, in the hundred parts, of eighty-eight parts of phosphate and carbonate of lime, ten of charcoal, and two of carburet or silicuret of iron. (*Dumas.*) The proportion of charcoal here given is small.

Pharmaceutical Uses, &c. Animal charcoal is used in pharmacy for decolorizing vegetable principles, such as gallic acid, quinia, morphia, veratria, &c., and in the arts, principally for clarifying syrups in sugar refining, and for depriving spirits distilled from grain of the peculiar volatile oil, called *grain* or *fusel oil*, which imparts to them an unpleasant taste as first distilled. The manner in which it is used is to mix it with the substance to be decolorized, and to allow the mixture to stand for some time. The charcoal unites with the colouring matter, and the solution by filtration is obtained white and transparent. Its use, however, in decolorizing the organic alkalies and other vegetable principles, no doubt, causes a loss by absorption; since it has been shown by the experiments of M. Lebourdais, mentioned under the head of purified animal charcoal, that several of these principles may be separated by the sole action of charcoal. For most pharmaceutical operations, and when used as an antidote, animal charcoal must be purified by muriatic acid from phosphate and carbonate of lime. (See *Carbo Animalis Purificatus.*) In the U. S. and Dublin formulæ for sulphate of quinia, however, it is used without purification. (See *Quiniæ Sulphas.*) According to Guthe, a German chemist, bone charcoal, without purification, is to be preferred as a decolorizer, in all cases in which the calcareous salts exert no injurious effect.

Off. Prep. Carbo Animalis Purificatus. B.

CARBO LIGNI. *U. S., Ed., Dub.*

Charcoal.

Off. Syn. CARBO. *Lond.*

Vegetable charcoal; Charbon de bois, *Fr.;* Holzkohle, *Germ.;* Carbone di legno, *Ital.;* Carbon de lena, *Span.*

Preparation on the Large Scale. Billets of wood are piled in a conical form, and covered with earth and sod to prevent the free access of air; several holes being left at the bottom, and one at the top of the pile, in order to produce a draught to commence the combustion. The wood is then kindled from the bottom. In a little while, the hole at the top is closed, and, after the ignition is found to pervade the whole pile, those at the bottom are stopped also. The combustion taking place with a smothered flame and limited access of air, the volatile portions of the wood, consisting of hydrogen and oxygen, are dissipated; while the carbon, in the form of charcoal, is left behind.

In this process for the carbonization of wood, all the volatile products are lost; and a portion of the charcoal itself is dissipated by combustion. Wood, thus carbonized, yields not more than 17 or 18 per cent. of charcoal. A better method is to char the wood in iron cylinders, when it yields from 22 to 23 parts in 100 of excellent charcoal; and, at the same time, the means are afforded for collecting the volatile products, consisting of pyroligneous acid, empyreumatic oil, and tar. This process for obtaining charcoal has been described under another head. (See *Acidum Aceticum.*) A method of preparing charcoal by subjecting wood to over-heated steam has been invented by M. Violette. When the temperature of the steam is 572° F., the wood is converted into a peculiar charcoal, called *red charcoal*, which is

intermediate in its qualities between wood and ordinary charcoal. When the temperature is lower, the carbonization is incomplete; when higher, the product is black charcoal. The steam process yields a uniform charcoal for a given temperature, which may be easily regulated, and a product about double that obtained in closed cylinders. Charcoal, prepared in closed cylinders, contains ten times as much ash as that made by the ordinary process. Charcoal contains *carbon*, in proportion to the temperature at which it is formed; from 65 per cent. when made at 482° F., to 80 per cent. when made at 752° F. The gaseous matter present is always inversely as the temperature of carbonization. Thus, for charcoal made at 572° F., it is one-third its weight; at 662° F., one-fourth its weight. For an abstract of the important results of M. Violette, the reader is referred to the *Journ. de Pharm.* for July, 1851, p. 35.

Preparation for Medical Use. M. Belloc recommends charcoal for this purpose to be obtained from poplar shoots, cut at the time the sap rises, and deprived of their bark. The carbonization should be performed in cast-iron vessels at a red-white heat. The product is a light and brilliant charcoal, which must be purified by being macerated for three or four days in water, frequently renewed. It is then dried, powdered, and placed in bottles which should be well stopped. (*Journ. de Pharm.*, xvii. 355.) The charcoal most esteemed in Philadelphia for medical purposes is that prepared by the Messrs. Dupont, near Wilmington, Delaware, for the manufacture of gunpowder. It is made from young willow shoots of two or three years' growth.

Properties. Charcoal is a black, shining, brittle, porous substance, tasteless and inodorous, and insoluble in water. It is a good conductor of electricity, but a bad one of heat. It possesses the remarkable property of absorbing many times its own bulk of certain gases. When exposed to the air after ignition, it increases rapidly in weight, absorbing from twelve to fourteen per cent. of moisture. As ordinarily prepared, it contains the incombustible part of the wood, amounting to one or two per cent., which is left in the form of ashes when the charcoal is burnt. These may be removed by digesting the charcoal in diluted muriatic acid, and afterwards washing it thoroughly with boiling water.

Medical Properties, &c. Powdered charcoal is antiseptic and absorbent. It is employed with advantage in certain forms of dyspepsia, attended with fetid breath and putrid eructations; and has been exhibited in dysentery with the effect of correcting the fetor of the stools. M. Belloc recommends it strongly in gastralgia, and especially pyrosis; and, where it fails to remove the disease, he finds it to abate the pain, nausea, and vomiting. As a remedy in obstinate constipation, Dr. Daniel, of Savannah, speaks of it in high terms. He also found it useful in the nausea and confined state of the bowels which usually attend pregnancy. Dr. Newman recommends it as a dressing to wounds and ulcers of various kinds. Its use as an ingredient of poultices is noticed under the title of *Cataplasma Carbonis*. Several of its varieties constitute the best tooth powder that can be used. Those which are generally preferred are the charcoals of the cocoa-nut shell and of bread. The dose of charcoal varies from one to four teaspoonfuls or more. Dr. Daniel gave it, in his cases of constipation, in doses of a tablespoonful, repeated every half hour.

Meat, embedded in charcoal in close vessels, is kept perfectly sweet for many months; and water intended for long voyages is equally preserved by the addition of its powder. The power of some of its varieties in destroying colours and odours is very considerable. Schönbein has observed the power of charcoal to absorb chlorine, iodine, and bromine, both in the gaseous and

vaporous state, and when in aqueous solution. He has also noticed its deoxidizing effects when shaken with certain salts of peroxides, reducing them to salts of protoxides.

Off. Prep. Cataplasma Carbonis. B.

CARDAMOMUM. *U. S., Lond., Ed., Dub.*

Cardamom.

The fruit of Elettaria Cardamomum. *U. S.* The seeds. *Lond., Dub.* Fruit of Renealmia Cardamomum. *Ed.*

Petit cardamome, *Fr.;* Kleine Cardamomen, *Germ.;* Cardamomo minore, *Ital.;* Cardamomo menor, *Span.;* Ebil, *Arab.;* Kakelah seghar, *Persian;* Capalaga, *Malay;* Gujaratii elachi, *Hindoost.*

The subject of cardamom has been involved in some confusion and uncertainty, both in its commercial and botanical relations. The name has been applied to the aromatic capsules of various Indian plants belonging to the family of Scitamineæ. Three varieties have long been designated by the several titles of the *lesser*, *middle*, and *larger*, the *cardamomum minus*, *medium*, and *majus* of older authors; but these terms have been used differently by different writers, so that their precise signification remained doubtful. Pereira, whose position, in the midst of the greatest drug market in the world, gave him excellent opportunities of investigating the commercial history of drugs, has enabled us in great measure to clear up this confusion. It is well known that the *lesser cardamom* of most writers is the variety recognised by the Pharmacopœias, and generally kept in the shops. The other varieties, though circulating to a greater or less extent in European and Indian commerce, are little known in this country. A sketch of the non-officinal cardamoms, chiefly condensed from the account of Pereira, is given below.* The following remarks have reference exclusively to the genuine Malabar or officinal cardamom.

* 1. *Ceylon Cardamom.* This has been denominated variously by different authors, *cardamomum medium*, *cardamomum majus*, and *cardamomum longum*, and is sometimes termed in English commerce *wild cardamom*. It is the *large cardamom* of Guibourt. In the East it is sometimes called *grains of paradise:* but it is distinct from the product known with us by that name. It is derived from a plant cultivated in Candy, in the island of Ceylon, which belongs to the same genus as that producing the officinal cardamom, and is specifically designated by Sir James Edward Smith, *Elettaria major.* This plant was described by Pereira in the Pharmaceutical Journal and Transactions (vol. ii. p. 388). The fruit is a lanceolate-oblong, acutely triangular capsule, somewhat curved, about an inch and a half long and four lines broad, with flat and ribbed sides, tough and coriaceous, brownish or yellowish ash-coloured, having frequently at one end the long, cylindrical, three lobed calyx, and at the other the fruit stalk. It is three-celled, and contains angular, rugged, yellowish-red seeds, of a peculiar fragrant odour, and spicy taste. Its effects are analogous to those of the officinal cardamom, which, however, commands three times its price.

2. *Round Cardamom.* This is probably the "Αμωμον of Dioscorides, and the *Amomi uva* of Pliny, and is believed to be the fruit of *Amomum Cardamomum* (*Willd.*), growing in Sumatra, Java, and other East India islands. The capsules are usually smaller than a cherry, roundish or somewhat ovate, with three convex sides, more or less striated longitudinally, yellowish or brownish-white, and sometimes reddish, with brown, angular, cuneiform, shrivelled seeds, which have an aromatic camphorous flavour. They are sometimes, though very rarely, met with connected together in their native clusters, constituting the *amomum racemosum*, or *amome en grappes* of the French Codex. They are similar in medicinal properties to the officinal cardamom, but are seldom used except in the southern parts of Europe.

3. *Java Cardamom.* The plant producing this variety is supposed to be the *Amomum maximum* of Roxburgh, growing in Java and other Malay islands, and said to be culti-

Linnæus confounded, under the name of *Amomum Cardamomum*, two different vegetables—the genuine plant of Malabar, and another growing in Java. These were separated by Willdenow, who conferred on the former Sonnerat's title of *Amomum repens*, while he retained the original name for the latter, though not the true cardamom plant. In the tenth volume of the Linn. Transactions, A. D. 1811, Mr. White, a British Army Surgeon in India, published a very minute description of the Malabar plant, which he had enjoyed frequent opportunities of examining in its native state. From this description, Dr. Maton inferred that the plant, according to Roscoe's arrangement of the Scitamineæ, could not be considered an *Amomum*; and as he was unable to attach it to any other known genus, he proposed to construct a new one with the name of *Elettaria*, derived from *elettari*, or *elatari*, the Malabar name of this vegetable. Sir James Smith afterwards suggested the propriety of naming the new genus *Matonia*, in honour of Dr. Maton; and the latter title, having been adopted by Roscoe, obtained a place in former editions of the London and United States Pharmacopœias. The celebrated Dr. Roxburgh described the Malabar cardamom plant as an *Alpinia*, with the specific appellation of *Cardamomum*. As doubts were entertained of the necessity for the new genus proposed by Maton, the London College and the framers of the U. S. Pharmacopœia followed the authority of Roxburgh in their editions antecedent to the latest, and referred the fruit to Alpinia Cardamomum. This decision, however, has been revised in the recent editions of these

vated in the mountains of Nepaul. The product of the latter site is called *Nepaul* or *Bengal cardamoms* in the East. The capsules are oval, or oval-oblong, often somewhat ovate, from eight to fifteen lines long and from four to eight broad, usually flattened on one side and convex on the other, sometimes curved, three-valved, and occasionally imperfectly three-lobed, of a dirty grayish-brown colour, and coarse fibrous appearance. They are strongly ribbed, and, when soaked in water, exhibit from nine to thirteen ragged membranous wings, which distinguish them from all other varieties. The seeds have a feebly aromatic taste and smell. This variety of cardamom affords but a very small proportion of volatile oil, is altogether of inferior quality, and, when imported into London, is usually sent to the continent.

4. *Madagascar Cardamom.* This is the *Cardamomum majus* of Geiger and some other authors, and is thought to be the fruit of *Amomum angustifolium* of Sonnerat, which grows in marshy grounds in Madagascar. The capsule is ovate, pointed, flattened on one side, striated, with a broad circular scar at the bottom, surrounded by an elevated, notched, and corrugated margin. The seeds have an aromatic flavour analogous to that of the officinal cardamom.

5. *Grains of Paradise. Grana Paradisi.* Under this name, and that of *Guinea grains*, and *Melegueta pepper*, are kept in the shops small seeds of a round or ovate form, often angular and somewhat cuneiform, minutely rough, brown externally, white within, of a feebly aromatic odour when rubbed between the fingers, and of a strongly hot and peppery taste. Two kinds of them are known in the English market, one, larger, plumper, and more warty, with a short conical projecting tuft of pale fibres on the umbilicus; the other, smaller and smoother, and without the fibrous tuft. The latter are the most common. It is probable that one of the varieties is produced by *Amomum Grana Paradisi* of Sir J. E. Smith, and the other by Roscoe's *Amomum Melegueta*. They are imported from Guinea and other parts of the western coast of Africa. (Pereira's *Mat. Med.*, 3d ed., p. 1134.) Similar grains are imported into England from Demerara, where they are obtained from a plant cultivated by the negroes, supposed to have been brought from Africa, and believed by Dr. Pereira to be the *Amomum Melegueta* of Roscoe. (*Pharm. Journ. and Trans.*, vi. 412.) Their effects on the system are analogous to those of pepper; but they are seldom used except in veterinary practice, and to give artificial strength to spirits, wine, beer, and vinegar. In the Pharm. Journ. and Trans. (ii. 443), Dr. Pereira points out seven distinct scitamineous fruits, to which the name of grains of paradise has been applied by different authors. Those above described are the only ones now known by the name in commerce.

Other products of different Scitamineæ, which have received the name of cardamom, are described by Pereira; but the above are all that are known in commerce, or likely to be brought into our drug markets.

works, in which the plant is recognised with the title of Elettaria Cardamomum. Finally, Roscoe has arranged the plant with the abandoned genus *Renealmia* of Linnæus, which he has restored; and the Edinburgh College has recognised this arrangement.

ELETTARIA. *Sex. Syst.* Monandria Monogynia.—*Nat. Ord.* Scitamineæ. *Brown.* Zingiberaceæ. *Lindley.*

Gen. Ch. Corolla with the tube filiform and the inner limb one-lipped. *Anther* naked. *Capsule* often berried, three-celled, three-valved. *Seeds* numerous, arillate. *Blume.*

Elettaria Cardamomum. Maton.—*Alpinia Cardamomum.* Roxburgh.—*Amomum Repens.* Sonnerat; Willd. *Sp. Plant.* i. 9 —*Renealmia Cardamomum.* Roscoe, *Monandrous Plants.* Figured in *Linn. Trans.* x. 248, and Carson's *Illust. of Med. Bot.* ii. 55. The cardamom plant has a tuberous horizontal root or rhizoma, furnished with numerous fibres, and sending up from eight to twenty erect, simple, smooth, green and shining, perennial stems, which rise from six to twelve feet in height, and bear alternate sheathing leaves. These are from nine inches to two feet long, from one to five inches broad, elliptical-lanceolate, pointed, entire, smooth and dark-green on the upper surface, glossy and pale sea-green beneath, with strong midribs, and short footstalks. The scape or flower-stalk proceeds from the base of the stem, and lies upon the ground, with the flowers arranged in the form of a panicle. The calyx is monophyllous, tubular, and toothed at the margin; the corolla monophyllous and funnel-shaped, with the inferior border unilabiate, three-lobed, and spurred at the base. The fruit is a three-celled capsule, containing numerous seeds.

This valuable plant is a native of the mountains of Malabar, where it springs up spontaneously in the forests after the removal of the undergrowth. From time immemorial, great numbers of the natives have derived a livelihood from its cultivation. It begins to yield fruit at the end of the fourth year, and continues to bear for several years afterwards. The capsules when ripe are picked from the fruit stems, dried over a gentle fire, and separated by rubbing with the hands from the footstalks and adhering calyx.

Thus prepared, they are ovate-oblong, from three to ten lines long, from two to four thick, three-sided with rounded angles, obtusely pointed at both ends, longitudinally wrinkled, and of a yellowish-white colour. The seeds which they contain are small, angular, irregular, rough as if embossed upon their surface, of a brown colour, easily reduced to powder, and thus separable from the capsules, which, though slightly aromatic, are much less so than the seeds, and should be rejected when the medicine is given in substance. The seeds constitute about 74 parts by weight in the hundred. According to Pereira, three varieties are distinguished in British commerce:—1. the *shorts*, from three to six lines long, from two to three broad, browner and more coarsely ribbed, and more highly esteemed than the other varieties; 2. the *long-longs*, from seven lines to an inch in length by two or three lines in breadth, elongated, and somewhat acuminate; and 3. the *short-longs*, which differ from the second variety in being somewhat shorter and less pointed. The odour of cardamom is fragrant, the taste warm, slightly pungent, and highly aromatic. These properties are extracted by water and alcohol, but more readily by the latter. They depend on a volatile oil which rises with water in distillation. The seeds contain, according to Trommsdorff, 4·6 per cent. of volatile oil, 10·4 of fixed oil, 2·5 of a salt of potassa mixed with a colouring principle, 3·0 of starch, 1·8 of azotized mucilage, 0·4 of yellow colouring matter, and 7·73 of ligneous fibre. The volatile oil is colourless, of an agreeable and very penetrating odour, and of a strong, aromatic, burn-

ing, camphorous, and slightly bitter taste. Its sp. gr. is 0·945. It cannot be kept long without undergoing change, and finally, even though excluded from the air, loses its peculiar odour and taste. (Trommsdorff, *Annal. der Pharm.*, July, 1834.) If ether be allowed to percolate through the powdered seeds, and the liquor obtained be deprived of the ether by evaporation, a light greenish-brown fluid remains, consisting almost exclusively of the volatile and fixed oils. It has the odour of cardamom and keeps better than the oil obtained by distillation. (*Am. Journ. of Pharm.*, xxi. 116.) The seeds should be powdered only when wanted for immediate use; as they retain their aromatic properties best while enclosed within the capsules.

Medical Properties and Uses. Cardamom is a warm and grateful aromatic, less heating and stimulating than some others belonging to the class, and very useful as an adjuvant or corrective of cordial, tonic, and purgative medicines. Throughout the East Indies it is largely consumed as a condiment. It was known to the ancients, and derived its name from the Greek language. In this country it is employed chiefly as an ingredient in compound preparations.

Off. Prep. Confectio Aromatica; Extractum Colocynthidis Comp.; Pilula Colocynthidis Comp.; Pulvis Aromaticus; Pulvis Cinnamomi Comp.; Tinctura Cardamomi; Tinct. Cardamomi Comp.; Tinct. Cinnamomi Comp.; Tinct. Gentianæ Comp.; Tinct. Quassiæ Comp.; Tinct. Rhei; Tinct. Rhei Comp.; Tinct. Rhei et Aloës; Tinct. Sennæ Comp.; Tinct. Sennæ et Jalapæ; Vinum Aloës. W.

CAROTA. *U. S. Secondary.*

Carrot Seed.

The fruit of Daucus Carota. *U. S.*

DAUCI RADIX. *Ed.*

Garden Carrot Root.

Root of Daucus Carota, *var.* Sativa. *Ed.*

Off. Syn. CAROTA. Daucus Carota, *var. Sativa. Radix recens. Lond.* DAUCUS CAROTA. *The root. Dub.*

Carotte, *Fr.;* Gemeine Mohre, Gelbe Rube, *Germ.;* Carota, *Ital.;* Lanahoria, *Span.*

DAUCUS. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Umbelliferæ, or Apiaceæ.

Gen. Ch. Corolla somewhat rayed. *Florets* of the disk abortive. *Fruit* hispid with hairs. *Willd.*

Daucus Carota. Willd. *Sp. Plant.* i. 1389; Woodv. *Med. Bot.* p. 130, t. 50. The *wild carrot* has a biennial spindle-shaped root, and an annual, round, furrowed, hairy stem, which divides into long, erect, flower-bearing branches, and rises two or three feet in height. The leaves are hairy, and stand on footstalks nerved on their under side. The lower are large and tripinnate, the upper, smaller and less compound; in both, the leaflets are divided into narrow pointed segments. The flowers are small, white, and disposed in many-rayed compound umbels, which are at first flat on the top and spreading, but, when the seeds are formed, contract so as to present a concave cup-like surface. A sterile flower of a deep purple colour is often observable in the centre of the umbel. The general involucrum is composed of several leaves, divided into long narrow segments; the partial is more simple. The petals are five, unequal, and cordate. The fruit consists of two plano-convex hispid portions, connected by their flat surfaces.

Daucus Carota is exceedingly common in this country, growing along fences, and in neglected fields, which, in the months of June and July, are sometimes white over their whole surface with its flowers. It grows wild also in Europe, from which it is supposed by some botanists to have been introduced into the United States. The well-known garden carrot is the same plant, somewhat altered by cultivation. The officinal portions are the fruit of the wild, and the root of the cultivated variety.

1. Carrot Seeds. Strictly speaking, these should be called the fruit. They are very light, of a brownish colour, of an oval shape, flat on one side, convex on the other, and on their convex surface presenting four longitudinal ridges, to which stiff, whitish hairs or bristles are attached. They have an aromatic odour, and a warm, pungent, and bitterish taste. By distillation they yield a pale-yellow volatile oil, upon which their virtues chiefly depend. Boiling water extracts their active properties.

Medical Properties and Uses. Carrot seeds are moderately excitant and diuretic, and are employed, both in domestic practice and by physicians, in chronic nephritic affections, and in dropsy. As they possess to a certain extent the cordial properties of the aromatics, they are especially adapted to cases in which the stomach is enfeebled. They are said to afford relief in the strangury from blisters. From thirty grains to a drachm of the bruised seeds may be given at a dose, or a pint of the infusion, containing the virtues of half an ounce or an ounce of the seeds, may be taken during the day. The whole umbel is often used instead of the seeds alone.

2. Carrot Root. The root of the wild carrot is whitish, hard, coriaceous, branched, of a strong smell, and an acrid, disagreeable taste; that of the cultivated variety is reddish, fleshy, thick, conical, rarely branched, of a pleasant odour, and a peculiar sweet, mucilaginous taste. The constituents of the root are crystallizable and uncrystallizable sugar, a little starch, extractive, gluten, albumen, volatile oil, vegetable jelly or *pectin*, malic acid, saline matters, lignin, and a peculiar crystallizable, ruby-red, neuter principle, without odour or taste, called *carotin*. The substance called *vegetable jelly* was by some considered a modification of gum or mucilage, combined with a vegetable acid. Braconnot found it to be a peculiar principle, and gave it the name of pectin from the Greek (πηκτις), expressive of its characteristic property of gelatinizing. It exists more or less in all vegetables, and is abundant in certain fruits and roots from which jellies are prepared. It may be separated from the juice of fruits by alcohol, which precipitates it in the form of a jelly. This being washed with weak alcohol and dried, yields a semi-transparent substance bearing some resemblance to ichthyocolla. Immersed in 100 parts of cold water, it swells like bassorin, and ultimately forms a homogeneous jelly. With a larger proportion it exhibits a mucilaginous consistence. It is less acted on by boiling than by cold water. When perfectly pure it is tasteless, and has no effect on vegetable blues. A striking peculiarity is that, by the agency of a fixed alkali or alkaline earthy base, it is instantly converted into pectic acid, which unites with the base to form a pectate. This may be decomposed by the addition of an acid, which unites with the base and separates the pectic acid. (Braconnot, *Annales de Chimie, Juillet*, 1831.) *Pectic acid* thus obtained is in the form of a colourless jelly, slightly acidulous, with the property of reddening litmus paper, scarcely soluble in cold water, more soluble in boiling water, and forming with the latter a solution, which, though it does not become solid on cooling, is coagulated by the addition of alcohol, lime-water, acids, or salts, and even of sugar if allowed to stand for some time. With the alkalies the acid forms salts, which are also capable of assuming the consistence of a jelly. With the earths and

metallic oxides it forms insoluble salts. Braconnot thinks that pectic acid exists in many plants already formed. M. Frémy found that pectin results, in fruits, from the reaction of acids upon a peculiar insoluble substance they contain when immature, called by him *pectose;* and that pectin is changed into pectic acid not only by alkalies, but also by vegetable albumen.

Medical Properties and Uses. The wild root possesses the same properties with the seeds, and may be used for the same purposes. That of the garden plant has acquired much reputation as an external application to phagedenic, sloughing, and cancerous ulcers, the fetor of which it is supposed to correct, while it sometimes changes the character of the diseased action. It is also useful in the ulcers which follow fevers. The root is brought to the proper consistence by scraping. In this state it retains a portion of the active principles of the plant, which render it somewhat stimulant. Boiled and mashed, as usually recommended, the root is perfectly mild, and fit only to form emollient cataplasms.* W.

CARTHAMUS. *U. S. Secondary.*

Dyers' Saffron.

The flowers of Carthamus tinctorius. *U. S.*

Fleurs de carthame, Safran bâtard, *Fr.;* Farber Saffor, *Germ.;* Cartamo, *Ital., Span.*

CARTHAMUS. *Sex. Syst.* Syngenesia Æqualis.—*Nat. Ord.* Compositæ Cynareæ. *De Cand.* Cynaraceæ. *Lindley.*

Gen. Ch. Receptacle paleaceous, setose. *Calyx* ovate, imbricated, with ovate scales, leafy at the end. *Seed-down* paleaceous, hairy, or none. *Willd.*

Carthamus tinctorius. Willd. *Sp. Plant.* iii. 1706. The *dyers' saffron* or *safflower* is an annual plant, with a smooth erect stem, somewhat branched at top, and a foot or two in height. The leaves are alternate, sessile, ovate, acute, entire, and furnished with spiny teeth. The flowers are compound, in large, terminal, solitary heads. The florets are of an orange-red colour, with a funnel-shaped corolla, of which the tube is long, slender, and cylindrical, and the border divided into five equal, lanceolate, narrow segments.

The plant is a native of India, the Levant, and Egypt, and is cultivated in those countries, as well as in various parts of Europe and America. The florets are the part employed. They are brought to us chiefly from the ports of the Mediterranean. Considerable quantities are produced in this country, and sold as American saffron.

Safflower in mass is of a red colour, diversified by the yellowness of the filaments contained within the floret. It has a peculiar slightly aromatic odour, and a scarcely perceptible bitterness. Among its ingredients are two colouring substances—one red, insoluble in water, slightly soluble in alcohol, very soluble in alkaline liquids, and called *carthamine*, or *carthamic acid* by Döbereiner, who found it to possess acid properties; the other yellow, and soluble in water. It is the former which renders safflower useful as a dyestuff. Carthamine, mixed with finely powdered talc, forms the cosmetic powder called *rouge*. For more detailed information in relation to these principles, the reader is referred to the Journal de Pharmacie (3e sér., iii. 203).

* *Carrot Ointment.* The following formula for this ointment has been handed to us by Professor Procter, who has long been in the habit of preparing it:—Take of grated carrot root half a pound, lard a pound, wax four ounces. Melt the lard and wax, add the carrot root, evaporate with a moderate heat the moisture of the root, and strain. It may be used in excoriated or ulcerated surfaces, requiring a gentle stimulation.—*Note to the tenth edition.*

These flowers are sometimes fraudulently mixed with saffron, which they resemble in colour, but from which they may be distinguished by their tubular form, and by the yellowish style and filaments which they enclose.

Medical Properties. In large doses carthamus is said to be laxative; and administered in the state of warm infusion it proves somewhat diaphoretic. It is used in domestic practice, as a substitute for saffron, in measles, scarlatina, and other exanthematous diseases, in order to promote the eruption. An infusion made in the proportion of two drachms to a pint of boiling water is usually employed, and given without restriction as to quantity. W.

CARUM. *U. S.*

Caraway.

The fruit of Carum Carui. *U. S.*

Off. Syn. CARUI. Carum Carui. The fruit. *Lond., Ed.* The seeds. *Dub.* Carvi, *Fr., Ital.;* Gemeiner Kummel, *Germ.;* Alcaravea, *Span.*

CARUM. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Umbelliferæ or Apiaceæ.

Gen. Ch. Fruit ovate-oblong, striated. *Involucre* one-leafed. *Petals* keeled, inflexed-emarginate. *Willd.*

Carum Carui. Willd. *Sp. Plant.* i. 1470; Woodv. *Med. Bot.* p. 102, t. 41. This plant is biennial and umbelliferous, with a spindle-shaped, fleshy, whitish root, and an erect stem, about two feet in height, branching above, and furnished with doubly pinnate, deeply incised leaves, the segments of which are linear and pointed. The flowers are small and white, and terminate the branches of the stem in erect umbels, which are accompanied with an involucre, consisting sometimes of three or four leaflets, sometimes of one only, and are destitute of partial involucre.

The caraway plant is a native of Europe, growing wild in meadows and pastures, and cultivated in many places. It has been introduced into this country. The flowers appear in May and June, and the seeds, which are not perfected till the second year, ripen in August. The root, when improved by culture, resembles the parsnip, and is used as food by the inhabitants of the North of Europe. The seeds are the part used in medicine. They are collected by cutting down the plant, and threshing it on a cloth. Our markets are supplied partly from Europe, partly from our own gardens. The American seeds are usually rather smaller than the German.

Caraway seeds (half-fruits) are about two lines in length, slightly curved, with five longitudinal ridges, which are of a light yellowish colour, while the intervening spaces are dark brown. They have a pleasant aromatic smell, and a sweetish, warm, spicy taste. These properties depend on an essential oil, which they afford largely by distillation. The residue is insipid. They yield their virtues readily to alcohol, and more slowly to water.

Medical Properties and Uses. Caraway is a pleasant stomachic and carminative, occasionally used in flatulent colic, and as an adjuvant or corrective of other medicines. The dose in substance is from a scruple to a drachm. An infusion may be prepared by adding two drachms of the seeds to a pint of boiling water. The volatile oil, however, is most employed. (See *Oleum Cari.*) The seeds are baked in cakes, to which they communicate an agreeable flavour, while they stimulate the digestive organs.

Off. Prep. Aqua Carui; Confectio Opii; Confectio Rutæ; Emplastrum Cumini; Oleum Cari; Spiritus Carui; Spiritus Juniperi Compositus; Tinctura Cardamomi Composita; Tinct. Sennæ Comp.; Tinct. Sennæ et Jalapæ. W.

CARYOPHYLLUS. *U. S., Ed., Dub.*

Cloves.

The unexpanded flowers of Caryophyllus aromaticus. *U. S., Ed., Dub.*

Off. Syn. CARYOPHYLLUM. Caryophyllus aromaticus. *Flos nondum explicatus. Lond.*

Girofle, Clous de Girofles, *Fr.;* Gewurznelken, *Germ.;* Garofani, *Ital.;* Clavos de espicia, *Span.;* Cravo da India, *Portuguese;* Kruidnagel, *Dutch;* Kerunfel, *Arab.*

CARYOPHYLLUS. *Sex. Syst.* Icosandria Monogynia.—*Nat. Ord.* Myrtaceæ.

Gen. Ch. Tube of the *calyx* cylindrical; limb, four-parted. *Petals* four, adhering by their ends in a sort of calyptra. *Stamens* distinct, arranged in four parcels in a quadrangular fleshy hollow, near the teeth of the calyx. *Ovary* two-celled, with about twenty ovules in each cell. *Berry* one or two-celled, one or two-seeded. *Seeds* cylindrical, or half-ovate. *Cotyledons* thick, fleshy, convex externally, sinuous in various ways internally. *Lindley. De Cand.*

Caryophyllus aromaticus. Linn. *Sp.* 735; De Cand. *Prodrom.* iii. 262; Carson, *Illust. of Med. Bot.* i. 43, pl. 37.—*Eugenia caryophyllata.* Willd. *Sp. Plant.* ii. 965; Woodv. *Med. Bot.* p. 538, t. 193. This small tree is one of the most elegant of those which inhabit the islands of India. It has a pyramidal form, is always green, and is adorned throughout the year with a succession of beautiful rosy flowers. The stem is of hard wood, and covered with a smooth, grayish bark. The leaves are about four inches in length by two in breadth, obovate-oblong, acuminate at both ends, entire, sinuated, with many parallel veins on each side of the midrib, supported upon long footstalks, and opposite to each other upon the branches. They have a firm consistence, a shining green colour, and when bruised are highly fragrant. The flowers are disposed in terminal corymbose panicles, and exhale a strong, penetrating, and grateful odour.

The natural geographical range of the clove-tree is extremely limited. It was formerly confined to the Molucca islands, in most of which it grew abundantly before their conquest by the Dutch. By the monopolizing policy of that commercial people, the trees were extirpated in nearly all the islands except Amboyna and Ternate, which were under their immediate inspection. Notwithstanding, however, the jealous vigilance of the Dutch, a French governor of the Isle of France and of Bourbon, named Poivre, succeeded, in the year 1770, in obtaining plants from the Moluccas, and introducing them into the colonies under his control. Five years afterwards, the clove-tree was introduced into Cayenne and the West Indies, in 1803 into Sumatra, and in 1818 into Zanzibar. It is now cultivated largely in these and other places; and commerce has ceased to depend on the Moluccas for supplies of this spice.

The unexpanded flower buds are the part of the plant employed under the ordinary name of cloves.* They are first gathered when the tree is about six years old. The fruit has similar aromatic properties, but much weaker. The buds are picked by the hand, or separated from the tree by long reeds, and are then quickly dried. In the Moluccas they are said to be sometimes immersed in boiling water, and afterwards exposed to smoke and artificial heat, before being spread out in the sun. In Cayenne and the West Indies they are dried simply by solar heat.

Cloves appear to have been unknown to the ancients. They were introduced into Europe by the Arabians, and were distributed by the Venetians.

* The peduncles of the flowers have been sometimes employed. They possess the odour and taste of the cloves, though in a less degree, and furnish a considerable quantity of essential oil. The French call them *griffes de Girofles.*

After the discovery of the southern passage to India, the trade in this spice passed into the hands of the Portuguese; but was subsequently wrested from them by the Dutch, by whom it was long monopolized. Within a few years, however, the extended culture of the plant has thrown open the commerce in cloves to all nations. The United States derive much of their supply from the West Indies and Guiana. The Molucca cloves are said to be thicker, darker, heavier, more oily, and more highly aromatic than those of the colonies to which the clove-tree has been transplanted. They are known by the name of *Amboyna cloves.* The *Bencoolen cloves,* from Sumatra, are deemed equal if not superior by the English druggists.

Properties. Cloves resemble a nail in shape, are usually rather more than half an inch long, and have a round head with four spreading points beneath it. Their colour is externally deep brown, internally reddish; their odour strong and fragrant; their taste hot, pungent, aromatic, and very permanent. The best cloves are large, heavy, brittle, and exude a small quantity of oil on being pressed or scraped with the nail. When light, soft, wrinkled, pale, and of feeble taste and smell, they are inferior. We are told that those from which the essential oil has been distilled are sometimes fraudulently mixed with the genuine.

Trommsdorff obtained from 1000 parts of cloves 180 of volatile oil, 170 of a peculiar tannin, 130 of gum, 60 of resin, 280 of vegetable fibre, and 180 of water. M. Lodibert afterwards discovered a fixed oil, aromatic and of a green colour, and a white resinous substance which crystallizes in fasciculi composed of very fine diverging silky needles, without taste or smell, soluble in ether and boiling alcohol, and exhibiting neither alkaline nor acid reaction. This substance, called by M. Bonastre *caryophyllin,* was found in the cloves of the Moluccas, of Bourbon, and of Barbadoes, but not in those of Cayenne. Berzelius considers it a stearoptene, and probably identical with that deposited by the oil of cloves when long kept. To obtain it, the ethereal extract of cloves is treated with water, and the white substance formed is separated by filtration, and treated repeatedly with ammonia to deprive it of impurities. Thus procured, Dr. Muspratt found it to consist of carbon, hydrogen, and oxygen, in the proportion represented by the formula $C_{10}H_8O_7$. (*Pharm. Journ. and Trans.*, x. 343.) M. Dumas has discovered another crystalline principle, which forms in the water distilled from cloves, and is gradually deposited. Like caryophyllin, it is soluble in alcohol and ether, but differs from that substance in becoming red when touched with nitric acid. M. Bonastre proposes for it the name of *eugenin.* (*Journ. de Pharm.*, xx. 565.) Water extracts the odour of cloves with comparatively little of their taste. All their sensible properties are imparted to alcohol, and the tincture when evaporated leaves an excessively fiery extract, which becomes insipid when deprived of the oil by distillation with water, while the oil which comes over is mild. Hence it has been inferred that the pungency of this aromatic depends on a union of the essential oil with the resin. For an account of the oil, see *Oleum Caryophylli.* The infusion and oil of cloves are reddened by nitric acid, and rendered blue by tincture of chloride of iron; facts of some interest, as morphia affords the same results with these reagents.

Medical Properties and Uses. Cloves are among the most stimulant of the aromatics; but, like others of this class, act less upon the system at large than on the part to which they are immediately applied. They are sometimes administered in substance or infusion to relieve nausea and vomiting, correct flatulence, and excite languid digestion; but their chief use is to assist or modify the action of other medicines. They enter into several officinal preparations. Their dose in substance is from five to ten grains.

The French Codex directs a *tincture of cloves* to be prepared by digesting

for six days, and afterwards filtering, a mixture of four ounces of powdered cloves and sixteen of alcohol of 31° Cartier. Three ounces to the pint of alcohol is a sufficiently near approximation.

Off. Prep. Confectio Aromatica; Confectio Scammonii; Infusum Aurantii Compositum; Infusum Caryophylli; Mistura Ferri Aromatica; Oleum Caryophylli; Spiritus Ammoniæ Aromaticus; Spiritus Lavandulæ Compositus; Syrupus Rhei Aromaticus; Vinum Opii. W.

CASCARILLA. *U. S., Lond., Ed., Dub.*

Cascarilla.

The bark of Croton Eleuteria. *U. S., Lond., Dub.* Bark probably of Croton Eleuteria, and possibly other species of the same genus. *Ed.*

Cascarille, *Fr.;* Cascarillrinde, *Germ.;* Cascariglia, *Ital.;* Chacarila, *Span.*

CROTON. *Sex. Syst.* Monœcia Monadelphia. — *Nat. Ord.* Euphorbiaceæ. *Gen. Ch.* MALE. *Calyx* cylindrical, five-toothed. *Corolla* five-petalled. *Stamens* ten to fifteen. FEMALE. *Calyx* many-leaved. *Corolla* none. *Styles* three, bifid. *Capsule* three-celled. *Seed* one. *Willd.*

Cascarilla has been ascribed by different writers to different species of Croton; but authorities now generally agree in referring it to *C. Eleuteria.* It is not impossible that *C. Cascarilla* of Linnæus contributes a portion of the drug, but we have no proof of the fact. The London College has corrected the error, committed in a former edition of its Pharmacopœia, of recognising the *C. Cascarilla* of Don as the source of it. This botanist mistook the *Copalchi bark* of Mexico, which is produced by the *Croton Pseudo-China* of Schiede, and bears some resemblance to cascarilla, for the genuine bark, and hence proposed to transfer the specific name of Cascarilla to the Mexican plant; an unfortunate error, to which the London College formerly gave authority by its sanction. No fact is better ascertained than that the proper cascarilla bark is a West India product, and is never brought from Mexico. The Copalchi bark has been mistaken also for a variety of cinchona.*

Croton Eleuteria. Willd. *Sp Plant.* iv. 545; Carson, *Illust. of Med. Bot.* ii. 34, pl. 78. This species of Croton is a small tree or shrub, said by Browne to be four or five feet in height, but as seen by Dr. Wright in Jamaica, rising to twenty feet, and branching thickly towards the summit. The leaves are entire, ovate or cordate-lanceolate, and elongated towards the apex, which is blunt. They are of a bright green colour upon their upper surface, and stand alternately upon short footstalks. The flowers, which are of a whitish colour, are disposed in axillary and terminal racemes. This shrub grows wild in the West Indies, especially the Bahama islands, in one of which, the small island of Eleutheria, it is found so abundantly as to have received its name from that circumstance. It is called by Browne *sea-side balsam.*

* Portions of *Copalchi bark* have been taken to Europe, and attracted the attention both of pharmacologists and medical practitioners. Two kinds of it have been noticed; one, in small slender quills, of an ash colour, bearing some resemblance to a variety of pale cinchona, but having the flavour of cascarilla, and burning with a similar odour; the other, in larger quills, with a thick cork-like epidermis, very bitter, and yielding an aromatic odour when burnt. The former is the product of C. Pseudo-China, the latter is of unknown origin, but conjecturally referred to *Croton suberosum.* Copalchi bark is an aromatic tonic, used in Mexico in intermittents, and capable of useful application in all cases requiring a mild aromatic bitter. Dr. Stark has employed it advantageously in feeble states of digestion with irritable bowels, and found it in one or two cases to exhibit antiperiodic properties. It may be given in infusion made with half an ounce of the bark to a pint of water, in the dose of one or two fluidounces three times a day. (*Ed. Med. and Surg. Journ.*, April, 1849, p. 410.)—*Note to ninth edition.*

Croton Cascarilla. Willd. *Sp. Plant.* iv. 531; Woodv. *Med. Bot.* p. 629, t. 222. This is still smaller than the preceding species, and is called by Browne the *small sea-side balsam.* The stem is branched and covered with brown bark, of which the external coat is rough and whitish. The leaves are long, very narrow, somewhat pointed, entire, of a bright green colour on the upper surface, downy and of a silvery whiteness on the under. They are placed alternately on short footstalks. The flowers are small, greenish, and disposed in long terminal spikes. This plant is a native of the Bahamas, has been found abundantly in Hayti, and is said also to grow in Peru and Paraguay. Browne describes it as hot and pungent to the taste. The *Croton lineare* of Jacquin, considered by Willdenow as a variety of C. Cascarilla, is made a distinct species by Sprengel. It is the wild rosemary of Jamaica, and is said by Dr. Wright to have none of the sensible qualities of cascarilla.

Cascarilla is brought to this market from the West Indies, and chiefly, as we have been informed, from the Bahamas. It comes in bags or casks. We have observed it in the shops in two forms, so distinct as almost to deserve the title of varieties. In one, the bark is in rolled pieces of every size, from three or four inches in length and half an inch in diameter to the smallest fragments, covered externally with a dull whitish or grayish-white epidermis, which in many portions is partially, sometimes wholly removed, leaving a dark-brown surface, while the inner surface has a chocolate colour, and the fracture is reddish-brown. The small pieces are sometimes curled, but have a distinct abrupt edge as if broken from the branches. The second variety consists entirely of very small pieces not more than an inch or two in length, very thin, without the white epidermis, not regularly quilled, but curved more or less in the direction of their length, often having a small portion of woody fibre attached to their inner surface, and presenting an appearance precisely as if shaved by a knife from the stem or branches of the shrub. Whether these two varieties are derived from distinct species, or differ only from the mode of collection, it is difficult to determine.

Properties. Cascarilla has an aromatic odour, rendered much more distinct by friction, and a warm, spicy, bitter taste. It is brittle, breaking with a short fracture. When burnt it emits a pleasant odour, closely resembling that of musk, but weaker and more agreeable. This property serves to distinguish it from all other barks. It was analyzed by Trommsdorff, and more recently by M. Duval, of Liseux, in France. The constituents found by the latter were albumen, a peculiar kind of tannin, a bitter crystallizable principle called *cascarillin*, a red colouring matter, fatty matter of a nauseous odour, wax, gum, volatile oil, resin, starch, pectic acid, chloride of potassium, a salt of lime, and lignin. The oil, according to Trommsdorff, constitutes 1·6 per cent., is of a greenish-yellow colour, a penetrating odour analogous to that of the bark, and of the sp. gr. 0·938. To obtain cascarillin, M. Duval treated the powdered bark with water, added acetate of lead to the solution, separated the lead by sulphuretted hydrogen, filtered, evaporated with the addition of animal charcoal, filtered again, evaporated again at a low temperature to the consistence of a syrup, allowed this to harden by cooling, and purified the matter thus obtained by twice successively treating it, first with a little cold alcohol, to separate the colouring and fatty matters, and afterwards with boiling alcohol and animal charcoal. The last alcoholic solution was allowed to evaporate spontaneously. Thus obtained, cascarillin is white, crystallized, inodorous, of a bitter taste, very slightly soluble in water, soluble in alcohol and ether, neuter in chemical relations, and without nitrogen. (*Journ. de Pharm.*, 3*e sér.*, viii. 96.) Either alcohol or water will partially extract the active matters of cascarilla; but diluted alcohol is the proper menstruum.

Medical Properties and Uses. This bark is aromatic and tonic. It was known in Germany so early as the year 1690, and was much used as a substitute for Peruvian bark by those who were prejudiced against that febrifuge in the treatment of remittent and intermittent fevers. It has, however, lost much of its reputation, and is now employed only where a pleasant and gently stimulant tonic is desirable; as in dyspepsia, chronic diarrhœa and dysentery, flatulent colic, and other cases of debility of the stomach or bowels. It is sometimes advantageously combined with the more powerful bitters. It may be given in powder or infusion. The dose of the former is from a scruple to half a drachm, which may be repeated several times a day. In consequence of its pleasant odour when burnt, some smokers mix it in small quantity with their tobacco; but it is said when thus employed to occasion vertigo and intoxication.

Off. Prep. Infusum Cascarillæ; Tinctura Cascarillæ. W.

CASSIA FISTULA. *U. S.*

Purging Cassia.

The fruit of Cassia Fistula. *U. S.*

Off. Syn. CASSIA. Cassia Fistula. *Fructus. Lond.;* CASSIÆ PULPA. Pulp of the pods of Cassia Fistula. *Ed.*

Casse, *Fr.;* Röhrenkassie, *Germ.;* Polpi di Cassia, *Ital.;* Cana Fistula, *Span.*

CASSIA. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Fabaceæ or Leguminosæ.

Gen. Ch. Calyx five-leaved. *Petals* five. *Anthers,* three upper sterile, three lower beaked. *Lomentum. Willd.*

The tree which yields the purging cassia is ranked by some botanists in a distinct genus, separated from the Cassia and denominated *Cathartocarpus.* (See *Lindley's Flor. Med.*, 262.)

Cassia Fistula. Willd. *Sp. Plant.* ii. 518; Woodv. *Med. Bot.* p. 445, t. 160; Carson, *Illust. of Med. Bot.* i. 24, pl. 26.—*Cathartocarpus Fistula.* Persoon, *Synops.* i. 459. This is a large tree, rising to the height of forty or fifty feet, with a trunk of hard heavy wood, dividing towards the top into numerous spreading branches, and covered with a smooth ash-coloured bark. The leaves are commonly composed of five or six pairs of opposite leaflets, which are ovate, pointed, undulated, smooth, of a pale green colour, from three to five inches long, and supported upon short petioles. The flowers are large, of a golden yellow colour, and arranged in long pendent axillary racemes. The fruit consists of long, cylindrical, woody, dark-brown, pendulous pods, which, when agitated by the wind, strike against each other, and produce a sound that may be heard at a considerable distance.

This species of Cassia is a native of Upper Egypt and India, whence it is generally supposed to have been transplanted to other parts of the world. It is at present very extensively diffused through the tropical regions of the old and new continents, being found in Insular and Continental India, Cochin-China, Egypt, Nubia, the West Indies, and the warmer parts of America. The fruit is the officinal portion of the plant. It is imported from the East and West Indies, chiefly the latter, and from South America.

Properties. Cassia pods are a foot or more in length, straight or but slightly curved, cylindrical, less than an inch in diameter, with a woody shell, externally of a dark-brown colour, and marked with three longitudinal shining bands, extending from one end to the other, two of which are in close proximity, appearing to constitute a single band, and the third is on the opposite side of the pod. These bands mark the place of junction of the valves

of the legume, and are represented as sometimes excavated in the form of furrows. There are also circular depressions at unequal distances. Internally the pod is divided into numerous cells by thin transverse plates, which are covered with a soft, black pulp. Each cell contains a single, oval, shining seed. The pods brought from the East Indies are smaller, smoother, have a blacker pulp, and are more esteemed than those from the West Indies.

We have seen a quantity of pods in this market sold as cassia pods, which were an inch and a half in diameter, flattened on the sides, exceedingly rough on the outer surface, and marked by three longitudinal very elevated ridges corresponding to the bands or furrows of the common cassia. The pulp was rather nauseous, but in other respects seemed to have the properties of the officinal purging cassia. They corresponded exactly with a specimen of the fruit of *Cassia Brasiliana* brought from the West Indies, and were probably derived from that plant.

The heaviest pods, and those which do not make a rattling noise when shaken, are to be preferred; as they contain a larger portion of the pulp, which is the part employed. This should be black and shining, and have a sweet taste. It is apt to become sour if long exposed to the air, or mouldy if kept in a damp place. The pulp is extracted from the pods by first bruising them, then boiling them in water, and afterwards evaporating the decoction; or, when the pods are fresh, by opening them at the sutures, and removing the pulp by a spatula. (See *Cassiæ Fistulæ Pulpa.*)

Cassia pulp has a slight rather sickly odour, and a sweet mucilaginous taste. From the analysis of M. Henry it appears to contain sugar, gum, a substance analogous to tannin, a colouring matter soluble in ether, traces of a principle resembling gluten, and a small quantity of water.

Medical Properties and Uses. Cassia pulp is generally laxative, and may be advantageously given in small doses in cases of habitual costiveness. In quantities sufficient to purge, it occasions nausea, flatulence, and griping. In this country it is very rarely prescribed, except as an ingredient in the confection of senna, which is a highly pleasant and useful laxative preparation. The dose of the pulp as a laxative is one or two drachms, as a purge one or two ounces.

Off. Prep. Cassiæ Fistulæ Pulpa; Cassia Præparata. W.

CASSIA MARILANDICA. *U. S.*

American Senna.

The leaves of Cassia Marilandica. *U. S.*

Cassia. See CASSIA FISTULA.

Cassia Marilandica. Willd. *Sp. Plant.* ii. 524; Bigelow, *Am. Med. Bot.* ii. 116; Barton, *Med. Bot.* i. 137. This is an indigenous perennial plant, of vigorous growth, sending up annually numerous round, erect, nearly smooth stems, which are usually simple, and rise from three to six feet in height. The leaves are alternate, and composed of from eight to ten pairs of oblong-lanceolate, smooth, mucronate leaflets, green on their upper surface, pale beneath, and connected by short petioles with the common footstalk, which is compressed, channeled above, and furnished near its base with an ovate, stipitate gland. The flowers, which are of a beautiful golden yellow colour, grow in short axillary racemes at the upper part of the stem. The calyx is composed of five oval, obtuse, unequal, yellow leaves; the corolla of the same number of spatulate concave petals, of which three are ascending, and two descending and larger than the others. The stamens are ten, with yellow

filaments and brown anthers, which open by a terminal pore. The three upper stamens bear short abortive anthers; the three lowermost are long, curved, and tapering into a beak. The germ, which descends with the latter, bears an erect style terminating in a hairy stigma. The fruit is a pendulous legume, from two to four inches long, linear, curved, swelling at the seeds, somewhat hairy, and of a blackish colour.

The *American senna*, or *wild senna* as it is sometimes called, is very common in all parts of the United States south of New York, and grows as far northward as the southern boundary of Massachusetts. It prefers a low, moist, rich soil, in the vicinity of water, and, though frequently found in dryer and more elevated places, is most abundant and luxuriant in the flat ground on the borders of rivers and ponds. It is sometimes cultivated in gardens for medical use. In the months of July and August, when in full bloom, it has a rich and beautiful appearance. The leaves should be collected in August or the beginning of September, and carefully dried.

They are sometimes brought into the market, compressed into oblong cakes, such as those prepared by the Shakers from most herbaceous medicinal plants. The leaflets are from an inch and a half to two inches long, from one-quarter to half an inch in breadth, thin, pliable, and of a pale-green colour. They have a feeble odour, and a nauseous taste somewhat analogous to that of senna. Water and alcohol extract their virtues. They were analyzed by Mr. Martin, of Philadelphia, and found to contain a principle analogous to *cathartin*, albumen, mucilage, starch, chlorophylle, yellow colouring matter, volatile oil, fatty matter, resin, and lignin, besides salts of potassa and lime. (*Am. Journ. of Pharm.*, i. 22.)

Medical Properties and Uses. American senna is an efficient and safe cathartic, closely resembling the imported senna in its action, and capable of being substituted for it in all cases in which the latter is employed. It is, however, less active; and, to produce an equal effect, must be administered in a dose about one-third larger. It is habitually used by many practitioners in the country. Like senna it is most conveniently given in the form of infusion, and should be similarly combined in order to obviate its tendency to produce griping. W.

CASTANEA. *U. S. Secondary.*

Chinquapin.

The bark of Castanea pumila. *U. S.*

CASTANEA. *Sex. Syst.* Monœcia Polyandria.—*Nat. Ord.* Cupuliferæ. *Gen. Ch.* MALE. *Ament* naked. *Calyx* none. *Corolla* five-petalled. *Stamens* ten to twenty. FEMALE. *Calyx* five or six leaved, muricate. *Corolla* none. *Germs* three. *Stigmas* pencil-formed. *Nuts* three, included in the echinated calyx. *Willd.*

Castanea pumila. Willd. *Sp. Plant.* iv. 461; Michaux, *N. Am. Sylv.* iii. 15. The chinquapin is an indigenous shrub or small tree, which, in the Middle States, rarely much exceeds seven or eight feet in height; but, in Carolina, Georgia, and Louisiana, sometimes attains an elevation of thirty or forty feet, with a diameter of trunk equal to twelve or fifteen inches. The leaves are oblong, acute, mucronately serrate, and distinguished from those of the chestnut, which belongs to the same genus, by their whitish and downy under surface. The barren flowers are grouped upon axillary peduncles three of four inches long; the fertile aments are similarly disposed, but less conspicuous. The fruit is spherical, covered with short prickles, and encloses

a brown nut, which is sweet and edible, but differs from the chestnut in being much smaller, and convex on both sides.

The tree extends from the banks of the Delaware southward to the Gulf of Mexico, and south-westward to the Mississippi. It is most abundant in the southern portions of this tract of country. The bark is the part used. It is astringent and tonic, and has been employed in the cure of intermittents; but has no peculiar virtues to recommend it, and might well be spared even from the secondary catalogue of the Pharmacopœia. W.

CASTOREUM. *U. S., Lond., Ed., Dub.*

Castor.

A peculiar concrete substance obtained from Castor fiber. *U. S.* The follicles of the prepuce filled with a peculiar secretion. *Lond.* A peculiar secretion in the præputial follicles. *Ed., Dub.*

Castoreum, *Fr.;* Bibergeil, *Germ.:* Castoro, *Ital.;* Castoreo, *Span.*

In the beaver, *Castor fiber* of naturalists, between the anus and external genitals of both sexes, are two pairs of membranous follicles, of which the lower and larger are pear-shaped, and contain an oily, viscid, highly odorous substance, secreted by glands which lie externally to the sac. This substance is called castor. After the death of the animal, the follicles containing it are removed, and dried either by smoke or in the sun; and in this state are brought into the market.

This drug is derived either from the northern and north-western parts of the American continent, or from the Russian dominions; and is distinguished, according to its source, into the Canadian or American, and Russian castor. It is supposed by some that the American and Russian beavers are distinct species, the former being a building, the latter a burrowing animal; and additional ground for the supposition is afforded by the fact, that the products of the two differ considerably. Of the Russian but a very small portion reaches this country. That which is brought to Philadelphia is derived chiefly from Missouri.

Castor comes to us in the form of solid unctuous masses, contained in sacs about two inches in length, larger at one end than at the other, much flattened and wrinkled, of a brown or blackish colour externally, and united in pairs by the excretory ducts which connect them in the living animal. In each pair, one sac is generally larger than the other. They are divided internally into numerous cells containing the castor, which, when the sacs are cut or torn open, is exhibited of a brown or reddish-brown colour, intermingled more or less with the whitish membrane forming the cells. Those brought from Russia are larger, fuller, heavier, and less tenacious than the American; and their contents, which are of a rusty or liver colour, have a stronger taste and smell, and are considered more valuable as a medicine. A variety of Russian castor, described by Pereira under the name of *chalky Russian castor*, is in smaller and rounder sacs than the American, has a peculiar empyreumatic odour very different from that of the other varieties, breaks like starch under the teeth, and is characterized by effervescing with dilute muriatic acid. In a specimen examined by Müller, 40·646 per cent. of carbonate of lime was found. (*Am. Journ. of Pharm.*, xviii. 276.) In the castor from Missouri, the contents of the sac are sometimes almost white, and evidently inferior. According to Jannarch, castor varies with the time of year at which it is collected, being lighter coloured, more fluid, and less copious in the follicles from February to July, than in the remainder of the year. (*Pharm. Cent. Blatt*, Mai, 1847, p. 318.) It is said by M. Kohli that the Canadian

castor, treated with distilled water and ammonia, affords an orange precipitate, while the matter thrown down from the Russian under similar treatment is white.

Properties. Good castor has a strong, fetid, peculiar odour; a bitter, acrid, and nauseous taste; and a colour more or less tinged with red. It is of a softer or harder consistence, according as it is more or less thoroughly dried. When perfectly desiccated, though still somewhat unctuous to the touch, it is hard, brittle, and of a resinous fracture. Its chemical constituents, according to Brandes, whose analysis is the most recent, are volatile oil; a resinous matter; albumen; a substance resembling osmazome; mucus; urate, carbonate, benzoate, phosphate, and sulphate of lime; acetate and muriate of soda; muriate, sulphate, and benzoate of potassa; carbonate of ammonia; membranous matter; and a peculiar proximate principle previously discovered by M. Bizio, an Italian chemist, and called by him *castorin*. This principle crystallizes in long, diaphanous, fasciculated prisms, has the smell of castor, and a copperish taste. It is insoluble in cold water and cold alcohol; but is dissolved by one hundred parts of the latter liquid at the boiling temperature, and by the essential oils. It possesses neither alkaline nor acid properties. It may be obtained by treating castor, minutely divided, with six times its weight of boiling alcohol, filtering the liquor while hot, and allowing it to cool. The *castorin* is slowly deposited, and may be purified by the action of cold alcohol. It has been thought to be the active principle of castor; but its claims are at best very doubtful. The *volatile oil* may be separated by repeated distillation with the same portion of water. It is pale yellow, and has the smell and taste of castor.

F. Wöhler has ascertained the existence of salicin in castor; also that it contains a small quantity of *carbolic acid*, one of the products of the distillation of coal-tar, to which he ascribes its odour. This acid is poisonous, and has a special action on the nervous system. (*Chem. Gaz.*, No. 149, Jan. 1, 1849, from *Liebig's Annalen.*)*

Dr. Pereira found that a portion of water distilled from American castor gradually lost its own peculiar odour, and acquired that of the flowers of *Spiræa ulmaria*, and afterwards presented no trace of the presence of oil of castor. Upon testing it, he ascertained the existence in it of *hydruret of salicyle* (*oil of Spiræa ulmaria*), and concluded that the oil of castor had been converted into that principle. He farther inferred that the oil is probably a volatile product of the salicin of the castor, and ascribes the carbolic acid to the same source. (*Pharm. Journ. and Trans.*, xi. 200.) The salicin of the castor probably proceeds from the willow and poplar on which the beaver feeds.

Alcohol and ether extract the virtues of castor. An infusion made with boiling water has its sensible properties in a slight degree; but the odorous principle of the drug is dissipated by decoction.

* Under the name of *Hyraceum*, a substance has recently been taken to Europe from the Cape of Good Hope, and introduced to the notice of the profession as a substitute for castor. It is the product of *Hyrax Capensis*, an animal of South Africa, about the size of a large rabbit. It is said to be collected in small pieces on the rugged sides of mountains, and is probably the excrement of the animal. It is rather hard, tenacious, of a blackish-brown colour, and of a taste and smell not unlike those of castor. It is inflammable, and yields portions of its constituents to water and alcohol. Examined with the microscope, it has been found to contain vegetable tissues, animal hairs, sand, and globular particles, either resinous or oily. Schrader has found it to contain stearin, a gum-resin soluble in absolute alcohol, an odorous yellow substance soluble in ordinary alcohol and in water, a brown substance soluble in water, and insoluble residue. Dr. Pereira, from whose paper the above account is extracted, considers it worthless as a therapeutical agent, though in physiological effects it is said exactly to resemble American castor. (*Pharm. Journ. and Trans.*, x. 123.)

The virtues of castor are impaired by age; and the change is more rapid in proportion to the elevation of temperature. Moisture promotes its speedy decomposition. It should not, therefore, be kept in damp cellars. In a dry cool place it may be kept for a long time without material deterioration. When quite black, with little taste or smell, it is unfit for use. A factitious preparation is sometimes sold, consisting of a mixture of various drugs, scented with genuine castor, intermingled with membrane, and stuffed into the scrotum of a goat. The fraud may be detected by the comparatively feeble odour, the absence of other characteristic sensible properties, and the want of the smaller follicles containing fatty matter, which are often attached to the real bags of castor.

Medical Properties and Uses. Castor is moderately stimulant and antispasmodic. The experiments of Thouvenel prove that, in large doses, it quickens the pulse, increases the heat of the skin, and produces other symptoms of general excitement; but its force is directed chiefly to the nervous system, and in small doses it scarcely disturbs the circulation. It has also enjoyed a high reputation as an emmenagogue. It was employed by the ancients. Pliny and Dioscorides speak of it as useful in hysteria and amenorrhœa. In Europe, especially on the continent, it is still frequently prescribed in low forms of fever attended with nervous symptoms, in spasmodic diseases, such as hysteria and epilepsy, in many anomalous nervous affections, and in diseases dependent on or connected with suppression or retention of the menses. The practitioners of this country rarely resort to it. The dose in substance is from ten to twenty grains, which may be given in bolus or emulsion. The tincture is sometimes employed.

Off. Prep. Tinctura Castorei; Tinctura Castorei Ammoniata. W.

CATARIA. *U. S. Secondary.*

Catnep.

The leaves of Nepeta Cataria. *U. S.*

Cataire, *Fr.;* Katzenmünze, *Germ.;* Cattara, *Ital.;* Gatera, *Span.*

NEPETA. *Sex. Syst.* Didynamia Gymnospermia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Calyx dry, striate, five-toothed. *Corolla* with the upper lip undivided, the under lip three-parted, the middle division crenate. *Stamens* approximate.

Nepeta Cataria. The *catnep* or *catmint* is a perennial herbaceous plant, with a quadrangular, branching, somewhat hoary stem, from one to three feet high, and furnished with opposite, petiolate, cordate, dentate, pubescent leaves, which are green above and whitish on their under surface. The flowers are whitish or slightly purple, are arranged in whorled spikes, and appear in July and August. The plant is abundant in the United States, but is supposed to have been introduced from Europe.

The whole herb is used; but the leaves only are recognised in the U. S. Pharmacopœia. They have a strong, peculiar, rather disagreeable odour, and a pungent, aromatic, bitterish, camphorous taste. They yield their virtues to water. The active constituents are volatile oil, and tannin of the kind which produces a greenish colour with the salts of iron.

In its operation upon the system, catnep is tonic and excitant, bearing considerable resemblance to the mints. It has had the reputation also of being antispasmodic and emmenagogue. Cats are said to be very fond of it, and it has been asserted to act as an aphrodisiac in these animals. It is employed as a domestic remedy, in the form of infusion, in amenorrhœa, chlorosis,

hysteria, the flatulent colic of infants, &c.; but is scarcely known in regular practice. Some of the older writers speak favourably of its powers. The leaves are said to relieve toothache if chewed, or held for a few minutes in contact with the diseased tooth. Two drachms of the dried leaves or herb may be given as a dose in infusion. W.

CATECHU. *U. S., Lond., Ed., Dub.*

Catechu.

The extract of the wood of Acacia Catechu. *U. S., Dub.* Extract of the inner wood of Acacia Catechu; or of the leaves of Uncaria Gambir. *Lond.* Extract of the wood of Acacia Catechu, of the kernels of Areca Catechu, and of the leaves of Uncaria Gambir, probably too from other plants. *Ed.*

Cachou, *Fr.;* Catechu, *Germ.;* Catecu, Catciu, Catto, *Ital.;* Catecu, *Span.;* Cutt, *Hindoostanee.*

Acacia. See ACACIA.

Acacia Catechu. Willd. *Sp. Plant.* iv. 1079; Woodv. *Med. Bot.* p. 433, t. 157; Carson, *Illust. of Med. Bot.* i. 32, pl. 24. According to Mr. Kerr, whose description has been followed by most subsequent writers, Acacia Catechu is a small tree, seldom more than twelve feet in height, with a trunk one foot in diameter, dividing towards the top into many close branches, and covered with a thick, rough, brown bark. The leaves, which stand alternately upon the younger branches, are composed of from fifteen to thirty pairs of pinnæ nearly two inches long, each of which is furnished with about forty pairs of linear leaflets, beset with short hairs. At the base of each pair of pinnæ is a small gland upon the common footstalk. Two short recurved spines are attached to the stem at the base of each leaf. The flowers are in close spikes, which arise from the axils of the leaves, and are about four or five inches long. The fruit is a lanceolate, compressed, smooth, brown pod, with an undulated thin margin, and contains six or eight roundish flattened seeds, which when chewed emit a nauseous odour.

This species of Acacia is a native of the East Indies, growing abundantly in various provinces of Hindostan, and in the Burman empire. Pereira says that it is now common in Jamaica. Like most others of the same genus, it abounds in astringent matter, which may be extracted by decoction. Catechu is an extract from the wood of the tree.

This drug had been long known before its source was discovered. It was at first called *terra Japonica*, under the erroneous impression that it was an earthy substance derived from Japan. When ascertained by analysis to be of vegetable origin, it was generally considered by writers on the Materia Medica to be an extract of the *betel-nut*, which is the fruit of a species of palm, denominated *Areca Catechu*. Its true origin was made known by Mr. Kerr, assistant-surgeon of the civil hospital in Bengal, who had an opportunity of examining the tree from which it was obtained, and of witnessing the process of extraction. According to Mr. Kerr, the manufacturer, having cut off the exterior white part of the wood, reduces the interior brown or reddish-coloured portion into chips, which he then boils in water in unglazed earthen vessels, till all the soluble matter is dissolved. The decoction thus obtained is evaporated first by artificial heat, and afterwards in the sun, till it has assumed a thick consistence, when it is spread out to dry upon a mat or cloth, being, while yet soft, divided by means of a string into square or quadrangular pieces. The account more recently given by Dr. Royle, of the preparation of the extract in Northern India, is essentially the same. The process, as he observed it, was completed by the pouring of the extract into quadrangular

earthen moulds. Our own countryman, the Rev. Howard Malcolm, states, in his "Travels in South Eastern Asia," that catechu is largely prepared from the wood of Acacia Catechu in the vicinity of Prome, in Burmah. Two kinds, he observes, are prepared from the same tree, one *black*, which is preferred in China, and the other *red*, which is most esteemed in Bengal. According to some authors, the unripe fruit and leaves are also submitted to decoction.

The name *catechu* in the native language signifies the *juice of a tree*, and appears to have been applied to astringent extracts obtained from various plants. According to the United States and Dublin Pharmacopœias, however, the term is properly restricted to the extract of Acacia Catechu; as it was not intended to recognise all the astringent products which are floating in Asiatic commerce; and those from other sources than the Acacia, though they may occasionally find their way into our shops, do so as an exception to the general rule. A minute account of the diversified forms and exterior characters, which the officinal catechu presents as produced in different localities, would rather tend to perplex the reader than to serve any good practical purpose. These characters are, moreover, frequently changing, as the drug is procured from new sources, or as slight variations may occur in the mode of its preparation. Commerce is chiefly supplied with catechu from Bahar, Northern India, and Nepaul through Calcutta, from Canara through Bombay, and from the Burman dominions. We derive it directly from Calcutta, or by orders from London, and it is sold in our markets without reference to its origin. It is frequently called *cutch* by the English traders, a name derived, no doubt, from the Hindoostanee word *cutt.**

* In order not to embarrass the text unnecessarily, we have thrown together into the form of a note the following observations upon the varieties of catechu, those being first considered which are probably derived from *Acacia Catechu*, and, therefore, recognised as officinal in the U. S. Pharmacopœia.

1. *Officinal Catechus. U. S.*

The following, so far as we have been able to distinguish them, are the varieties of officinal catechu to be found in the markets of Philadelphia.

1. *Plano-convex Catechu. Cake Catechu.* This is in the form of circular cakes, flat on one side, convex on the other, and usually somewhat rounded at the edge, as if the soft extract had been placed in saucers, or vessels of a similar shape, to harden. As found in the retail shops, it is generally in fragments, most of which, however, exhibit some evidences of the original form. The cakes are of various size, from two or three to six inches or more in diameter, and weighing from a few ounces to nearly two pounds. Their exterior is usually smooth and dark brown, but we have seen a specimen in which the flat surface exhibited impressions as if produced by coarse matting. The colour internally is always brown, sometimes of a light yellowish-brown or chocolate colour, but more frequently dark reddish-brown, and sometimes almost black. The cakes are almost always more or less cellular in their interior; but in this respect great diversity exists. Sometimes they are very porous, so as almost to present a spongy appearance, sometimes compact and nearly uniform; and this difference may be observed even in the same piece. The fracture is sometimes rough and dull, but in the more compact parts is usually smooth and somewhat shining; and occasionally a piece split in one direction will exhibit a spongy fracture, while in another it will be shining and resinous, indicating the consolidation of the extract in layers. This variety of catechu is often of good quality. It is common at present in our market; but we have been unable to trace its origin accurately. There can be little doubt, from its internal character, that it comes from the East Indies, and is the product of *A. catechu:* but no accounts that we have seen of the preparation of the drug, in particular geographical sites, indicate this particular shape; and it is not impossible that portions of it may be formed out of other varieties of catechu by a new solution and evaporation.

2. *Pegu Catechu.* This is the product derived from the Burman dominions, and named from that section of the country whence it is exported. It enters commerce, probably in general through Calcutta, in large masses, sometimes of a hundred weight, consisting of layers of flat cakes, each wrapped in leaves said to be those of the *Nauclea Brunonis*. In this form, however, we do not see it in the shops; but almost always in

Properties. Catechu, as it comes to us, is in masses of different shapes, some in balls more or less flattened, some in circular cakes, some saucer-

angular irregular fragments, in which portions of two layers sometimes cohere with leaves between them, indicating their origin. It is characterized by its compactness, its shining fracture, and its blackish-brown or dark Port wine colour, so that when finely broken it bears no inconsiderable resemblance to kino. This is an excellent variety of catechu, and is not unfrequent in the shops.

3. *Catechu in Quadrangular Cakes.* This is scarcely ever found in the shops in its complete form, and the fragments are often such that it would be impossible to infer from them the original shape of the cake. This is usually between two and three inches in length and breadth, and somewhat less in thickness, of a rusty-brown colour externally, and dark-brown or brownish-gray within, with a somewhat rough and dull fracture, but, when broken across the layers in which it is sometimes disposed, exhibiting a smoother and more shining surface. Guibourt speaks of the layers as being blackish externally and grayish within, and bearing some resemblance to the bark of a tree, a resemblance, however, which has not struck us in the specimens which have fallen under our notice. There is little doubt that this variety comes from the provinces of Bahar and Northern India, where the preparation of the drug was witnessed by Mr. Kerr and Dr. Royle, who both speak of it as being brought, when drying, into the quadrangular form. It has been called *Bengal catechu*, because exported from that province.

Pale Catechu, so far as the term is not applied to *Gambir*, may be considered as belonging to this variety. A specimen with this name, which was sent from India to the great London exhibition, and which we have had an opportunity of examining, was in oblong rectangular pieces, or fragments of such pieces, about three and a half inches long by an inch and a half in breadth, of a dirty yellowish colour within, and an earthy fracture, quite free from gloss, and bearing a much stronger resemblance to gambir than to ordinary catechu.

4. *Catechu in Balls.* We have seen this in two forms—one consisting of globular balls about as large as an orange, very hard and heavy, of a ferruginous aspect externally, very rough when broken, and so full of sand as to be gritty under the teeth; the other in cakes, originally, in all probability, globular, and of about the same dimensions, but flattened and otherwise pressed out of shape before being perfectly dried, sometimes adhering two together, as happens with the lumps of Smyrna opium, and closely resembling in external and internal colour, and in the character of their fracture, the quadrangular variety last described. The former kind is rare, and the specimens we have seen had been twenty years in the shop, and had very much the appearance of a factitious product. The latter is in all probability the kind known formerly as the *Bombay catechu*; as Dr. Hamilton, and more recently Major Mackintosh, in describing the mode of preparing catechu on the Malabar coast, of which Bombay is the entrepot, say that, while the extract is soft, it is shaped into balls about the size of an orange.

2. *Catechus not recognised as officinal in the U. S. Pharmacopœia.*

1. *Gambir. Terra Japonica.* An astringent extract is abundantly prepared in certain parts of the East Indies, under the name of *gambir* or *gambeer*, and imported into Europe and America under that of terra Japonica. The plant from which it is obtained, called by Mr. Hunter, who first minutely described it, *Nauclea Gambir*, but by Roxburgh, De Candolle and others, *Uncaria Gambir*, is a climbing shrub, belonging to the class and order *Pentandria Monogynia*, and to the natural order *Rubiaceæ* of Jussieu, *Cinchonaceæ* of Lindley. It is a native of Malacca, Sumatra, Cochin-China, and other parts of Eastern Asia, and is largely cultivated in the islands of Bintang, Singapore, and Prince of Wales. The gambir is prepared by boiling the leaves and young shoots in water, and evaporating the decoction either by artificial or solar heat. When of a proper consistence, it is spread out into flat cakes in moulds or otherwise, and then cut into small cubes, which are dried in the sun. Sometimes these cohere into a mass, in consequence of being packed together before they are perfectly dry.

Gambir is in cubes, with sides about an inch square, is light and porous so that it floats when thrown in water, is of a deep yellowish or reddish-brown colour externally, but much paler within, presents a dull earthy surface when broken, is inodorous, and has a strongly astringent, bitter, and subsequently sweetish taste. It softens and swells up when heated, and leaves a minute proportion of ashes when burnt. It is partially soluble in cold water, and almost wholly so in boiling water, which deposits a portion upon cooling. Duhamel, Ecky, and Procter dissolved 87·5 per cent. of it in cold water by means of percolation. (*Am. Journ. of Pharm.*, xvi. 166.) Nees von Esenbeck found

shaped, others cubical or oblong, or quite irregular, and of every grade in size, from small angular pieces, which are evidently fragments of the original

it to consist of from 36 to 40 per cent. of tannic acid, a peculiar principle, called *catechuin* or *catechuic acid*, gum or gummy extractive, a deposit like the cinchonic red, and two and a half per cent. of lignin. Catechuic acid, when perfectly pure, is snow-white, of a silky appearance, crystallizable in fine needles, unalterable if dry in the air, fusible by heat, very slightly soluble in cold water with which it softens and swells up, soluble in boiling water which deposits it on cooling, and soluble also in alcohol and ether. It very slightly reddens litmus paper, and, though it colours the solution of chloride of iron green, and produces with it a grayish-green precipitate, it differs from tannic acid in not affecting a solution of gelatin. It bears considerable analogy to gallic acid in its relations to the metallic salts. To prepare it, the precipitate which falls upon the cooling of the decoction of gambir, is well washed upon a filter with cold water, and again dissolved in boiling water with a little purified animal charcoal. The solution, being filtered and allowed to stand, gradually deposits the acid, of a snow-white colour. To obtain it perfectly white in the dry state, it must be dried under an exhausted receiver with sulphuric acid. (*Wackenroder, Annal. der Pharm.*, xxxi. 72.) The sweet taste of gambir is thought to depend on this constituent.

Several varieties of gambir are described. Sometimes it is in oblong instead of cubical pieces, without differing in other respects from the ordinary kind; sometimes in small circular cakes or short cylindrical pieces, heavier than water, of a pale reddish-yellow colour, moderately astringent, gritty under the teeth, and quite impure; sometimes in very small cubes, distinguishable by the black colour they afford with tincture of iodine, indicating the admixture of sago or other amylaceous matter; and, finally, in circular cakes of the size of a small lozenge, flat on one side, and somewhat convex on the other, of a pale pinkish yellowish-white colour, and a chalky feel. This is most highly esteemed by the natives in India. (*Pereira.*) None of these varieties occur to any extent in our commerce, and we have met with none of them in the shops.

Gambir was probably the substance first brought from the East under the name of *terra Japonica*. It is largely consumed in the East by the betel-chewers. Great quantities are imported into Europe, where it is used for tanning, calico printing, dyeing, &c. In this country, it is also largely consumed by the calico printer. Though a strong astringent, and applicable to the same purposes as the officinal catechu, it is seldom medicinally employed in the United States.

2. *Areca Catechu.* This is obtained from the *areca nut* or *betel nut*, which is the seed of *Areca Catechu*, a palm cultivated in all parts of India. (See *Appendix.*) It is prepared by boiling the nuts in water, and evaporating the decoction. There are two varieties; one of a black colour, very astringent, mixed with paddy husks and other impurities, and obtained by evaporating the first decoction; the other, yellowish-brown, of an earthy fracture, and pure, resulting from the evaporation of a decoction of the nuts which had been submitted to the previous boiling. The first is called *kassu*, the other *coury*. (*Heyne, Tracts, &c., on India.*) They are prepared in Mysore, and Ainslie states that both varieties are sold in the bazars of Lower India, and used for the same purpose as the officinal catechu by the native and European practitioners. They are also much used for chewing by the natives. But they are seldom exported, and it is uncertain whether they find their way into European or American commerce. Pereira thinks he has identified the *kassu* with a variety of catechu derived from Ceylon, where he has been informed that an extract of the areca nut is prepared. It is in circular flat cakes, from two to three inches in diameter, scarcely an inch thick, covered on one side with paddy husks, and internally blackish-brown and shining, like Pegu catechu.

Guibourt and Pereira describe other varieties, which we have not met with, and which are probably rare. One of these is the *Siam catechu*, in conical masses shaped like a betel nut, and weighing about a pound and a half. Its fracture is shining and liver-coloured, like that of hepatic aloes; in other respects it resembles Pegu catechu. Another is the *black mucilaginous catechu* of Guibourt, in parallelopipeds an inch and a half in length, by an inch in breadth. Internally it is black and shining, and its taste is mucilaginous and feebly astringent. A third is the *dull reddish catechu* of Guibourt, in somewhat flattened balls, weighing three or four ounces, of a dull-reddish, wavy, and often marbled fracture. We saw something like this many years since, which had been brought upon speculation by a merchant from Calcutta, but it is not now in the market. Lastly, there is a *pale* or *whitish* catechu, in small roundish or oval lumps, with an irregular surface, dark or blackish-brown externally, very pale and dull internally, and of a bitter, astringent, and sweetish taste, with a smoky flavour. It is unknown in commerce.

cakes, to lumps which weigh one or two pounds. The colour is externally of a rusty brown, more or less dark, internally varying from a pale reddish or yellowish-brown to a dark liver colour. In some specimens it is almost black, in others somewhat like the colour of Port wine, and in others again, though rarely, dull red like annotta. The extract has been distinguished into the pale and dark varieties; but there does not appear to be sufficient ground for retaining this distinction. Catechu is inodorous, with an astringent and bitter taste, followed by a sense of sweetness. It is brittle, and breaks with a fracture which is rough in some specimens, in others uniform, resinous, and shining. That which is preferred in our market is of a dark colour, easily broken into small angular fragments, with a smooth glossy surface, bearing some resemblance to kino. Catechu is often mixed with sand, sticks, and other impurities. Its chief chemical constituents are tannic acid, extractive, and mucilage. Out of 200 parts of Bombay catechu, Sir H. Davy obtained 109 parts of tannic acid, 68 of extractive, 13 of mucilage, and 10 of insoluble residue. The same quantity of Bengal catechu yielded 97 of tannic acid, 73 of extractive, 16 of mucilage, and 14 of insoluble residue. Other experimenters have obtained results somewhat different. The proportion of tannic acid, which may be considered the efficient principle, varies from about 30 to 55 per cent. in the different varieties of the drug. The portion designated by Davy as extractive is said to contain, if it do not chiefly consist of, a principle discovered by Buchner, and now called *catechuic acid.* (See *note*, page 201.) The *tannic acid* is of the variety which precipitates iron of a greenish-black colour. It precipitates gelatin, but not tartar emetic. (*Kane.*) Catechu is almost entirely soluble in a large quantity of water, to which it imparts a brown colour. The extractive is much less soluble than the astringent principle, which may be almost entirely separated from it by the frequent application of small quantities of cold water. Boiling water dissolves the extractive matter much more readily than cold, and deposits it of a reddish-brown colour upon cooling. Both principles are readily dissolved by alcohol or proof spirit. Ether dissolves the tannic acid, and with it whatever catechuic acid may be contained in the drug. For the important reactions of catechu, see *Acidum Tannicum.*

Medical Properties and Uses. Catechu is gently tonic, and powerfully astringent. The dark coloured has the latter property in a somewhat greater degree than the light, and is therefore usually preferred. The latter, being rather sweeter, is preferred by the Malays, Hindoos, and other Indians, who consume vast quantities of this extract by chewing it, mixed with aromatics and a small proportion of lime, and wrapped in the leaf of the *Piper Betel.* Catechu may be advantageously used in most cases where astringents are indicated, and, though less employed in this country than kino, is not inferior to it in virtues. The complaints to which it is best adapted are diarrhœa dependent on debility or relaxation of the intestinal exhalants, and passive hemorrhages, particularly that from the uterus. A small piece, held in the mouth and allowed slowly to dissolve, is an excellent remedy in relaxation of the uvula, and the irritation of the fauces and troublesome cough which depend upon it. Applied to spongy gums, in the state of powder, it sometimes proves useful; and it has been recommended as a dentifrice in combination with powdered charcoal, Peruvian bark, myrrh, &c. Sprinkled upon the surface of indolent ulcers, it is occasionally beneficial, and is much used in India for the same purpose, in the form of an ointment. An infusion of catechu may be used as an injection in obstinate gonorrhœa, gleet, and leucorrhœa, and we have found it highly beneficial, when thrown up the nostrils, in arresting epistaxis. The dose is from ten grains to half a drachm, which

should be frequently repeated, and is best given with sugar, gum Arabic, and water.

Off. Prep. Electuarium Catechu; Infusum Catechu Compositum; Pulvis Catechu Compositus; Tinctura Catechu. W.

CENTAURIUM. *Ed.*

Common European Centaury.

The flowering heads of Erythræa Centaurium. *Ed.*

Petite centaure, *Fr.;* Tausengüldenkraut, *Germ.;* Centaurea minore, *Ital.;* Centaura minor, *Span.*

Erythræa. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Gentianaceæ. *Gen. Ch. Capsule* linear. *Calyx* five-cleft. *Corolla* funnel-shaped, with a short limb withering. *Anthers* often bursting, spiral. *Stigmas* two. *Loudon's Encyc.*

Erythræa Centaurium. Loudon's *Encyc. of Plants*, p. 130.—*Chironia Centaurium.* Willd. *Sp. Plant.* i. 1068; Woodv. *Med. Bot.* p. 275, t. 96. This is a small, annual herbaceous plant, rising about a foot in height, with a branching stem, which divides above into a dichotomous panicle, and bears opposite, sessile, ovate-lanceolate, smooth, and obtusely pointed leaves. The flowers are of a beautiful rose colour, standing without peduncles in the axils of the stems, with their calyx about half as long as the tube of the corolla. The plant grows wild in most parts of Europe, adorning the woods and pastures, towards the close of summer, with its delicate flowers.

The herb, though without odour, has a strong bitter taste, which it imparts to water and alcohol. The flowering summits are the officinal part. The name of *centaurin* has been proposed for its bitter principle.

Medical Properties and Uses. The common centaury of Europe has tonic properties very closely resembling those of gentian, with which it is associated in the same natural family. It is employed on the other side of the Atlantic in dyspeptic complaints, and formerly had considerable reputation in the treatment of fever. It was one of the ingredients of the *Portland powder.* In the United States it has been superseded by the *Sabbatia angularis*, or American centaury. The dose of the powder is from thirty grains to a drachm. Another species of Erythræa (*E. Chilensis*) possesses similar properties, and is employed to a considerable extent in Chili as a mild tonic. W.

CERA ALBA. *U. S., Lond., Ed., Dub.*

White Wax.

Bleached yellow wax. *U. S., Lond., Ed., Dub.*

Cire blanche, *Fr.;* Weisses Wachs, *Germ.;* Cera bianca, *Ital.;* Cere blanca, *Span.*

CERA FLAVA. *U. S., Ed., Dub.*

Yellow Wax.

A peculiar concrete substance prepared by Apis mellifica. *U. S.* Waxy concretion of Apis mellifica. *Ed.* A secretion of Apis mellifica. *Dub.*

Off. Syn. CERA. Apis mellifica. *The prepared comb. Lond.*

Cire jaune, *Fr.;* Gelbes Wachs, *Germ.;* Cera gialla, *Ital.;* Cera amarilla, *Span.*

Wax is a product of the common bee, *Apis mellifica* of naturalists, which

constructs with it the cells of the comb in which the honey and larvæ are deposited. It was at one time doubted whether the insect elaborated the wax by its own organs, or merely gathered it from vegetables. The question was set at rest by Huber, who fed a swarm of bees exclusively on honey and water, and found that they formed a comb consisting of wax. This, therefore, is a proper secretion of the insect. It is produced in the form of scales under the rings of the belly. But wax also exists in plants, bearing in this, as in other respects, a close analogy to the fixed oils. It is, however, the product of the bee only that is recognised by the Pharmacopœias. This is directed in two forms: 1. that of *yellow wax* procured immediately from the comb; and 2. that of *white wax* prepared by bleaching the former. We shall consider these separately, and afterwards give an account of *vegetable wax.*

1. Cera Flava or *Yellow Wax.* This is obtained by slicing the comb taken from the hive, draining and afterwards expressing the honey, and melting the residue in boiling water, which is kept hot for some time in order to allow the impurities to separate, and either subside or be dissolved by the water. When the liquid cools the wax concretes, and, having been removed and again melted in boiling water, is strained and poured into pans or other suitable vessels. It is usually brought to market in round flat cakes of considerable thickness. The druggists of Philadelphia are supplied chiefly from the Western States and North Carolina, especially the latter, and from Cuba. Some of inferior quality is imported from Africa.

In this state, wax has a yellowish colour, an agreeable somewhat aromatic odour, and a slight peculiar taste. To the touch it is rather soft and unctuous, though of a firm solid consistence and brittle. It has a granular fracture; but when cut with a knife presents a smooth glossy surface, the lustre of which is so peculiar as, when met with in other bodies, to be called waxy. It does not adhere to the fingers, nor to the teeth when chewed, but is softened and rendered tenacious by a moderate heat. Its point of fusion is 142° F.; its specific gravity from 0·960 to 0·965. The colour, odour, and taste of yellow wax depend upon some associated principle or principles.

Various adulterations have been practised, most of which may be readily detected. Meal, earth, and other insoluble substances are at the same time discovered and separated by melting and straining the wax. When the fracture is smooth and shining instead of being granular, the presence of resin may be suspected. This is dissolved by cold alcohol, while the wax is left untouched. Tallow and suet are detected by the softness they communicate to the wax, and its unpleasant odour when melted.

Yellow wax is used in medicine chiefly as an ingredient of plasters and cerates.

2. Cera Alba or *White Wax.* The colour of yellow wax is discharged by exposing it with an extended surface to the combined influence of air, light, and moisture. The process of bleaching is carried on to a considerable extent in the vicinity of Philadelphia. The wax, previously melted, is made to fall in streams upon a revolving cylinder, kept constantly wet, upon which it concretes, forming thin riband-like layers. These, having been removed, are spread upon linen cloths stretched on frames, and exposed to the air and light; care being taken to water and occasionally turn them. In a few days they are partially bleached; but, to deprive the wax completely of colour, it is necessary to repeat the whole process once, if not oftener. When sufficiently white it is melted and cast into small circular cakes. The colour may also be discharged by chlorine; but the wax is said to be somewhat altered. White wax sometimes contains one or more free fatty acids, consequent probably upon the employment of alkalies in bleaching it, which render it an unfit ingre-

dient in the unctuous preparations of certain salts. Of these acids it may be deprived by means of alcohol. (*Journ. de Pharm.*, 3e *sér.*, iv. 205.)

Perfectly pure wax is white, shining, diaphanous in thin layers, inodorous, insipid, harder and less unctuous to the touch than the yellow, soft and ductile at 95° F., and fusible at about 155°, retaining its fluidity at a lower temperature. According to Saussure, its specific gravity in the solid state is 0·966, at 178° F. 0·834, and at 201° 0·8247. By a great heat it is partly volatilized, partly decomposed; and, when flame is applied to its vapour, it takes fire and burns with a clear bright light. It is insoluble in water, and in cold alcohol or ether, but is slightly soluble in boiling alcohol and ether, which deposit it in a great measure upon cooling. The essential and fixed oils dissolve it with facility; resin readily unites with it by fusion, and soaps are formed by the action of soda and potassa in solution. It is not affected by the acids at ordinary temperatures, but is converted into a black mass when boiled with concentrated sulphuric acid. Its ultimate constituents are carbon, hydrogen, and oxygen. Dr. John found it to consist of two distinct principles, one of which he called *cerin*, the other *myricin*. According to MM. Boudet and Boissenot, the former constitutes at least 70 per cent. of wax, melts at about 143°, dissolves in 16 parts of boiling alcohol, and is saponifiable with potassa, yielding margaric acid, a little oleic acid, and a fatty matter insusceptible of saponification called *cerain;* the latter melts at 149°, is dissolved by 200 parts of boiling alcohol, and is not saponifiable by potassa. M. Lewy inferred from his experiments that cerin and myricin are isomeric with each other and with wax; that by a boiling solution of potassa wax is wholly saponified, without the formation of glycerin; that both wax and cerin are converted into stearic acid by saponification; and that this, by a further oxidation, is changed into margaric acid. (*Journ. de Pharm.*, 3e *sér.*, iii. 315.) Messrs. Warrington and Francis, however, have found that the substance supposed to be stearic acid, though similar to that body in appearance, is wholly different from it in properties and composition, and is isomeric, if not identical, with the cerain above referred to. (*Philosoph. Mag.*, Jan. 1844, p. 20.)*

* New views have been put forth as to the constitution of wax, in communications from B. Collins Brodie to the Royal Society of London. *Cerin*, when quite pure, he considers as a peculiar acid, having the constitution $C_{54}H_{54}O_4$, which he names *cerotic acid.* This he procures by precipitating a boiling alcoholic solution of cerin by means of an alcoholic solution of acetate of lead, treating the precipitated cerotate of lead by hot alcohol and ether until everything soluble is removed, then decomposing it with concentrated acetic acid, washing the separated cerotic acid with boiling water, and still further purifying it by solution in boiling absolute alcohol and refrigeration. The acid is deposited pure. It melts at 172° F., and on cooling concretes into a very crystalline mass. When distilled alone, the greater portion of it passes unchanged; whereas, if mixed with the other constituents of wax, it is wholly decomposed; and it is, consequently, not found in the results of the distillation of wax itself. It is a singular fact that cerotic acid was not found in some beeswax brought from Ceylon, showing that wax varies much according to the circumstances under which it is produced. *Myricin*, when entirely separated from the cerotic acid, is saponifiable, but with difficulty; and from the results of saponification palmitic acid ($C_{32}H_{32}O_4$) was isolated, and a peculiar body called by Mr. Brodie *melissine*, having the composition ($C_{60}H_{62}O_4$), and considered by him as a wax-alcohol, convertible by the loss of two eqs. of hydrogen and the gain of two of oxygen, into melissic acid, as alcohol is converted into acetic acid. (See *Acetum.*)

In the examination of a variety of wax from China, Mr. Brodie found a substance called by him *cerotine* ($C_{54}H_{56}O_2$), which he regards as the alcohol of cerotic acid, into which it was convertible by loss of hydrogen and gain of oxygen as above, that is by oxidation, two eqs. of the hydrogen being converted into water.

According to these views, the varieties of wax are composed of substances having

White wax has been adulterated with white lead, tallow, suet, spermaceti, stearic acid, and starch. White lead sinks to the bottom of the vessel when the wax is melted. Fatty substances render lime-water turbid, when agitated with it and allowed to stand. For the detection of stearin and stearic acid, M. Lebel dissolves the suspected wax in two parts of oil, beats the cerate thus formed with its weight of pure water, and then adds a few drops of solution of subacetate of lead. If stearin be present, there is an immediate decomposition, and the mixture acquires an extraordinary solidity from the formation of stearate of lead. (*Journ. de Pharm. et de Chim.*, xv. 302.) Vogel proposes chloroform as the means of detecting the adulteration with fatty matters. That liquid dissolves only 25 per cent. of wax, but stearin and stearic acid completely. If, therefore, wax, treated with 6 or 8 parts of chloroform, loses more than one-quarter of its weight, it may be considered as impure. (*Ibid.*, xvii. 374.) Overbeck detects stearic acid by the abundant effervescence produced, in consequence of the escape of carbonic acid, when a small portion of the suspected wax is boiled in a solution composed of one part of carbonate of soda and fifty of distilled water. (*Pharm. Journ. and Trans.*, xi. 128.) Starch remains behind when the wax is dissolved in oil of turpentine, and produces a blue colour with iodine added to water in which the wax has been boiled. Pereira says that pure wax is yellowish-white; and that the white wax in circular cakes always contains spermaceti, which is added to improve its colour.

Medical Properties and Uses. Wax has little effect upon the system. Under the impression that it sheathes the inflamed mucous membrane of the bowels, it has been occasionally prescribed in diarrhœa and dysentery; and it is mentioned by Dioscorides as a remedy in the latter complaint. By Poerner it is highly recommended in excoriations of the bowels, attended with pain and obstinate diarrhœa. His mode of using it is to melt the wax with oil of almonds or olive oil, and, while the mixture is still hot, to incorporate it by means of the yolk of an egg with some mucilaginous fluid. The dose is half a drachm three or four times a day. Another method is to form an emulsion by means of soap; but it is evident that the soap would be the most energetic ingredient. Wax is also used to fill cavities in carious teeth. Its chief employment, however, is in the formation of ointments, cerates, and plasters. It is an ingredient in almost all the officinal cerates, which owe their general title to the wax they contain.

3. Vegetable Wax. Many vegetable products contain wax. It exists in the pollen of numerous plants; and forms the bloom or glaucous powder which covers certain fruits, and the coating of varnish with which leaves are sometimes supplied. In some plants it is so abundant as to be profitably extracted for use. Such is the *Ceroxylon Andicola*, a lofty palm growing in the South American Andes. Upon the trunk of this tree, in the rings left by the fall of the leaves, is a coating of wax-like matter, about one-sixth of an inch thick, which is removed by the natives, and employed in the manufacture

to each other similar relations to those which characterize alcohol and acetic acid resulting from fermentation. (*Chem. Gaz.*, vi. 225, and vii. 46.)

The *China wax*, above referred to, resembles spermaceti in whiteness and crystalline appearance, but is distinguished by greater hardness and friability, and a somewhat fibrous fracture. It melts at about 181° F., is very slightly soluble in alcohol or ether, but dissolves easily in the oil of naphtha. It was formerly supposed to be of vegetable origin; but has been ascertained to be the product of an insect belonging to the genus Coccus, which fixes itself to the branches of a certain tree, and investing them closely becomes imbedded in a waxy material, which is scraped off with the insects, and constitutes the crude wax. It is purified by melting and straining. (Hanbury. *Pharm. Journ. and Trans.*, xii. 476.)

of tapers. It contains, according to Vauquelin, two-thirds of a resinous substance, and one-third of pure wax. (*Fee.*) Two kinds of wax are collected in Brazil, one called *carnauba*, from the leaves of a palm growing in the province of Ceara, the other *ocuba*, from the fruit of a shrub of the province of Para. (*Journ. de Pharm. et de Chim.*, 3e *sér.*, v. 154.) But the form of vegetable wax best known in this country is that derived from *Myrica cerifera*, and commonly called *myrtle wax*. The *wax myrtle* is an aromatic shrub, from one to twelve feet high, found in almost all parts of the United States from New England to Louisiana. The fruit, which grows in clusters closely attached to the stems and branches, is small, globular, and covered with a whitish coat of wax, which may be separated for use. Other parts of the plant are said to possess medical virtues. The bark of the root is acrid and astringent, and in large doses emetic, and has been popularly employed as a remedy in jaundice. The process for collecting the wax is simple. The berries are boiled in water, and the wax, melting and floating on the surface, is either skimmed off and strained, or allowed to concrete as the liquor cools, and removed in the solid state. To render it pure, it is again melted and strained, and then cast into large cakes. It is collected in New Jersey, North Carolina, and New England, and particularly in Rhode Island.

Myrtle wax is of a pale grayish-green colour, somewhat diaphanous, more brittle and unctuous to the touch than beeswax, of a feeble odour, and a slightly bitterish taste. It is about as heavy as water, and melts at 109° F. It is insoluble in water, scarcely soluble in cold alcohol, soluble, with the exception of about thirteen per cent., in twenty parts of boiling alcohol, which deposits the greater portion upon cooling, soluble also in boiling ether, and slightly so in oil of turpentine. It is said to consist, like beeswax, of cerin and myricin, containing 87 parts of the former and 13 of the latter in the 100. The green colour and bitterness depend upon a distinct principle, which may be separated by boiling the wax with ether. On cooling, the wax is deposited colourless, while the ether remains green.

Medical Properties and Uses.—This variety of wax has been popularly employed in the United States as a remedy for dysentery; and we are told by Dr. Fahnestock that he found great advantage from its use in numerous cases, during an epidemic prevalence of that complaint. He gave the powdered wax in doses of a teaspoonful frequently repeated, mixed with mucilage or syrup. (*Am. Journ. of Med. Scien.*, ii. 313.) It is occasionally substituted by apothecaries for beeswax in the formation of plasters, and is used in the preparation of tapers and candles. It is somewhat fragrant when burning, but emits a less brilliant light than common lamp oil. W.

CEREVISIÆ FERMENTUM. *Lond., Dub.*

Yeast.

Levure, *Fr.;* Bierhefen, *Germ.;* Fermento di cervogia, *Ital.;* Espuma de cerveza, *Span.*

This is the substance which rises, in the form of froth, to the surface of beer, and subsides during the process of fermentation. A similar substance is produced during the fermentation of other saccharine liquids.

It is flocculent, frothy, somewhat viscid, semi-fluid, of a dirty yellowish colour, a sour vinous odour, and a bitter taste. At a temperature of 60° or 70°, in a close vessel or damp atmosphere, it soon undergoes putrefaction. Exposed to a moderate heat, it loses its liquid portion, becomes dry, hard and brittle; and may in this state be preserved for a long time, though with

the loss of much of its peculiar power. In France it is brought to the solid state by introducing it into sacks, washing it with water, then submitting it to pressure, and ultimately drying it.

Yeast is insoluble in alcohol or water. It was analyzed by Westrumb, and found to contain in 15,142 parts, 13 of potassa, 15 of carbonic acid, 10 of acetic acid, 45 of malic acid, 69 of lime, 240 of alcohol, 120 of extractive, 240 of mucilage, 315 of saccharine matter, 480 of gluten, 13,595 of water, besides traces of silica and phosphoric acid. Its bitterness is attributable to a principle derived from the hops. The property for which it is chiefly valued is that of exciting the vinous fermentation in saccharine liquids, and in various farinaceous substances. This property it owes to its azotized ingredient; for, if separated from this, it loses its powers as a ferment, and re-acquires them upon its subsequent addition. It is also rendered ineffective by the agency of strong alcohol, of several of the acids, as sulphuric and concentrated acetic acid, by various other substances, and by a heat of 212°. At an elevated temperature it is decomposed, affording products similar to those which result from the decomposition of animal matters.

Examined with a microscope, yeast is seen to abound in minute transparent vesicles, which appear to contain one or more granules. These are now believed to be a fungous plant, which has the power of propagating itself at the expense of organic proximate principles with which it may be brought into contact; and attempts have been made to solve the mysteries of fermentation by the conjecture, that the sugar or other fermenting substance, while contributing to the nourishment of the fungus undergoes a decomposition resulting in the formation of new products. Another theory, originally put forth by Liebig, is that fermentation is merely a chemical movement, excited by a movement of decomposition going on in the ferment. Mulder considers the cell-wall of the yeast plant to consist of a substance analogous to cellulose, and its contents to be a protein body, differing in some respects from gluten and albumen, and probably a superoxide of protein. During fermentation, this protein body makes its way through the vesicular coat, undergoes decomposition by the agency of heat, and, in the act of decomposition, sets on foot the changes in sugar which result in the formation of alcohol and carbonic acid. (*Chem. Gazette*, Feb. 15, 1845.)

Medical Properties and Uses. Yeast has been highly extolled as a remedy in low fevers of a typhoid character, and is said to have been given with advantage in hectic. It is, however, little employed; as its somewhat tonic and stimulating effects, ascribable to the bitter principle of hops, the alcohol, and the carbonic acid which are among its constituents, may be obtained with equal certainty from more convenient medicines. The late Dr. Hewson, of Philadelphia, informed the authors that, in a case of typhoid fever, attended with great irritability of the stomach, the patient was benefited and sustained by taking a pint of yeast daily for five days, during which period no other remedy was employed. We have used it with apparent advantage in diabetes. (See *Trans. of Col. of Phys. of Phil.*, N. S. i. 390.) It has also been recommended internally in boils. When largely taken, it generally proves laxative; and it may sometimes be necessary to obviate this effect by opium. Externally applied, it is very useful in foul and sloughing ulcers, the fetor of which it corrects, while it affords a gentle stimulus to the debilitated vessels. It is usually employed mixed with farinaceous substances in the form of a cataplasm. The dose is from half a fluidounce to two fluidounces every two or three hours.

Off. Prep. Cataplasma Fermenti. W.

CETACEUM. *U. S., Lond., Ed., Dub.*

Spermaceti.

A peculiar concrete substance obtained from Physeter macrocephalus. *U. S., Dub.* A concrete substance prepared from the oily matter of the head. *Lond.* The cetine nearly pure. *Ed.*

Blanc de baleine, Spermaceti, Cetine, *Fr.;* Wallrath, *Germ.;* Spermaceti, *Ital.;* Esperma de bellena, *Span.*

The spermaceti whale is from sixty to eighty feet long, with an enormous head, not less in its largest part than thirty feet in circumference, and constituting one-third of the whole length of the body. The upper part of the head is occupied by large cavities, separated by cartilaginous partitions, and containing an oily liquid, which, after the death of the animal, concretes into a white spongy mass, consisting of spermaceti mixed with oil. This mass is removed, and the oil allowed to separate by draining. The quantity of crude spermaceti, obtained from a whale of the ordinary size, is more than sufficient to fill twelve large barrels. It still contains much oily matter and other impurities, from which it is freed by expression, washing with hot water, melting, straining, and lastly by repeated washing with a weak boiling ley of potash. Common whale oil and the oil of other cetaceous animals contain small quantities of spermaceti, which they slowly deposit on standing.

Spermaceti is in white, pearly, semitransparent masses, of a crystalline foliaceous texture; friable, soft, and somewhat unctuous to the touch; slightly odorous; insipid; of the sp. gr. 0·943; fusible at 112° F. (*Bostock*); volatilizable at a higher temperature without change *in vacuo*, but partially decomposed if the air is admitted; inflammable; insoluble in water; soluble in small proportion in boiling alcohol, ether, and oil of turpentine, but deposited as the liquids cool; readily soluble in the fixed oils; not affected by the mineral acids, except the sulphuric, which decomposes and dissolves it; rendered yellowish and rancid by long exposure to hot air, but capable of being again purified by washing with a warm ley of potash. By the agency of the alkalies, it is with difficulty saponified, yielding an acid, called by MM. Dumas and Stass *ethalic acid*, and a peculiar principle named *ethal* by Chevreul. From a more recent analysis, however, by Dr. Heintz, it would appear that the ethalic acid of Dumas and Stass is a complex substance, consisting of not less than five distinct acids, viz. the margaric, palmitic, *cetic*, myristic, and cocinic, and that consequently pure spermaceti is a mixture of the salts which these acids form with ethal. (See *Chem. Gaz.*, x. 321.) The name of *cetin* was proposed for it in this state by Chevreul. As found in the shops it is not entirely pure, containing a fixed oil, and often a peculiar colouring principle. From these it is separated by boiling in alcohol, which on cooling deposits the *cetin* in crystalline scales. Thus purified, it does not melt under 120 F., is soluble in 40 parts of boiling alcohol of the sp. gr. 0·821 (*Thenard*), and is harder, more shining, and less unctuous than ordinary spermaceti. Its ultimate constituents are carbon, hydrogen, and oxygen.

Medical Properties and Uses. Like the fixed oils, spermaceti has been given as a demulcent in irritations of the pulmonary and intestinal mucous membranes; but it possesses no peculiar virtues, and its internal use has been generally abandoned. It may be reduced to powder by the addition of a little alcohol or almond oil, or suspended in water, by means of mucilage, or the yolk of eggs and sugar. A convenient mode of forming an emulsion with spermaceti, is to mix it first with half its weight of olive oil, then with

powdered gum Arabic, and lastly with water gradually added. Externally it is much employed as an ingredient of ointments and cerates.

Off. Prep. Ceratum Cetacei; Unguentum Aquæ Rosæ; Unguentum Cantharidis; Unguentum Cetacei. W.

CETRARIA. *U. S., Lond., Ed.*

Iceland Moss.

Cetraria Islandica. *U. S., Lond., Ed.*

Off. Syn. LICHEN ISLANDICUS. Cetraria Islandica. *Dub.*

Lichen d'Islande, *Fr.;* Islandiches Moos, *Germ.;* Lichene Islandico, *Ital.;* Liquen Islandico, *Span.*

CETRARIA. *Sex. Syst.* Cryptogamia Lichenes.—*Nat. Ord.* Lichenaceæ.

Gen. Ch. Plant cartilagino-membranous, ascending or spreading, lobed, smooth, and naked on both sides. *Apothecia* shield-like, obliquely adnate with the margin, the disk coloured, plano-concave; border inflexed, derived from the frond. (*Loudon's Encyc.*)

The genus *Lichen* of Linnæus has been divided by subsequent botanists into numerous genera, which have been raised to the dignity of a distinct order, both in the natural and artificial systems of arrangement. The name *Cetraria* has been conferred on the genus to which the Iceland moss belongs.

Cetraria Islandica. Acharius, *Lichenog. Univ.* 512.—*Lichen Islandicus.* Woodv. *Med. Bot.* p. 803, t. 271. Iceland moss is foliaceous, erect, from two to four inches high, with a dry, coriaceous, smooth, shining, laciniated frond or leaf, the lobes of which are irregularly subdivided, channeled, and fringed at their edges with rigid hairs. Those divisions upon which the fruit is borne are dilated. The colour is olive-brown or greenish gray above, reddish at the base, and lighter on the under than the upper surface. The fructification is in flat, shield-like, reddish-brown receptacles, with elevated entire edges, placed upon the surface of the frond near its border.

The plant is found in the northern latitudes of the old and new continents, and on the elevated mountains further south. It received its name from the abundance in which it prevails in Iceland. It is also abundant on the mountains and in the sandy plains of New England.

The dried moss is of diversified colour, grayish-white, brown, and red, in different parts, with less of the green tint than in the recent state. It is inodorous, and has a mucilaginous, bitter taste. Macerated in water, it absorbs rather more than its own weight of the fluid, and, if the water be warm, renders it bitter. Boiling water extracts all its soluble principles. The decoction thickens upon cooling, and acquires a gelatinous consistence, resembling that of starch in appearance, but without its viscidity. After some time the dissolved matter separates, and when dried forms semitransparent masses, insoluble in cold water, alcohol, or ether, but soluble in boiling water, and in solution forming a blue compound with iodine. This principle resembles starch in its general characters, but differs from it in some respects, and has received the distinctive name of *lichenin.* Berzelius found in 100 parts of Iceland moss 1·6 of chlorophylle, 3·0 of a peculiar bitter principle, 3·6 of uncrystallizable sugar, 3·7 of gum, 7·0 of the apotheme of extractive, 44·6 of the peculiar starch-like principle, 1·9 of the bilichenates of potassa and lime mixed with phosphate of lime, and 36·2 of amylaceous fibrin—the excess being 1·6 parts. (*Traité de Chim.*, vi. 251.)

The name of *cetrarin* has been conferred on the bitter principle. The following process for obtaining it is that of Dr. Herberger. The moss,

coarsely powdered, is boiled for half an hour in four times its weight of alcohol of 0·883. The liquid, when cool, is expressed and filtered, and treated with diluted muriatic acid, in the proportion of three drachms to every pound of moss employed. Water is then added in the quantity of about four times the bulk of the liquid, and the mixture left for a night in a closed matrass. The deposit which forms is collected on a filter, allowed to drain as much as possible, and submitted to the press. To purify it, the mass, while still moist, is broken into small pieces, washed with alcohol or ether, and treated with two hundred times its weight of boiling alcohol, which dissolves the cetrarin, leaving the other organic principles by which it has been hitherto accompanied. The greater part is deposited as the liquor cools, and the remainder may be obtained by evaporation. By this process one pound of moss yielded to Dr. Herberger 133 grains of cetrarin. This principle is white, not crystalline, light, unalterable in the air, inodorous, and exceedingly bitter, especially in alcoholic solution. Its best solvent is absolute alcohol, of which 100 parts dissolve 1·7 of cetrarin at the boiling temperature. Ether also dissolves it, and it is slightly soluble in water. Its solutions are quite neutral to test paper. It is precipitated by the acids, and rendered much more soluble by the alkalies. Concentrated muriatic acid changes its colour to a bright blue. It precipitates the salts of iron, copper, lead, and silver. In the dose of two grains, repeated every two hours, it has been used successfully in intermittent fever. (*Journ. de Pharm.*, xxiii. 505.) Drs. Schnedermann and Knopp have ascertained that the cetrarin above referred to consists of three distinct substances; 1. *cetraric acid*, which is the true bitter principle, is crystallizable, and intensely bitter; 2. a substance resembling the fatty acids, called *lichstearic* acid; and 3. a green colouring substance, which they name *thallochlor*. These principles are obtained perfectly pure with great difficulty. (*Ann. der Pharm.*, lv. 144.)

The gum and starch contained in the moss render it sufficiently nutritive to serve as food for the inhabitants of Iceland and Lapland, who employ it powdered and made into bread, or boiled with milk, having first partially freed it from the bitter principle by repeated maceration in water. The bitterness may be entirely extracted by macerating the powdered moss, for twenty-four hours, in twenty-four times its weight of a solution formed with 1 part of an alkaline carbonate and 375 parts of water, decanting the liquid at the end of this time, and repeating the process with an equal quantity of the solution. The powder being now dried is perfectly sweet and highly nutritious. This process was suggested by Berzelius.

Medical Properties and Uses. Iceland moss is at the same time demulcent, nutritious, and tonic, and well calculated for affections of the mucous membrane of the lungs and bowels, in which the local disease is associated with debility of the digestive organs, or of the system generally. Hence it has been found useful in chronic catarrhs, and other chronic pulmonary affections attended with copious puruloid expectoration; as also in dyspepsia, chronic dysentery, and diarrhœa. It has, moreover, been given in the debility succeeding acute disease, or dependent on copious purulent discharge from external ulcers. But it has acquired most reputation in the treatment of pulmonary consumption. It had long been employed in this disease, and in hæmoptysis, by the Danish physicians, before it became known to the profession at large. In the latter half of the last century it came into extensive use, and numerous cures supposed to have been effected by it are on record. But now that the pathology of phthisis is better understood, physicians have ceased to expect material advantage from it in that disease; and there is reason to believe that the cases which have recovered under its use, were nothing

more than chronic bronchitis. It acts only as a mild, nutritious, demulcent tonic; and can exercise no specific influence over the tuberculous affection.

It is usually employed in the form of decoction. (See *Decoctum Cetrariæ.*) By some writers it is recommended to deprive it of the bitter principle by maceration in water, or a weak alkaline solution, before preparing the decoction; but we thus reduce it to the state of a simple demulcent, or mild article of diet, in which respect it is not superior to the ordinary farinaceous or gummy substances used in medicine. The powder is sometimes given in the dose of thirty grains or a drachm; and a preparation at one time obtained some repute, in which the ground moss was incorporated with chocolate, and used at the morning and evening meal as an ordinary beverage.

Off. Prep. Decoctum Cetrariæ. W.

CHENOPODIUM. *U. S.*

Wormseed.

The fruit of Chenopodium anthelminticum. *U. S.*

CHENOPODIUM. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Chenopodiaceæ.

Gen. Ch. Calyx five-leaved, five-cornered. *Corolla* none. *Seed* one, lenticular, superior. *Willd.*

Chenopodium anthelminticum. Willd. *Sp. Plant.* i. 1304; Barton, *Med. Bot.* ii. 183. This is an indigenous perennial plant, with an herbaceous, erect, branching, furrowed stem, which rises from two to five feet in height. The leaves are alternate or scattered, sessile, oblong-lanceolate, attenuated at both ends, sinuated and toothed on the margin, conspicuously veined, of a yellowish-green colour, and dotted on their under surface. The flowers are very numerous, small, of the same colour with the leaves, and arranged in long, leafless, terminal panicles, which are composed of slender, dense, glomerate, alternating spikes.

This species of Chenopodium, known commonly by the names of *wormseed* and *Jerusalem oak*, grows in almost all parts of the United States, but most vigorously and abundantly in the southern section. It is usually found in the vicinity of rubbish, along fences, in the streets of villages, and in open grounds about the larger towns. It flowers from July to September, and ripens its seeds successively through the autumn. The whole herb has a strong, peculiar, offensive, yet somewhat aromatic odour, which it retains when dried. All parts of the plant are occasionally employed; but the fruit only is strictly officinal. This should be collected in October.*

Wormseed, as found in the shops, is in small grains, not larger than the head of a pin, irregularly spherical, very light, of a dull, greenish-yellow or brownish colour, a bitterish, somewhat aromatic, pungent taste, and possessed in a high degree of the peculiar smell of the plant. These grains, when deprived, by rubbing them in the hand, of a capsular covering which invests

* C. anthelminticum is cultivated to a considerable extent in Maryland, twenty or thirty miles north of Baltimore. The seeds are sown in small beds of rich mould early in spring, and during the month of June the young plants are pulled up, and set out in ridges three feet apart, with intervals of from six to ten inches. The plants do not require to be renewed oftener than once in four or five years. The crop of the second year is more productive than the first. The plant is fit for distillation during the first half of September. The distillation is carried on in the same neighbourhood. The whole herbaceous part of the plant is used. It is said to yield from 1·5 to 2 per cent. of the oil, and the produce of an acre will yield 20 pounds. (See *Am. Journ. of Pharm.*, xxii. 304.)

the proper seed, exhibit a shining surface of a very dark colour. They abound in a volatile oil, upon which their sensible properties and medical virtues depend, and which is obtained by distillation. (See *Oleum Chenopodii.*) The same oil impregnates to a greater or less extent the whole plant.

The fruit of *Chenopodium ambrosioides*, which is also an indigenous plant, and very prevalent in the Middle States, is said to be used indiscriminately with that of *C. anthelminticum*. It may be distinguished by its odour, which is weaker and less offensive, and to some persons agreeable. The plant itself is often confounded with the true wormseed, from which it differs in having its flowers in leafy racemes. This species of Chenopodium has been employed in Europe as a remedy in nervous affections, particularly chorea. Five or six cases of this disease, reported by Plenk, after having resisted the ordinary means, yielded to the daily use of an infusion of two drachms of the plant in ten ounces of water, taken in the dose of a cupful morning and evening, and associated with the employment of peppermint.

C. Botrys, known by the vulgar name of *Jerusalem oak*, is another indigenous species, possessing anthelmintic virtues. It is said to have been used in France with advantage in catarrh and humoral asthma.

Medical Properties and Uses. Wormseed is one of our most efficient indigenous anthelmintics, and is thought to be particularly adapted to the expulsion of the round worms in children. A dose of it is usually given before breakfast in the morning, and at bed time in the evening, for three or four days successively, and then followed by calomel or some other brisk cathartic. If the worms are not expelled, the same plan is repeated. The medicine is most conveniently administered in powder, mixed with syrup in the form of an electuary. The dose for a child two or three years old is from one to two scruples. The volatile oil is more frequently given than the fruit in substance; though its offensive odour and taste sometimes render it of difficult administration. The dose for a child is from five to ten drops, mixed with sugar, or in the form of emulsion. A tablespoonful of the expressed juice of the leaves, or a wineglassful of a decoction prepared by boiling an ounce of the fresh plant in a pint of milk, with the addition of orange-peel or other aromatic, is sometimes substituted in domestic practice for the ordinary dose of the fruit and oil.

Off. Prep. Oleum Chenopodii. W.

CHIMAPHILA. *U. S., Lond.*

Pipsissewa.

The leaves of Chimaphila umbellata. *U. S.* The herb. *Lond.*

Off. Syn. PYROLA. Herb of Chimaphila umbellata. *Ed., Dub.*

CHIMAPHILA. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Pyrolaceæ.

Gen. Ch. Calyx five-toothed. *Petals* five. *Style* very short, immersed in the germ. *Stigma* annular, orbicular, with a five-lobed disk. *Filaments* stipitate; stipe discoid, ciliate. *Capsules* five-celled, opening from the summits, margins unconnected. *Nuttall.*

This genus was separated from *Pyrola* by Pursh. It embraces two species, *C. umbellata* and *C. maculata*, which are both indigenous, and known by the common title of *winter green*. The generic title was founded upon the vulgar name of the plants. It is formed of two Greek words, χειμα winter, and φιλος a friend. *C. umbellata* only is officinal.

Chimaphila umbellata. Barton, *Med. Bot.* i. 17; Carson, *Illust. of Med. Bot.* i. 62, pl. 53.—*Pyrola umbellata.* Willd. *Sp. Plant.* ii. 622; Bigelow, *Am. Med. Bot.* ii. 15. The pipsissewa is a small evergreen plant, with a

perennial, creeping, yellowish root (rhizoma), which gives rise to several simple, erect or semi-procumbent stems, from four to eight inches in height, and ligneous at their base. The leaves are wedge-shaped, somewhat lanceolate, serrate, coriaceous, smooth, of a shining sap-green colour on the upper surface, paler beneath, and supported upon short footstalks, in irregular whorls, of which there are usually two on the same stem. The flowers are disposed in a small terminal corymb, and stand upon nodding peduncles. The calyx is small, and divided at its border into five teeth or segments. The corolla is composed of five roundish, concave, spreading petals, which are of a white colour tinged with red, and exhale an agreeable odour. The stamens are ten, with filaments shorter than the petals, and with large, nodding, bifurcated, purple anthers. The germ is globular and depressed, supporting a thick and apparently sessile stigma, the style being short and immersed in the germ. The seeds are numerous, linear, chaffy, and enclosed in a roundish, depressed, five-celled, five-valved capsule, having the persistent calyx at the base.

This humble but beautiful evergreen is a native of the northern latitudes of America, Europe, and Asia. It is found in all parts of the United States, and extends even to the Pacific Ocean. It grows under the shade of woods, and prefers a loose sandy soil, enriched by decaying leaves. The flowers appear in June and July. All parts of the plant are endowed with active properties. The leaves and stems are kept in the shops.

C. maculata, or *spotted winter green*, probably possesses similar virtues. The character of the leaves of the two plants will serve to distinguish them. Those of C. maculata are lanceolate, rounded at the base, where they are broader than near the summit, and of a deep olive-green, veined with greenish-white; those of the officinal species are broadest near the summit, gradually narrowing to the base, and of a uniform shining green.

Pipsissewa, when fresh and bruised, exhales a peculiar odour. The taste of the leaves is pleasantly bitter, astringent, and sweetish; that of the stems and root unites with these qualities a considerable degree of pungency. Boiling water extracts the active properties of the plant, which are also imparted to alcohol. The constituents, so far as known, are bitter extractive, tannin, resin, gum, lignin, and saline matters. The active principle has not been isolated, though probably contained in the substance called bitter extractive.

Medical Properties and Uses. This plant is diuretic, tonic, and astringent. It was employed by the aborigines in various complaints, especially scrofula, rheumatism, and nephritic affections. From their hands it passed into those of the European settlers, and was long a popular remedy in certain parts of the country, before it was adopted by the profession. The first regular treatise in relation to it that has come to our knowledge, was the thesis of Dr. Mitchell, published in the year 1803; but it was little thought of till the appearance of the paper of Dr. Sommerville, in the 5th volume of the London Medico-Chirurgical Transactions. By this writer it was highly recommended as a remedy in dropsy; and his favourable report has been sustained by the subsequent statements of many respectable practitioners. It is particularly useful in cases attended with disordered digestion and general debility, in which its tonic properties and usual acceptability to the stomach prove highly useful auxiliaries to its diuretic powers. Nevertheless, it cannot be relied on exclusively in the treatment of the complaint; for, though it generally produces an increased flow of urine, it has seldom effected cures. Other disorders, in which it is said to have proved useful, are calculous and nephritic affections, and in general all those complaints of the urinary passages for which uva ursi is prescribed. It is highly esteemed by some practitioners as a remedy in scrofula, both before and after the occurrence of ulceration;

and it has certainly proved highly advantageous in obstinate ill-conditioned ulcers and cutaneous eruptions, supposed to be connected with the strumous diathesis. In these cases it is used both internally, and locally as a wash.

The decoction is the preparation usually preferred, and may be taken to the amount of a pint in twenty-four hours. The watery extract may be given in the dose of twenty or thirty grains four times a day. Prof. Procter prepares a syrup by macerating four ounces of the leaves, finely bruised, in eight fluidounces of water for thirty-six hours, and then subjecting the mass to percolation till a pint of fluid is obtained, which is reduced one-half by evaporation, and incorporated with twelve ounces of sugar. One or two tablespoonfuls may be given for a dose.

Off. Prep. Decoctum Chimaphilæ. W.

CHIRETTA. *Ed., Dub.*

Chiretta.

Herb and root of Agathotes Chirayta. *Ed.* The herb. *Dub.*

AGATHOTES. *Sex. Syst.* Pentandria Monogynia. — *Nat. Ord.* Gentianaceæ.

Gen. Ch. Corolla withering, rotate, in æstivation twisted to the right; with glandular hollows protected by a fringed scale upon the segments. *Anthers* not changing. *Stigmas* sessile. *Capsules* conical; one-celled, with spongy placentæ upon the sutures. *Seeds* indefinite, minute. (*Lindley*)

Agathotes Chirayta. Don, *Lond. Phil. Mag.* 1836, p. 76. — *Gentiana Chirayta.* Fleming, *Asiat. Research.* xi. 167. — *Ophelia Chirata.* Grisebach. The *chirayta* or *chiretta* is an annual plant, about three feet high, with a branching root, and an erect, smooth, round stem, branching into an elegant leafy panicle, and furnished with opposite, embracing, lanceolate, very acute, entire, smooth, three or five-nerved leaves. The flowers are numerous, pedunculed, yellow, with a four-cleft calyx having linear acute divisions, the limb of the corolla spreading and four parted, four stamens, a single style, and a two-lobed stigma. The capsules are shorter than the permanent calyx and corolla. The plant is a native of Nepaul, and other parts of Northern India. The whole of it is officinal. It is gathered when the flowers begin to decay.

The dried plant is imported into Europe in bundles, consisting mainly of the stems, with portions of the root attached. The stems are as above described, and contain a yellowish pith. All parts of the plant have a very bitter taste, which is strongest in the root. It is without odour. It imparts its virtues to water and alcohol; and they are retained in the extract. According to Lassaigne and Boissel, the stems contain resin, a yellow bitter substance, brown colouring matter, gum, and various salts.

Medical Properties and Uses. Chiretta has long been used in India, where it is a favourite remedy with both the native and European practitioners. It has been introduced into Europe, and appears to be highly esteemed; but has not been employed to any considerable extent in this country. Its properties are those of the pure bitters, and probably do not differ from those of the other members of the family of Gentianaceæ. (See *Gentiana.*) Like these, in overdoses it nauseates and oppresses the stomach. Some have supposed that, in addition to its tonic properties, it exerts a peculiar influence over the liver, promoting the secretion of bile and correcting it when deranged, and restoring healthy evacuations in cases of habitual costiveness. But it may well be doubted whether it produces any other effects of this kind than such as are incident to its tonic power. It has been used in dyspepsia, in the debility of convalescence, and generally in cases in which

corroborant measures are indicated. In India it has been successfully employed in intermittents and remittents, combined with the seeds of *Guilandina Bonduc*. It may be administered in powder, infusion, tincture, or extract. The dose in substance is twenty grains.

Off. Prep. Infusum Chirettæ; Tinctura Chirettæ. W.

CHONDRUS. *U. S.*

Irish Moss.

Chondrus crispus. *U. S.*

Chondrus. *Sex. Syst.* Cryptogamia Algæ.—*Nat. Ord.* Algaceæ.

Gen. Ch. Frond cartilaginous, dilating upwards into a flat, nerveless, dichotomously divided frond, of a purplish or livid-red colour. *Fructification*, subspherical capsules in the substance of the frond, rarely supported on little stalks, and containing a mass of minute free seeds. (*Greville.*)

Chondrus crispus. Greville, *Alg. Brit.* 129, t. 15.—*Sphærococcus crispus.* Agardh.—*Fucus crispus.* Linn. The *Irish moss*, or *carrageen* as it is frequently called, consists of a flat, slender, cartilaginous frond, from two to twelve inches in length, dilated as it ascends until it becomes two or three lines in width, then repeatedly and dichotomously divided, with linear, wedge-shaped segments, and more or less curled up so as to diminish the apparent length. The capsules are somewhat hemispherical, and are embedded in the disk of the frond. The plant grows upon rocks and stones on the coasts of Europe, and is especially abundant on the southern and western coasts of Ireland, where it is collected. It is said also to be a native of the United States.

When collected, it is washed and dried. In the recent state it is of a purplish colour, but, as found in the shops, is yellowish or yellowish-white, with occasionally purplish portions. It is translucent, of a feeble odour, and nearly tasteless. It swells in cold water, but does not dissolve. Boiling water dissolves a large proportion of it, and, if the solution be sufficiently concentrated, gelatinizes on cooling. According to Feuchtwanger, it contains starch and pectin, with compounds of sulphur, chlorine, and bromine, and some oxalate of lime. Herberger found 79·1 per cent. of pectin, and 9·5 of mucus, with fatty matter, free acids, chlorides, &c., but neither iodine nor bromine. M. Dupasquier discovered in it both of these principles, which had generally escaped attention in consequence of their reaction, as soon as liberated, upon the sulphuret of sodium resulting from the decomposition of the sulphate of soda of the moss when charred. (*Journ. de Pharm.*, 3*e sér.*, iii. 113.) The pectin Pereira thinks peculiar, and proposes to call *carrageenin*. It is distinguished from gum by affording, when dissolved in water, no precipitate with alcohol; from starch, by not becoming blue with tincture of iodine; from pectin, by yielding no precipitate with acetate of lead, and no mucic acid by the action of nitric acid.

Carrageen is nutritive and demulcent, and, being easy of digestion and not unpleasant to the taste, forms a useful article of diet in cases in which the farinaceous preparations, such as tapioca, sago, barley, &c., are usually employed. It has been particularly recommended in chronic pectoral affections, scrofulous complaints, dysentery, diarrhœa, and disorders of the kidneys and bladder. It may be used in the form of decoction, made by boiling a pint and a half of water with half an ounce of the moss down to a pint. Sugar and lemon juice may usually be added to improve the flavour. Milk may be substituted for water, when a more nutritious preparation is required. It is recommended to macerate the moss for about ten minutes in cold water before

submitting it to decoction. Any unpleasant flavour that it may have acquired from the contact of foreign substances is thus removed. W.

CIMICIFUGA. *U. S.*

Black Snakeroot.

The root of Cimicifuga racemosa. *U. S.*

Cimicifuga. *Sex. Syst.* Polyandria Di-Pentagynia.—*Nat. Ord.* Ranunculaceæ.

Gen. Ch. Calyx four or five-leaved. *Petals* four to eight, deformed, thickish, sometimes wanting. *Capsules* one to five, oblong, many-seeded. *Seeds* squamose. *Nuttall.*

Cimicifuga racemosa. Torrey, *Flor.* 219; Carson, *Illust. of Med. Bot.* i. 9, pl. 3.—*C. Serpentaria.* Pursh, *Flor. Am. Sept.* p. 372.—*Actæa racemosa.* Willd. *Sp. Plant.* ii. 1139.—*Macrotys racemosa.* Eaton's *Manual*, p. 288. This is a tall stately plant, having a perennial root, and a simple herbaceous stem, which rises from four to eight feet in height. The leaves are large, and ternately decomposed, having oblong-ovate leaflets, incised and toothed at their edges. The flowers are small, white, and disposed in a long, terminal, wand-like raceme, with occasionally one or two shorter racemes near its base. The calyx is white, four-leaved, and deciduous; the petals are minute, and shorter than the stamens; the pistil consists of an oval germ and a sessile stigma. The fruit is an ovate capsule containing numerous flat seeds.

The *black snakeroot*, or *cohosh* as this plant is sometimes called, is a native of the United States, growing in shady and rocky woods from Canada to Florida, and flowering in June and July. The root is the part employed.

This, as found in the shops, consists of a thick, irregularly bent or contorted body or caudex, from one-third of an inch to an inch in thickness, often several inches in length, furnished with many slender radicles, and rendered exceedingly rough and jagged in appearance by the remains of the stems of successive years, which to the length of an inch or more are frequently attached to the root. The colour is externally dark brown, almost black, internally whitish; the odour, though not strong, is very peculiar and rather disagreeable; the taste is bitter, herbaceous, and somewhat astringent, leaving a slight sense of acrimony. The root yields its virtues to boiling water. It was found by Mr. Tilghman, of Philadelphia, to contain gum, starch, sugar, resin, wax, fatty matter, tannic and gallic acids, a black colouring matter, a green colouring matter, lignin, and salts of potassa, lime, magnesia, and iron. (*Journ. of Phil. Col. of Pharm.*, vi. 20.)

Medical Properties and Uses. The effects of cimicifuga in health have not been fully investigated. It was at one time considered a mild tonic, with the property of stimulating the secretions, particularly those of the skin, kidneys, and bronchial mucous membrane; and has been thought by some to have an especial affinity for the uterus. It undoubtedly exercises considerable influence over the nervous system, probably of a sedative character; but this influence, so far as our observation has gone, is shown more in morbid states of that system than in health. Dr. Hildreth, of Ohio, found it, in large doses, to produce vertigo, impaired vision, nausea and vomiting, and a reduction of the circulation; but from very large quantities observed no alarming narcotic effects. Dr. N. S. Davis uniformly found it to lessen the force and frequency of the pulse, to soothe pain, and allay irritability. (*Trans. of Am. Med. Assoc.*, i. 352.) Its common name was probably derived from its supposed power of curing the disease arising from the bite of the rattlesnake. It was originally employed in domestic practice in rheu-

matism, dropsy, hysteria, and various affections of the lungs, particularly those resembling consumption. The first published notice of its use in phthisis was by Dr. Thomas J. Garden, of Charlotte, Virginia. (*Am. Med. Recorder*, October, 1823.)* Several cases of chorea are recorded by Dr. Jesse Young, in which it effected cures; and the editor of the *Am. Journ. of the Med. Sci.* states that he was informed by Dr. Physick that he had known it, in the dose of ten grains every two hours, to prove successful in the cure of this complaint in several instances. Dr. Young gave a teaspoonful of the powdered root three times a day. (*Am. Journ. of Med. Sciences*, ix. 310.) We have administered the medicine in chorea with complete success, and have derived the happiest effects from it in a case of periodical convulsions, connected with uterine disorder. Dr. Hildreth has found it, in combination with iodine, very advantageous in the early stages of phthisis. (*Ibid.*, *N. S.*, iv. 281.) Dr. F. N. Johnson has employed it with extraordinary success in acute rheumatism; the disease generally yielding completely within eight or ten days. (*Trans. of Am. Med. Assoc.*, i. 352.)

It may be given in substance, decoction, or tincture. The dose of the powder is from a scruple to a drachm. The decoction has been much used, but is thought by some not to contain all the virtues of the root. An ounce of the bruised root may be boiled for a short time in a pint of water, and one or two fluidounces given for a dose. From half a pint to a pint of the decoction may be taken without inconvenience during the day. The tincture may be made in the proportion of four ounces to the pint of diluted alcohol, and given in the dose of one or two fluidrachms. In acute rheumatism, the remedy is recommended by Dr. Davis, in the dose of from thirty to sixty drops of the tincture, or twenty grains of the powder, repeated every two hours, till its effects are observed. (*Ibid.*, p. 356.) Dr. Brundige speaks, in the strongest terms, of the efficacy of a saturated tincture of the dried root, as an application about the eye and to the outer surface of the eyelids in ophthalmia. (*Med. Exam.*, *N. S.*, vii. 809; from the *N. Y. Med. Gaz.*) W.

CINCHONA. *U. S.*

Peruvian Bark.

The bark of different species of Cinchona from the western coast of South America. *U. S.*

Varieties.

CINCHONA FLAVA. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Yellow Bark.* The variety of Peruvian Bark derived from Cinchona Calisaya, and called in commerce *Calisaya bark.* *U. S.* The bark of Cinchona Calisaya. *Lond.* Bark of an unascertained species of Cinchona. *Ed.*, *Dub.*

CINCHONA PALLIDA. *U. S.*, *Lond.* *Pale Bark.* The variety of Peruvian Bark derived from Cinchona Condaminea and Cinchona micrantha, and called in commerce *Loxa* and *Lima bark.* *U. S.* Bark of Cinchona Condaminea. *Lond.* CINCHONA CORONÆ. *Crown Bark.* Bark of Cinchona Condaminea. CINCHONA CINEREA. *Gray Bark.* *Silver Bark.* Bark of Cinchona micrantha. *Ed.* CINCHONA CONDAMINEA. *Crown* or *Loxa Bark.* CINCHONA MICRANTHA. *Gray* or *Huanuco Bark.* *Dub.*

* In a letter from Dr. Garden to the authors, dated May 15th, 1850, that practitioner states that thirty years' use of the medicine has fully realized the favourable anticipations produced by the first trials.

CINCHONA RUBRA. *U. S., Lond., Ed., Dub. Red Bark.* The variety of Peruvian Bark called in commerce *red bark. U. S.* The bark of an undetermined species of Cinchona. *Lond., Ed., Dub.*

Quinquina, *Fr.;* China, Peruvianische Rinde, *Germ.;* China, *Ital.;* Quina, *Span.*

Botanical History.

Though the use of Peruvian bark was introduced into Europe so early as 1640, it was not till the year 1737 that the plant producing it was known to naturalists. In that year, La Condamine, on a journey to Lima, through the province of Loxa, had an opportunity of examining the tree, of which, upon his return, he published a description in the Memoirs of the French Academy. Soon afterwards Linnæus gave it the name of *Cinchona officinalis*, in honour of the Countess of Cinchon, who is said to have first taken the bark to Europe; but, in his description of the plant, he united the species discovered by La Condamine with *C. pubescens*, a specimen of which had been sent him from Santa Fé de Bogota. For a long time it was not known that more than one species existed; and the C. officinalis continued, till a comparatively recent period, to be recognised by the Pharmacopœias as the only source of the Peruvian bark of commerce. But a vast number of plants belonging to the genus Cinchona, as constructed by Linnæus, were in the course of time discovered; and the list became at length so unwieldy and heterogeneous, that botanists were compelled to distribute the species into several groups, each constituting a distinct genus, and all associated in the natural family of Cinchonaceæ. Among these genera, the *Cinchona* is that which embraces the proper Peruvian bark trees, characterized by the production of the three alkaloids, quinia, cinchonia, and quinidia, as well as by certain botanical peculiarities, among which the most distinctive is probably the dehiscence of the capsule from the base towards the apex, or from below upward. The new genera *Exostemma* and *Buena* embrace species which have been, perhaps, most frequently referred to as Cinchonas; but they are sufficiently characterized, the former by the projection of the stamens beyond the corolla, a peculiarity which has given name to the genus, the latter by the different shape of the corolla, the separation of the calyx from the fruit at maturity, and the opening of the capsule from above downward. Very recently Weddell has separated several generally admitted species from Cinchona, and instituted a new genus, which he proposes to name *Cascarilla*. This includes the former *Cinchona magnifolia* of Ruiz and Pavon (*C. oblongifolia* of Mutis), the *C. stenocarpa* of Lambert, the *C. acutifolia* of Ruiz and Pavon, the *C. oblongifolia* of Lambert, the *C. macrocarpa* of Vahl, and the *C. cava* of Pavon, which differ from the true Cinchona in having the dehiscence of the capsules from the apex towards the base, or from above downward, and the barks of which contain neither of the alkaloids above referred to. (Weddell, *Hist. Nat. des Quinquinas*, p. 77.) With this brief preliminary notice, we shall proceed to consider the true Cinchonas. It may be proper, however, first to say, that the botanists who have personally observed these plants, besides *La Condamine*, of whom we have before spoken, are chiefly *Joseph de Jussieu*, who in the year 1739 explored the country about Loxa, and gathered specimens still existing in the cabinets of Europe; *Mutis*, who in the year 1772 discovered Cinchona trees in New Granada, and afterwards, aided by his pupil *Zea*, made further investigations and discoveries in the same region; *Ruiz* and *Pavon*, who in the year 1777 began a course of botanical inquiries in the central portions of Lower Peru, and discovered several new species; *Humboldt* and *Bonpland*, who visited several of the Peruvian bark districts, and published the results of their

observations after 1792; *Pöppig*, who travelled in Peru as late as 1832, and published an account of his journey about the year 1835; and finally *Weddell*, whose recent researches in Bolivia are so well known, and have been so productive of valuable information in relation to the Calisaya bark.

CINCHONA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Cinchonaceæ.

Gen. Ch. Calyx with a turbinate tube, and a persistent five-toothed limb. *Corolla* with a round tube, a five-parted limb, and oblong lobes valvate in æstivation. *Stamens* with short filaments inserted into the middle of the tube, and linear anthers entirely enclosed. *Stigma* bifid, subclavate. *Capsule* ovate or oblong, somewhat furrowed on each side, bilocular, crowned with the calyx, septicidal-dehiscent, with the mericarps loosened from the base towards the apex, the introflexed part disjoined. *Placentæ* elongated. *Seeds* numerous, erect, imbricated upward, compressed, winged, with a membranous margin, and a fleshy albumen.—The plants composing this genus are trees or shrubs. The leaves are opposite upon short petioles, with flat margins, and are attended with ovate or oblong, foliaceous, free, deciduous stipules. The flowers are terminal, in corymbose panicles, and of a white or purplish rose colour. (*De Candolle.*)

The genuine cinchona trees are confined exclusively to South America. In that continent, however, they are widely diffused, extending from the 19th degree of south latitude, considerably south of La Paz, in Bolivia, to the mountains of Santa Martha, or, according to Weddell, to the vicinity of Caracas, on the northern coast, in about the 10th degree of north latitude. They follow, in this distance, the circuitous course of the great mountain ranges, and for the most part occupy the eastern slope of the second range of the Cordilleras. Those which yield the bark of commerce grow at various elevations upon the Andes, seldom less than 4000 feet above the level of the sea; and require a temperature considerably lower than that which usually prevails in tropical countries.

There has been much difficulty in properly arranging the species of Cinchona. One source of the difficulty is stated by Humboldt to be the varying shape of the leaves of the same species, according to the degree of elevation upon the mountainous declivities, to the severity or mildness of the climate, the greater or less humidity of the soil, and to various circumstances in the growth of individual plants. Even the same tree often produces foliage of a diversified character; and a person, not aware of this fact, might be led to imagine that he had discovered different species, from an examination of the leaves which had grown upon one and the same branch. The fructification partakes, to a certain extent, of the same varying character. Lambert, in his "Illustration of the genus Cinchona," published in the year 1821, after admitting with Humboldt the identity of several varieties which had received specific names from other botanists, described nineteen species. De Candolle enumerated only sixteen. Lindley admits twenty-one known species, and five doubtful. Weddell describes twenty-one species, including eight new ones of his own, and two doubtful, and excluding several before admitted by other writers, which he joins to his new genus Cascarilla.

Until very recently, it was impossible to decide from which species of Cinchona the several varieties of bark were respectively derived. The former references of the yellow bark to *C. cordifolia*, of the pale to *C. lancifolia*, and of the red to *C. oblongifolia*, have been very properly abandoned in all the Pharmacopœias. It is now universally admitted that the officinal barks, known in the market by these titles, are not the product of the species mentioned. It is stated by Humboldt, that the property of curing agues belongs to the barks of all the Cinchonas with hairy and woolly blossoms, and to these alone. All those with smooth corollas belong to the genus Cascarilla

of Weddell. Within a few years much light has been thrown upon the botanical history of the different varieties of bark, and at present most of them can be traced to their sources, though something in this respect remains yet to be learned. The following species are acknowledged by the Pharmacopœias of the United States and Great Britain.

1. *Cinchona Calisaya.* Weddell, *Hist. Nat. des Quinquinas*, p. 30, t. 3. This is a lofty tree, with a trunk often two feet or more in diameter, and a summit usually rising above the other trees of the forest. The leaves are petiolate, oblong or lanceolate-obovate, from three to six inches long, and one or two in breadth, obtuse, acute or slightly attenuated at the base, softish, above smooth, of a velvety aspect and obscurely green, beneath smooth and of a pale emerald hue, with scrobiculi at the axils of the veins, but scarcely visible on the upper surface. The stipules are about as long as the petioles, oblong, very obtuse, and very smooth. The flowers are in ovate or subcorymbose panicles. The calyx is pubescent, with a cup-shaped limb, and short triangular teeth; the corolla is rose-coloured, with a cylindrical tube about one-third of an inch long, and a laciniate limb fringed at the edges; the stamina are concealed in the tube, and have anthers more than twice as long as the filaments. The fruit is an ovate capsule scarcely as long as the flower, enclosing elliptical lanceolate seeds, the margin of which is irregularly toothed, so as to have a fimbriated appearance. The tree grows in the forests, upon the declivities of the Andes, at the height of six or seven thousand feet above the ocean, in Bolivia and the southernmost part of Peru.

A variety of this species, described by Weddell under the name of *Josephiana* is a mere shrub, not more than twelve feet high, with a slender stem, erect branches, and a bark strongly adherent to the wood. This variety is found in some places covering extensive surfaces, destitute of forest trees. Weddell supposes that these tracts had once been covered with forests, which, having been destroyed by fires, have been succeeded by this stunted growth springing up from the roots, and prevented from receiving its natural development by the want of protection from other trees.

By the discovery of this species the long unsettled point of the botanical source of Calisaya bark has been determined. The immense consumption of that bark, and the wasteful methods pursued by the bark gatherers have caused the rapid destruction of the tree; and already it has disappeared from the neighbourhood of inhabited places, except in the form of a shrub. Weddell was compelled to make long journeys on foot through the forests, by paths scarcely opened, before he could get a sight of the tree in its full vigour.

2. *Cinchona Condaminea.* Humb. and Bonpl. *Plant. Equin.* i. p. 33, t. 10; Lindley, *Flor. Med.* 414; Carson, *Illust. of Med. Bot.* i. 53, pl. 45. This tree, when full grown, has a stem about eighteen feet high and a foot in thickness, with opposite branches, of which the lower are horizontal, and the higher rise at their extremities. The bark of the trunk yields when wounded a bitter astringent juice. The leaves are of variable shape, but generally ovate-lanceolate, about four inches in length by less than two in breadth, smooth, and scrobiculate at the axils of the veins beneath. The flowers are in axillary, downy, corymbose panicles. The tree grows on the declivities of the mountains, at an elevation of from about a mile to a mile and a half, and in a mean temperature of 67° F. It was seen by Humboldt and Bonpland in the neighbourhood of Loxa, and is said also to grow near Guancabamba and Ayavaca in Peru. It is now admitted to be the source of the *crown bark of Loxa.* Weddell considers as varieties of this species, though with some hesitation, as he has never seen them alive, the following; 1. *Candollii* (C. macrocalyx of Pavon and De Candolle); 2. *lucumæfolia* (C. lucumæfolia of Pavon and Lindley); 3. *lancifolia* (C. lancifolia of Mutis),

hereafter referred to as a distinct species; and 4. *Pitayensis*, growing in New Granada.

3. *C. micrantha.* Ruiz and Pavon. *Fl. Peruv.* ii. 52, t. 194; Lindley, *Flor. Med.* 412; Carson, *Illust. of Med. Bot.* i. 52, pl. 44. This is a large tree, forty feet high, with oblong leaves, from four to twelve inches in length and from two to six in breadth, scarcely acute, smooth, shining on the upper surface, and scrobiculate at the axils of the veins beneath. The flowers are in terminal, loose, leafless panicles, and are smaller than those of any other species except C. lancifolia. (*Lindley.*) The tree grows, according to Ruiz and Pavon, in the mountains near Chicoplaya, Monzon, and Puebla de San Antonio, according to Pöppig, at Cuchero, and, according to Weddell, in the Peruvian province of Carabaya, and in Bolivia. Ruiz states that its bark is always mixed with that sent into the market from the provinces of Panatahuas, Huamilies, and Huanuco. The Edinburgh and Dublin Colleges ascribe to it the *cinchona cinerea*, the *gray* or *silver bark* of British commerce; and the U. S. Pharmacopœia recognises it as one of the sources of pale bark, as it undoubtedly is.

Besides the foregoing species, several others deserve a brief notice, either as contributing to furnish the bark of commerce, or on account of the attention they have received from pharmacologists.

4. *C. scrobiculata.* Humb. and Bonpl. *Plant. Equin.* i. p. 165, t. 47; Weddell, *Hist. Nat. des Quinquinas*, p. 42, t. 7. This species was united by Lindley with C. micrantha; but Weddell, who has had the amplest opportunities of forming a just conclusion, considers it as one of the best characterized species of the genus. According to this author, the scrobiculi at the axils of the veins on the under surface of the leaf, which are one of the most prominent of its peculiarities, are not usually found in C. micrantha, as stated in its description; but that what have been taken for them, in the latter species, are simply small bundles of hairs. The tree was seen by Humboldt and Bonpland forming large forests near the city of Jaen de Bracomoros; and Weddell states that it is met with also in the Peruvian provinces of Cuzco and Carabaya. Large quantities of the bark were formerly collected at Jaen, and sent to the coast to be shipped for Lima. At present the traders in this bark are said by Weddell to be chiefly at Cuzco. The bark of the younger branches has been ranked with the pale or gray barks; that of the larger branches has been sometimes employed to adulterate the Calisaya.

5. *C. lancifolia.* Mutis, *Period. de Santa Fé*, p. 465; Lindley, *Flor. Med.* 415. This is one of the species discovered by Mutis in New Granada, and by the disciples of that botanist was considered as embracing many trees which had received distinct specific designations. By the London College it was long recognised as the source of one of the officinal barks, under the impression, probably, that it was identical with *C. Condaminea*, which was known to yield one of the most highly valued varieties. It is, however, a native of New Granada; and, as none of the barks recognised by the Pharmacopœias come from Carthagena, its product, which must be shipped from that port, cannot be considered as ranking among them. It yields the *orange bark* of Mutis, or *fibrous Carthagena bark* of present pharmacologists.

6. *C. cordifolia.* Mutis, in *Humb. Magaz. Berlin*, 1807, p. 117; Lindley, *Flor. Med.* 839; Carson, *Illust. of Med. Bot.* i. 51, pl. 43. This is a spreading tree, fifteen or twenty feet high, with a single, erect, round stem, covered with a smooth bark, of a brownish-gray colour. It was first discovered by Mutis in the mountains about Santa Fé de Bogota in New Granada, and grows at elevations varying from 5800 to 9500 feet. It was formerly considered by the British Colleges as the source of their *yellow bark;* but has been ascertained not to produce the officinal bark, which never comes from the region

where it is known to grow. Guibourt found that the *quina amarilla*, or *yellow bark of Santa Fé*, which is probably produced by C. cordifolia, is identical with *hard Carthagena bark*. Weddell states that the tree grows also in Peru, and yields the white and ash-coloured barks of Loxa.

7. *C. Boliviana*. Weddell, *Hist. Nat. des Quinquinas*, p. 50, t. 9. This tree was discovered and named by Weddell, who found it growing in Bolivia and Peru, extending somewhat further northward than C. Calisaya, but not so far towards the south. In the northern parts of Bolivia the two species frequently grow together. The bark of C. Boliviana is generally mixed in commerce with the proper Calisaya, from which it cannot always be easily distinguished. This is less to be regretted, as, according to Weddell, the properties of the two barks are not essentially different.

In addition to the species above mentioned, the following, for a description of which we refer to Lindley's Flora Medica, yield barks possessing febrifuge properties.—8. *C. nitida* of the Flora Peruviana, incorrectly confounded, according to Lindley, with C. lanceolata by De Candolle, and C. Condaminea by Lambert, grows in groves, in cold situations upon the Andes, in the Peruvian provinces of Huanuco, Tarma, Huamilies, and Xuaxa, and is probably the source of the finest variety of commercial *Lima bark*.—9. *C. lucumæfolia* of Pavon, confounded by Lambert with C. Condaminea, grows near Loxa, and probably contributes to the Loxa or pale barks.—10. *C lanceolata* of the Flora Peruviana is found at Cuchero, and various other places fifteen or twenty leagues distant from Huanuco, where it forms groves in lofty cold situations upon the Andes. Its bark is said by Ruiz and Pavon to be called *yellow bark*, from the colour of its inner surface, and to resemble Calisaya bark in flavour.—11. *C. ovalifolia* of Humboldt and Bonpland, the *C. Humboldtiana* of Römer and Schultes, and of De Candolle, is a shrub from six to nine feet high, inhabiting the province of Cuenca, where it forms considerable forests. It probably contributes to the Loxa barks, although its product is said to be of inferior quality.—12. *C. ovata*, of the Fl. Peruv., grows in close groves, in warm situations at the foot of the Andes, near Pozuzo and Panao, about ten leagues from Huanuco. Lindley considers it quite distinct from the *C. pubescens* of Vahl, and *C. cordifolia* of Mutis, with both of which it has been confounded. Ruiz calls its bark *cascarillo pallido* or pale bark, and states that it was not to be found in commerce. Von Bergen, however, upon comparing a specimen of the *cascarillo pallido* in the collection of Ruiz with the Jaen bark, found them identical. From Weddell's statements it would seem that this species is widely diffused in Peru and Bolivia, and varies extremely in the character of its bark in different situations. In the parts visited by him, the finer qualities pass for Calisaya bark; and in the Peruvian province of Carabaya, bordering on Bolivia, it is habitually employed to sophisticate that bark. He believes also that much of the quilled bark of Loxa and Huanuco must be referred to this species.—13. *C. pubescens* of Vahl, considered by Lindley as identical with *C. purpurea* of the Fl. Peruv., is a tree of considerable magnitude, distinguished by the violet tint of its large leaves, and the purple colour of its flowers. It occurs in groves on the lower mountain ridges in the provinces of Loxa, Jaen, Panatahuas, &c., was seen by Pöppig at Cuchuo, and is stated to grow also in New Granada. The bark is inferior, and is said to be employed for adulterating the better kinds. A specimen taken to Europe by Pöppig was found by Reichel to be identical with the Huamilies bark. By Weddell it is stated to be the bark known in French commerce as *Cusco bark*, and very closely to resemble that of C. cordifolia.—14. *C. hirsuta* of the Fl. Peruv. grows on wooded mountains in the province of Panatahuas near Huanuco, and is said to yield a good bark, called formerly *quina delgadilla* or *delgada*, but now scarcely collected.—15.

C. glandulifera of the Fl. Peruv. is a shrub of about twelve feet, flourishing on the high mountains N. W. of Huanuco, and yielding an excellent bark, unknown in commerce, called by the inhabitants *cascarillo negrillo* from its blackish epidermis. In its flowering season, it perfumes the forest by the strong scent of its blossoms.—16. *C. Mutisii* of Lambert (*C. glandulifera* of Lindley) is considered among the best characterized species. It grows in Loxa, but its bark is unknown.

Besides the above species, Lindley enumerates, 17. *C. rotundifolia* of Ruiz and Pavon, growing in the province of Loxa; 18. *C. villosa* of Pavon (C. Humboldtiana of Lambert), growing at Jaen of Loxa; and 19. *C. caduciflora* of Bonpland, growing near Jaen de Bracomoros; not to mention the species joined by Weddell to his now admitted genus of Cascarilla. None of the species referred to in this paragraph are known to yield bark to commerce. To these must now be added, 20. *C. amygdalifolia* of Bolivia and Peru; 21. *C. australis* of Bolivia, the most southern of all the known species, growing as far south as the 19th degree of latitude; 22. *C. purpurascens;* 23. *C. Chomeliana;* 24. *C. asperifolia*, also of Bolivia; and 25. *C. Carabayensis* of the Peruvian province of Carabaya; all of which were discovered and described by Weddell; but from none of which is commercial bark procured. *C. dichotoma* of the *Flora Peruviana*, *C. macrocalyx* of De Candolle, *C. crassifolia* of Pavon in De Candolle's Prodromus, *C. Pelalba* of the same authority, and *C. Muzonensis* of Goudot in De Candolle's Prodromus, are considered by Lindley as uncertain species.

Perhaps too much importance has been attached to the study of particular species of Cinchona. The character of the product of any one species varies much according to the part of the plant decorticated, and the circumstances of its growth. Weddell has made some observations on this point, which, if confirmed, may lead to important practical results.*

* The fundamental idea is, that the chemical character of the bark is connected with peculiarities in its intimate structure, and that by knowing the latter we may ascertain, with an approach to certainty, the former also; and thus, as the virtues of the bark depend on its chemical constitution, we may have reliable criteria of its value. Now in the different barks there are three varieties of structure; the dead exterior layers being left out of the question. *First*, as in the *Calisaya bark* which consists of the inner bark or liber, the whole substance is filled with short fusiform fibres, which, whether viewed in a longitudinal or transverse section, are seen, with the aid of the microscope, to be isolated by a cellular tissue, in the midst of which they are regularly disposed in parallel lines, lying end to end without absolute junction. It is known that this bark abounds in quinia, and owes its virtue to that constituent.

In the *second variety*, such as the flat bark of *C. scrobiculata*, a cellular coat exists outside of the liber. In this, under the microscope, the inner layer is seen to consist of fibres more closely arranged, more numerous and much larger than in the preceding, and firmly attached at their extremities; and they suddenly diminish in number as we approach the outer surface, where the bark consists solely of cells.

The *third* variety, of which the bark of *C. pubescens* is an example, consists chiefly of cellular tissue, with a few irregular series of fibres in the inner half; and these fibres are three or four times as large as in the other varieties. In the two latter barks cinchonia is the predominant alkali; but it is not very abundant in either, and least so in the one last mentioned. The inference is, that quinia is most largely developed in those barks in which the fibres are short and intimately mixed with cells; while the cinchonia is more especially deposited in the tissue exclusively cellular. The fracture in the first variety is from its structure fibrous, but shortly-fibrous throughout; that of the second and third is smooth where cells exist exclusively, and with long fibres where fibres exist. A short smooth fracture, therefore, as in the young barks, or a fracture partly smooth and partly long-fibrous, as in the older barks which have not thrown off their cellular layer, indicate a cinchonia bark, and one comparatively feeble; while a fracture uniformly short-fibrous indicates a variety abounding in quinia and energetic; and, in proportion as a bark approaches this latter condition, will it prove to be efficacious.—*Note to the ninth edition.*

Commercial History.

For more than a century after Peruvian bark came into use, it was procured almost exclusively from the neighbourhood of Loxa. In a memoir published A. D. 1738, La Condamine speaks of the bark of Rhiobambo, Cuenca, Ayavaca, and Jaen de Bracomoros. Of these places, the first two, together with Loxa, lie within the ancient kingdom of Quito, at its southern extremity; the others are in the same vicinity, within the borders of Peru. The drug was shipped chiefly at Payta, whence it was carried to Spain, and thence spread over Europe. Beyond the limits above mentioned, the Cinchona was not supposed to exist, till, in the year 1753, a gentleman of Loxa discovered it, while on a journey to Santa Fé de Bogota, in numerous situations along his route, wherever, in fact, the elevation of the country was equal to that of Loxa, or about 6,500 feet above the level of the sea. This discovery extended through Quito into New Granada, as far as two degrees and a half north of the equator. But no practical advantage was derived from it; and the information lay buried in the archives of the vice-royalty, till subsequent events brought it to light. To Mutis belongs the credit of making known the existence of the Cinchona in New Granada. He first discovered it in the neighbourhood of Bogota, in the year 1772. A botanical expedition was afterwards organized by the Spanish government, with the view of exploring this part of their dominions, and the direction was given to Mutis. Its researches eventuated in the discovery of several species of Cinchona in New Granada; and a commerce in the bark soon commenced, which was carried on through the ports of Carthagena and Santa Martha.

To these sources another was added about the same time, A. D. 1776, by the discovery of the Cinchona in the centre of Peru, in the mountainous region about the city of Huanuco, which lies on the eastern declivity of the Andes, north-east of Lima, at least six degrees south of the province of Loxa. To explore this new locality, another botanical expedition was set on foot, at the head of which were Ruiz and Pavon, the distinguished authors of the Flora Peruviana. These botanists spent several years in this region, during which time they discovered numerous species. Lima became the entrepot for the barks collected around Huanuco; and hence probably originated the name of Lima bark, so often conferred, in common language, not only upon the varieties received through that city, but also upon the medicine generally.

Soon after the last-mentioned discovery, two additional localities of the Cinchona were found, one at the northern extremity of the continent near Santa Martha, the other very far to the south, in the provinces of La Paz and Cochabamba, then within the vice-royalty of Buenos Ayres, now in the republic of Bolivia. These latter places became the source of an abundant supply of excellent bark, which received the name of Calisaya. It was sent partly to the ports on the Pacific, partly to Buenos Ayres.

The consequence of these discoveries was a vast increase in the supply of bark, which was now shipped from the ports of Guayaquil, Payta, Lima, Arica, Buenos Ayres, Carthagena, and Santa Martha. At the same time, the average quality was probably deteriorated; for, though many of the new varieties were possessed of excellent properties, yet equal care in superintending the collection and assorting of the bark could scarcely be exercised, in a field so much more extended. The varieties now poured into the market soon became so numerous as to burthen the memory, if not to defy the discrimination of the druggist; and the best pharmacologists found themselves at a loss to discover any permanent peculiarities which might serve as the

basis of a proper and useful classification. This perplexity has continued more or less to the present time; though the discovery of the alkaline principles has presented a ground of distinction before unknown. The restrictions upon the commerce with South America, by directing the trade into irregular channels, had also a tendency to deteriorate the character of the drug. Little attention was paid to a proper assortment of the several varieties; and not only were the best barks mixed with those of inferior species and less careful preparation, but the products of other trees, bearing no resemblance to the Cinchona, were sometimes added, having been artificially prepared so as to deceive a careless observer. The markets of this country were peculiarly ill furnished. The supplies, being derived chiefly, by means of a contraband trade, from Carthagena and other ports on the Spanish Main, or indirectly through the Havana, were necessarily of an inferior character; and most of the good bark which reached us was imported by our druggists from London, whither it was sent from Cadiz. A great change, however, in this respect, took place, after the ports on the Pacific were opened to our commerce. The best kinds of bark were thus rendered directly accessible to us; and the trash with which our markets were formerly glutted is now in great measure excluded. Our ships trading to the Pacific run along the American coast from Valparaiso to Guayaquil, stopping at the intermediate ports of Coquimbo, Copiapo, Arica, Callao, Truxillo, &c., from all which they probably receive supplies. Much good bark has of late also been brought from Carthagena, and other ports of the Caribbean Sea.

The persons who collect the bark are called in South America *Cascarilleros.* Considerable experience and judgment are requisite to render an individual well qualified for this business. He must not only be able to distinguish the trees which produce good bark from those less esteemed, but must also know the proper season and the age at which a branch should be decorticated, and the marks by which the efficiency or inefficiency of any particular product is indicated. The bark gatherers begin their operations with the setting in of the dry season in May. Sometimes they first cut down the tree, and afterwards strip off the bark from the branches; in other instances, they decorticate the tree while standing. The former plan is said to be the most economical; as, when the tree is cut down, the stump pushes up shoots which in the course of time become fit for decortication, while, if deprived of its bark, the whole plant perishes. The operator separates the bark by making a longitudinal incision with a sharp knife through its whole thickness, and then forcing it off from the branch with the back of the instrument. Other means are resorted to when the trunk or larger limbs are decorticated. According to Pöppig, the bark is not separated until three or four days after the tree is felled. It must then be speedily dried, as otherwise it becomes deteriorated. For this purpose it is taken out of the woods into some open place, where it is exposed to the sun. In drying it rolls up, or in technical language becomes quilled; and the degree to which this effect takes place, is proportionate directly to the thinness of the bark, and inversely to the age of the branch from which it was derived. In packing the bark for exportation, it often happens that several different kinds are introduced into the same case. The packages are, in commercial language, called *seroons.* As found in this market they are usually covered with a case of thick and stiff ox-hide, lined within by a very coarse cloth, apparently woven out of some kind of grass.

The Cinchona forests, being in very thinly inhabited districts, do not, for the most part, belong to individuals, but are open to the enterprise of all who choose to engage in the collection of the bark. The consequence is, that the operations are carried on without reference to the future condition of this

important interest; and the most wasteful modes of proceeding are often adopted. Nevertheless, the great extent to which the Cinchona forests prevail, spreading, as they do, with some interruptions, over thirty degrees of latitude, and occupying regions which can never be applied to agricultural purposes, almost precludes the idea of their even remote extinction.

The bitterness of the Cinchona is not confined to its bark. The leaves and flowers also have this property, which in the former is associated with acidity, in the latter with a delicious aroma, which renders the air fragrant in neighbourhoods where the trees abound. The wood is nearly tasteless; but the bark of the root has the same virtues as that of the trunk; and rich mines of underground treasure may await future explorers, in regions which have been stripped of their trees either by fire or the axe.

Classification.

To form a correct and lucid system of classification is the most difficult part of the subject of bark. An arrangement founded on the botanical basis, is liable to the objection, that the product of the same species may vary according to the age of the bark and the situation of the tree; and, besides, is at present out of the question; as, though our knowledge of the source of the several varieties has much extended, it is by no means complete.

The Spanish merchants adopted a classification, dependent partly on the place of growth or shipment, and partly on the inherent properties, or supposed relative value of the bark. So long as the sources of the drug were very confined, and the number of varieties small, this plan answered the purposes of trade; but at present it is altogether inadequate; and, though some of the names originally conferred upon this principle are still retained, they are often uncertain or misapplied. Thus, it is said that, by the traders in South America, the young slender gray barks are called by the name of Loxa, from whatever source they may be derived; while those somewhat larger and older receive their appellation from Lima.

Perhaps, on the whole, the best arrangement for pharmaceutical and medicinal purposes is that founded upon difference of colour. It is true that dependence cannot be placed upon this property alone; as barks of a similar colour have been found to possess very different virtues; and, between the various colours considered characteristic, there is an insensible gradation of shade, so that it is not always possible to decide where one ends and the other begins. Still it has been found that most of the valuable barks may be arranged, according to their colour, in three divisions, which, though mingling at their extremes, are very distinctly characterized, in certain specimens, by peculiarity not only in colour, but also in other sensible properties, and even in chemical constitution. The three divisions alluded to are the *pale*, the *yellow*, and the *red*. This arrangement has been adopted in the U. S. and London Pharmacopœias, and, with slight variation, in those also of the Edinburgh and Dublin Colleges; and as, until recently, almost all the highly esteemed barks were brought from the Pacific coast of South America, and those from the northern coast were deemed inferior, it was only the former that were recognised under the three divisions referred to. In describing, therefore, the different kinds of bark, we shall treat first, under the officinal titles of *pale*, *yellow*, and *red*, of those brought from the ports of the Pacific; while those coming to us from the northern ports of New Granada and Venezuela will be subsequently considered under the heading of *non-officinal* or *Carthagena barks*, by the latter of which names they have been generally known in commerce. The commercial name will be given in all

instances in which a knowledge of it can be useful. It is proper to state that the different barks are often mingled in the same package, and that, in deciding upon the character of a seroon, the druggist is guided rather by the predominance than the exclusive existence of certain distinctive properties.

1. Pale Bark.

The epithet *pale* applied to the barks of this division is derived from the colour of the powder. The French call them *quinquinas gris*, or gray barks, from the colour of the epidermis. They come into the market in cylindrical pieces of variable length, from a few inches to a foot and a half, sometimes singly, sometimes doubly quilled, from two lines to an inch in diameter, and from half a line to two or three lines in thickness. The kinds which have generally been deemed the finest are about the size of a goosequill. Their exterior surface is usually more or less rough, marked with transverse and sometimes with longitudinal fissures, and of a grayish colour, owing to adhering lichens. The shade is different in different samples. Sometimes it is a light gray, approaching to white, sometimes dull and brown, sometimes a grayish-fawn, and frequently diversified by the intermixture of the proper colour of the epidermis with that of the patches of lichens. The interior surface, in the finer kinds, is smooth; in the coarser, occasionally rough and somewhat ligneous. Its colour is a brownish-orange, sometimes inclining to red, sometimes to yellow, and, in some inferior specimens, of a dusky hue. The fracture is usually smooth, with some short filaments on the internal part only. In the coarser barks it is more fibrous. The colour of the powder is a pale fawn, which is of a deeper hue in the inferior kinds. The taste is moderately bitter and somewhat astringent, without being disagreeable or nauseous. Authors speak also of an acidulous and aromatic flavour, which is less evident. The better kinds have a feeble odour, which is distinct and agreeably aromatic in the powder and decoction. The pale barks are chemically characterized by containing *a much larger proportion of cinchonia and quinidia than of quinia;* and their infusion does not yield a precipitate with solution of sulphate of soda. Their appearance generally indicates that they were derived from the smaller branches. They are collected in the provinces about Loxa, or in the country which surrounds the city of Huanuco, northeast of Lima, and are probably derived chiefly from Cinchona Condaminea, C. nitida, and C. micrantha.

There are several commercial varieties of pale bark, obtained from different sources, and differing more or less in their properties. The most highly esteemed of these is the *Loxa bark*, the finest specimens of which are sometimes called *crown bark of Loxa*, from the impression that they have the same origin and character with the bark formerly selected with great care for the use of the King of Spain and the royal family. The pale bark collected about Huanuco is either named *Lima bark*, because taken to that city for commercial distribution, or *Huanuco bark*, from its place of collection. The former name has been more common in this country, where, indeed, this commercial variety has not unfrequently been confounded with the Loxa bark. Other pale barks are the *Jaen* and *Huamilies barks*, which are scarcely known as distinct varieties in the United States.*

* The following description of the several varieties of *pale bark* has been derived mainly from the works of Von Bergen, Guibourt, and Pereira, probably the highest European authorities on this subject, the first in Germany, the second in France, and the third in England. We have consulted also other pharmacological writers, and have derived advantage from the recent observations of Dr. Weddell, and of Mr. J. E. Howard, of London, who has carefully examined the rich collection of Pavon deposited in the British Museum, and compared the specimens with the barks of commerce. Our re-

In this country, the pale bark has fallen into disuse. As it yields little *quinia*, it is not employed in the manufacture of the sulphate of that alkali,

marks are put in the form of a note; as the information in relation to these varieties can be of little use to the student, though it may aid the discrimination of the druggist.

For a proper understanding of the subject, the reader should have some idea of the general structure of the bark. In the young barks there are four layers, viz.: 1. the *epidermis* or outer coat, which is often covered or incorporated with lichens, 2. the periderm or suberous coat, which is sometimes of a cork-like character, 3. the *cellular coat* or *green layer*, often containing resin, and 5. the *liber*, or inner-coat, which is more or less fibrous.

1. *Loxa Bark. Crown Bark.* — *Quinquina de Loxa*, Fr. — *Loxa China, Kron-China*, Germ.—The following is Von Bergen's description of this variety, contained in his splendid work upon bark, entitled *Versuch einer Monographie der China*, published in Hamburg in the year 1826. This bark is in cylindrical tubes, strongly rolled, from six to fifteen inches long, from two lines to an inch in diameter, and from half a line to two lines thick. The outer surface is more or less rough, seldom much wrinkled longitudinally, but marked with numerous transverse fissures, which usually run round the bark, and divide it into rings, the edges of which are somewhat elevated. In the smallest quills these fissures are not very obvious; in the larger, they are distant and apt to be interrupted. In the largest the surface is sometimes very rough and even warty. The proper colour of the epidermis is dark gray, sometimes almost black, sometimes ash-coloured, and occasionally inclining to fawn; but frequently diversified by whitish lichens, which are in some instances so numerous as to cover almost the whole exterior of the bark, and to give it a light-gray appearance. The inner surface is smooth and uniform, and of the colour of cinnamon, with occasionally a reddish tinge. The fracture in the smaller quills is quite smooth, in the larger somewhat fibrous. The bark is of a rather firm consistence, and when cut transversely exhibits a resinous character. Its odour is compared by Guibourt to that perceived in damp woods, by Von Bergen to that of tan. Its taste is acidulous, astringent, and bitterish. The powder is of a dull cinnamon colour.

Guibourt, in the edition of his *Histoire des Drogues*, published in 1850, describes four chief varieties of Loxa bark, under the names severally of 1. *Quinquina de Loxa gris compacte*, 2. *Quinquina de Loxa brun compacte*, 3. *Quinquina de Loxa rouge fibreux de roi d'Espagne*, and 4. *Quinquina de Loxa jaune fibreux*. Of these the first two appear to be embraced in the description above given from Von Bergen. The third is distinguished from the common Loxa bark by its eminently fibrous texture, and its slight astringency to the taste. It is scarcely to be found in commerce. The fourth is almost the only variety of Loxa bark known in the French market. It is in quills, very thin, and usually very much rolled, but slightly rough externally, with minute transverse fissures, generally covered with a thin whitish coat which gives it a light-gray colour, reddish and very smooth internally, and of a very finely fibrous fracture. Its taste is astringent and bitter, and its odour sufficiently marked. The pieces from the trunk are much larger, and may even have a thickness of two lines, with some resemblance to the Calisaya; but its outer surface, scarcely rough, and often longitudinally wrinkled, the fineness of its texture, and the smoothness of its inner surface readily distinguish it. Guibourt has no hesitation in referring it to *C. macrocalyx*.

English druggists distinguish Loxa bark into 1. the *picked crown bark*, which consists of the finest, thinnest, and longest quills; 2. the *silvery crown bark*, somewhat larger in size, and characterized by a whitish silvery appearance of the epidermis derived from adhering lichens; and 3. the *leopard crown bark*, named from its speckled appearance, depending on whitish lichens alternating with the dark-brown epidermis. Dr. Pereira, in the last edition of his work on Materia Medica, the publication of which was completed after his death (A. D. 1853), distinguishes the following varieties of Loxa bark.—1. *Original or old Loxa bark.* This is the original *crown bark*, and derived its name from the circumstance, that parcels of it were found on board a captured Spanish vessel returning from S. America, put up with peculiar care, and marked as for the royal family. It was in slender quills, thirteen inches long, tied up in bundles about three inches in diameter. Similar bundles were afterwards imported, and still occasionally come in the seroons of commercial crown bark. This bark is believed to have been derived from *C. Condaminea*, variety *vera* of Weddell; but as the tree is nearly exhausted, little is obtained from it at present; and what is commonly called Loxa or crown bark, is derived from other varieties of C. Condaminea, or from other species.—2. *White Crown Bark.* This is in small and large quills; the former having a silvery appearance from the presence of crustaceous lichens, and exhibiting numerous

which has almost superseded the bark as a remedy in intermittents; and the red or yellow bark is preferred by physicians when it is necessary to resort to the

transverse cracks; the latter without these transverse fissures, but ragged externally from longitudinal rents in the epidermis, with a satin-like lustre of the surface thus exposed. It is the produce of the *C. Condaminea*, var. *lucumæfolia* of Weddell, *C. lucumæfolia* of Pavon.—3. H. O. *Crown Bark.* This is the variety usually found in commerce, and has been named from the brand H. O. with a crown, adopted in the time of the Spanish government in S. America. It is in quills from six to fifteen inches long, from two lines to an inch in diameter, and from one-third of a line to two lines thick. Some of the quills are without lichens, thin, externally brown and shrivelled, with numerous longitudinal wrinkles, but with few transverse fissures. The internal surface is cinnamon-coloured, and the fracture pale yellow. Others are larger, coarser, grayish externally from lichens, with many transverse fissures, some of which quite surround the quills. Others again are twisted, and have a patchy black and white appearance from the adhering lichens. The botanical origin of this bark is not certainly known; though Howard ascribes it to *C. glandulifera.* (*Pharm. Journ. and Trans.*, xii. 128.) It comes from the port of Payta.—4. *Ashy Crown Bark.* This is in quills about the size of the fingers, having an external surface mottled with white, gray, and black or soot-like patches of powdery and crustaceous lichens, sometimes also marked with rusty fungoid warts. The epidermis has longitudinal wrinkles and transverse fissures; the internal surface is of an orange or cinnamon colour. Mr. Howard found it identical with the bark, in Pavon's collection, ascribed to the *C. rotundifolia* of that botanist, the *C. cordifolia*, var. *rotundifolia* of Weddell. It is stated to be imported from Lima; and, according to Mr. Howard, large quantities are now used for pharmaceutical purposes. (*Ibid.*, 126.)—5. *Wiry Loxa Bark.* This is in very slender, wire-like quills, internally smoothish and brown, in some places slightly gray, without lichens, and almost destitute of transverse fissures. Many of the quills are lined within with a thin shaving of pale-yellow wood. The fracture is short and resinous. The taste is very astringent and but slightly bitter, and, as the bark is almost destitute of alkaloids, it is very nearly worthless. It is brought from Payta; but its botanical source is unknown.

The earlier analyses gave as constituents of the Loxa barks cinchonia and quinia, generally with a predominance of the former alkaloid. Since the discovery of *quinidia*, this also has been found, sometimes, in considerable proportion. The different varieties vary much in their yield of alkaloids; the larger barks, in all the varieties, affording more than the smaller. An average of several results, stated by Geiger, gives about 0·48 per cent. of cinchonia, and 0·06 of quinia. In the thickest pieces, Thiel found 1·0 per cent. of cinchonia, and 0·03 of quinia. According to Soubeiran, one pound of Loxa bark yields from a drachm and a half to two drachms of sulphate of cinchonia. From some fine old Loxa bark, not now in the market, Mr. Howard obtained 0·714 per cent. of quinia, 0·514 of quinidia, and 0·04 of cinchonia. From the *H. O. crown bark*, which is at present the variety usually found in commerce, he got from small quills 0·57 per cent. of quinidia and 0·6 of cinchonia, and from larger 1·05 of the former and 0·8 of the latter, and no quinia from either. (Pereira. *Mat. Med.*, 3d ed., p. 1639.) From the *ashy crown bark* the same chemist got 0·418 per cent. of quinia and quinidia jointly, and 0·914 of cinchonia. (*Pharm. Journ. and Trans.*, xii. 126.) From these results it would appear either that the older Loxa barks contained much more quinia than the modern, or that what was supposed to be quinia was really the then unknown alkaloid quinidia. The strong reaction of a solution of gelatin with the infusion of Loxa bark indicates the presence of much tannic acid.

2. *Lima* or *Huanuco Bark. Cinchona Cinerea, Gray Bark, Silver Bark*, Ed.—*Quinquina de Lima*, Fr.—*China Huanuco, Graue China*, Germ.—Lima or Huanuco bark was introduced into notice about the year 1779, after the discovery of Cinchona trees in the central regions of Peru; but Pöppig says that the trade in it began in 1785. The first name originated from the circumstance that the bark entered into commerce through the city of Lima, the second was derived from the name of the city (Huanuco or Guanuco), in the more immediate neighbourhood of which the trees were found. There would seem to be two varieties of this bark, which come either in separate packages, or mixed together in the same. They are distinguished in England as *fine* and *coarse* gray barks, and have a different botanical origin; the former having been ascertained by Mr. Howard to belong to *C. nitida*, and the latter being ascribed to *C. micrantha*, probably with justice.

Fine Gray Bark.—*Quinquina Rouge de Lima.* Guibourt. The dimensions of this variety do not materially differ from those of the preceding, although in the largest pieces the diameter is somewhat greater. Many of the smaller quills have a more or

medicine in substance. There is no doubt, however, that *cinchonia* possesses febrifuge properties little inferior to those of *quinia;* and the same is

less spiral form. At the edge of most of the complete quills, a sharp oblique cut with a knife is observable. The epidermis is usually adherent. The exterior surface is marked with longitudinal wrinkles or furrows, which in the thick pieces often penetrate quite through the outer coating of the bark. Transverse fissures are also generally observable; but they never run wholly round the quill, often not more than a quarter or half round, and do not exhibit elevated borders. In some pieces the epidermis is rubbed off, either wholly or in spots; and in a few the entire thickness of the external layers is here and there removed, exhibiting the proper bark in patches. The colour externally is very light-gray, almost milk-white, with occasionally bluish-gray and darkish spots intermingled. Where the outer crust which imparts this whitish colour is wanting, the surface is grayish-fawn or reddish-gray, and in the thicker pieces of a dark cinnamon colour. The inner surface, though in the smaller quills sometimes tolerably uniform, is generally more or less uneven, fibrous, or splintery, especially in the larger pieces, in which may often be observed adhering yellowish-white splinters of wood. The colour is usually a rusty brown inclining somewhat to red, with occasionally a purplish tinge. The transverse fracture is smooth exteriorly, fibrous or splintery interiorly. The longitudinal fracture is usually somewhat uneven, without being splintery, and exhibits here and there minute shining spots. The inner layers of the bark are usually soft and friable. The colour of the powder is a full cinnamon-brown. The odour of the bark is like that of clay, and in this respect different from that of all other varieties. The taste is at first acidulous, astringent, and slightly aromatic, and ultimately bitter and adhesive.

Coarse or Inferior Gray Bark. The characters of this bark as a distinct variety were first given by Guibourt, who calls it *quinquina de Lima gris brun.* The following is his description. "It is in the form of long tubes, well-rolled, from the size of a quill to that of the little finger, offering very often longitudinal wrinkles, formed by desiccation. The exterior surface is, moreover, moderately rugose, often nearly destitute of transverse fissures, having a general deep-gray tint, but with black or white spots, and bearing here and there the same lichens as the Loxa barks. The inner bark is of a deep brownish yellow, and formed as it were of agglutinated fibres." (*Hist. des Drogues,* 4e ed., iii. 108.) Mr. Howard says of this bark that its predominant feature is its general *woody texture,* a feature very observable on reducing it to powder, while the only hard portion of the former variety is a resinous circle existing between the inner and outer coat. He further states, as distinctions between the two varieties, that the one now described is thinner than the former; that its prevailing superficial colour, independently of the white lichenous covering, is *glaucous green,* and the colour of its substance *rusty-yellow,* while the *fine gray* varies superficially, as regards the inner surface, from a maroon colour to rust, and as regards the outer is brown, the substance of the bark being red; that a decoction of the former is pale, and gives a small flocculent deposit on cooling, while one of the latter is brown, and lets fall a copious sediment. (*Pharm. Journ. and Trans.,* xii. pp. 15 and 16.)

The Edinburgh College refers the Lima bark, which it denominates *Cinchona cinerea* or *Gray bark,* to *C. micrantha.* There is at present little room to doubt, from the observations of Guibourt, Pereira, and Howard, that it is only the *coarse or inferior variety* that belongs to that species; while the *fine gray bark* must be ascribed to *C. nitida,* which also grows in the neighbourhood of Huanuco.

The Lima or Huanuco barks contain a considerable proportion of the alkaloids, though cinchonia predominates over quinia, and the latter is said to exist in a form in which it is difficultly crystallized, at least in the fine variety. Howard gives as the result of his analysis of the *fine gray bark* (C. nitida) 1·4 per cent. of cinchonia, 0·571 of quinia, and 0·142 of quinidia, amounting altogether to 2·113 per cent. (*Pharm. Journ. and Trans.,* xii. 12.) It also contains a good deal of tannic acid. (*Ibid.,* p. 161.) In the *inferior kind* (*C. micrantha*) he found 1·25 cinchonia, 0·243 quinia, 0·28 quinidia, together 1·773 per cent. (*Ibid.,* p. 14.) Geiger gives as the average of several results, in relation to Lima or Huanuco bark in general, 1·72 per cent. of cinchonia and 0·29 of quinia. Van Santen got from the best specimens, as the maximum, 2·73 per cent. of cinchonia, and no quinia. It would, therefore, appear that this variety of bark must become valuable if cinchonia should come into general use.

3. *Jaen Bark. Ash Bark.* — *China Jaen, Blasse Ten China,* Germ. — *Quinquina de Loxa cendré* of Guibourt. This variety probably derives its name from the province of Jaen de Bracomoros, in the vicinity of Loxa, where large quantities of bark have been collected. The Jaen bark is always in quills, which do not differ much in size from

probably the case with *quinidia;* so that, should the source of quinia begin to fail, the pale bark may come into more extensive use for the preparation of the two other alkaloids.

those of the Loxa bark, but are distinguishable by being frequently curved longitudinally, or bent in different directions, and somewhat spiral. The outer coat is often partially or entirely rubbed off, leaving the surface smooth and soft to the touch. When the epidermis is perfect, it exhibits small irregular transverse fissures, with occasionally faint longitudinal fissures and wavy wrinkles, and here and there a few warts, but no deep furrows. The colour varies from light or ash-gray to light yellow, diversified with blackish and brownish spots. When the outer coat is rubbed off, it inclines still more to yellow. Considered in mass, the bark always appears somewhat yellowish or straw-coloured. The exterior layers are soft and rather spongy, and may be readily scraped by the nail. The inner surface is exceedingly diversified, sometimes smooth, sometimes uneven and splintery. It is usually of a dull cinnamon colour. The bark is very brittle, and the fracture is smooth in the smaller quills, more or less uneven and sometimes splintery in the larger, and in neither exhibits a resinous appearance. The odour is sweetish, and is compared to that of tan. The taste is acidulous, slightly astringent, and bitter, without being disagreeable. The colour of the powder is cinnamon-brown. The bark is very deficient in alkalies. Some experimenters have found none, or only traces, while the highest product obtained was 80 grains of quinia and 13 grains of cinchonia from a pound. M. Manzini, of Paris, extracted from it an alkaline principle which he believed to be peculiar, and named *cinchovatin;* but others believe that it is identical with the *aricina* of Pelletier; and Mr. Howard can discover no difference between it and quinidia. (*Pharm. Journ. and Trans.*, xii. 127.) Mr. Howard does not coincide in the general opinion of the great poverty of the *ash bark* in alkaloids. He found in a mean-looking specimen 0·86 per cent. of cinchonia, and 0·61 of quinidia. (*Ibid.*, p. 127.) Von Bergen believes this bark to be the product of C. ovata; and Mr. Howard confirms this reference.

Von Bergen describes a variety of pale bark, under the name of *dark Jaen bark* (*dunkele Ten-China*), or *pseudo Loxa*, which resembles the Loxa, but may be distinguished by the oblique or bent shape of the quills, and the uneven, fibrous, or splintery appearance of the inner surface. It seldom comes in large pieces. Pereira considers it identical with the *ashy crown bark* already described. (See page 230.)

4. *Huamilies Bark.* — *China Huamilies*, Germ. This bark is little known as a distinct variety. Its commercial name was derived from the province of Huamilies, which lies in the interior of Peru, northward of Huanuco, and is a part of the region explored by the botanical expedition under Ruiz and Pavon. It came into notice in Germany about the beginning of the present century. It is in quills and flat pieces. The quills are from three lines to an inch and a half in diameter, from five to sixteen inches long, and from half a line to three lines thick. The flat pieces, which are usually only fragments of the largest quills, are from one to two inches broad, and six to twelve inches long. In general all the layers of the bark are present, but sometimes the outer coat, and even the whole of that part usually called the epidermis in our descriptions of bark (including those outer layers which in the tree are destitute of vitality, having been thrown outward by the annually renewed layers beneath them), are wanting in spots, though very seldom entirely absent. The epidermis is comparatively thin, very brittle, soft, and spongy. The outer surface, in the small and middling quills, is sometimes nearly smooth, but usually marked with wavy longitudinal wrinkles, and beset here and there with warts. These warts are abundant upon the thick pieces, which they sometimes almost entirely cover. Transverse fissures are seldom found, and only in the thick pieces. The colour of the epidermis is usually grayish-fawn, here and there passing into a rusty brown; but in the thicker pieces, in which the warts are abundant, it is between a liver and chestnut colour, often mixed with a tinge of purple. When the epidermis is wanting, the colour is often a full ochre yellow. The inner surface is sometimes uniform and almost smooth, sometimes slightly fibrous, rarely splintery. The colour of the surface is rusty brown, occasionally reddish, and in the fibrous or splintery pieces of an ochre yellow. The fracture in the smaller quills is rather even, in the larger presents short fibres, and is sometimes even splintery. The odour of the bark is feeble but agreeable, the taste somewhat aromatic, bitterish, and slightly astringent. The powder is of a full cinnamon colour. The average product of cinchonia and quinia, as stated by Geiger, is 0·67 per cent. of the former, and 0·25 of the latter; so that the bark, though dissimilar in appearance from the other varieties of pale bark, agrees with them in containing more cinchonia than quinia. Von Santen

2. Yellow Bark.

The officinal term yellow bark is applicable only to the most valuable variety of the drug having this colour. This is known in commerce by the name of *Calisaya*, which has been said, though erroneously, to be derived from a province in Bolivia, near the city of La Paz, where the bark is collected.* By the druggists, Calisaya bark is arranged in two sub-varieties, the quilled and the flat, which sometimes come mixed together in the same seroon, sometimes separate. They are called by the French *quinquina jaune royal* (royal yellow bark), from their resemblance to a variety of bark formerly collected for the Spanish king.

The *quilled Calisaya* (*Calisaya arrolada* of the Spanish Americans) is in pieces from three inches to two feet long, from a quarter of an inch to two or three inches in diameter, and of equally variable thickness. The epidermis is of a brownish colour, diversified or concealed by whitish or yellowish lichens, is marked by longitudinal wrinkles and transverse fissures, and is often partially separated, and generally easily separable from the proper bark. In the larger kinds, it is thick, rough, deeply indented by the transverse fissures, which often surround the quills, and is composed of several layers, separated from each other by a reddish-brown membrane. The epidermis yields a dark-red powder, and is tasteless and inert. It is desirable, therefore, to get rid of it before the bark is powdered, as the medicine is thus procured of greater strength. The bark itself, without the epidermis, is from one to two lines in thickness, compact, of a short-fibrous texture, and when broken presents shining points, apparently the termination of small fibres running longitudinally, which, examined by the microscope, are found, when freed from a salmon-coloured powder that surrounds them, to be yellow and transparent. They readily separate, when the bark is powdered, in the form of spicula, which, like those of cowhage, insinuate themselves into the skin, and produce a disagreeable itching and irritation. The colour of the bark is brownish-yellow with a tinge of orange, the taste less astringent than that of the pale bark, but much more bitter; and the bitterness is somewhat peculiar. The external part of the proper bark is more bitter and astringent, and consequently stronger in medicinal power, than the internal. The odour is faint, but, when the bark is boiled, resembles that of the pale varieties. The small quills closely resemble some of the pale barks in appearance, but may be distinguished by their very bitter taste.

The *flat Calisaya* (*Calisaya plancha* of the Spaniards), which is derived from the large branches and trunk, is in pieces of various lengths, either quite flat, or but slightly curved, and generally destitute of the epidermis, which has been obviously removed from its own want of adhesiveness to the proper

obtained, as the maximum, 1·2 per cent. of cinchonia, and little or no quinia. Huamilies bark, on the authority of Reichel, has been referred to *C. pubescens* (*C. purpurea* of the *Flor. Peruv.*); but Dr. Pereira and Mr. Howard agree in believing it to be the product of *C. Condaminea*, variety *Chahuarguera* of De Candolle, considered by Weddell as identical with his *C. Condaminea*, variety *vera*.

The bark above described is noticed by Guibourt, who names it *quinquina Huamilies ferrugineux*. The same author makes four other varieties of Huamilies bark, viz: the *gris terne*, *mince et rougeâtre*, *blanc*, and *jaune de Cuença*.—*Note to the tenth edition.*

* No such province exists in Bolivia. According to M. Laubert, the name is a corruption of *colisalla*, said to be derived from *colla*, a remedy, and *salla*, a rocky country. (*Journ. de Pharm.*, xxii. 614.) Weddell refers the origin of the name to the words *colli* and *saya*, which in the Quichua language signify *red* and *sort*, and have probably been applied from the red colour which the outer denuded surface of the bark assumes in drying, or probably from the red colour which the leaves sometimes exhibit.

bark, and not by a knife, as is the case with some inferior barks in other respects resembling the Calisaya. The inner surface is like that of the quilled pieces; the outer is irregular, marked with confluent longitudinal furrows and ridges, and somewhat darker coloured than the inner, being of a brownish fawn, frequently diversified with darker stains. The bark is of uniform fracture throughout, generally thicker than the quilled, more fibrous in its texture, less compact, less bitter, and possessed of less medicinal power. Though weaker than the proper bark of the quills, it is usually, in equal weight, more valuable than that variety, because free from the useless epidermis.

The officinal yellow bark is characterized by its strongly bitter taste, with little astringency; by its fine brownish-yellow, somewhat orange colour, which is still brighter in the powder; and by *containing a large proportion of quinia with very little cinchonia.* The salts of quinia and lime are so abundant, that a strong infusion of it instantly affords a precipitate when crystals of sulphate of soda are added. (Guibourt, *Hist. des Drogues*, 4e ed. iii. 131.)*

* *Calisaya* bark is described by Von Bergen, under the name of *China Regia* or *König's China.* We present a brief abstract of his description, omitting the form and dimensions, which are given in the text. The epidermis,† which in many of the small quills is partly wanting, in the flat pieces usually quite wanting, is very thick and brittle, constituting from a third to one-half of the bark, and, in some of the largest quills or partially quilled pieces, even two-thirds. In the latter case, it often consists of six or eight different layers. The quills are generally marked with longitudinal wrinkles and furrows, and always with transverse fissures. These fissures, which often form complete circles round the quills, have usually an elevated border, and sink so deeply in many of the larger pieces, that they are observable upon the proper bark. In the smaller pieces they are often faint, but usually crowded. The colour of the epidermis varies from whitish-gray to bluish-gray; but it is very much diversified by lichens, so as to present yellowish-white, ash-gray, and blackish spots. When the outer layer of the epidermis is wanting, as is not unfrequently the case to a greater or less extent, the colour is somewhat sooty-brown or almost liver-brown. The outer surface of the pieces without epidermis is of a colour between cinnamon-brown and dark rusty-brown. The inner surface, in the pieces of all dimensions, is uniform and almost smooth, but exhibits fine longitudinal fibres closely compressed. Splinters of wood are never found adhering to the inner surface. The prevailing colour of this surface is a rather dark or full cinnamon-brown, passing sometimes into a rusty-brown, but seldom reddish. This bark breaks more easily in the longitudinal direction than any other variety, exhibiting a chestnut-brown colour in the part answering to the epidermis, a more or less dark cinnamon-brown in that answering to the proper bark. The transverse fracture of the epidermis is rather even, that of the inner part fibrous, or splintery. A resinous layer may be seen beneath the epidermis, which usually remains when the latter is removed, and communicates to the flat pieces the dark colour which distinguishes their external surface. Small sharp splinters, which in the longitudinal fracture appear like shining points, are apt to insinuate themselves into the skin when the bark is handled. The odour is feebly tan-like, the taste slightly acidulous, strongly but not disagreeably bitter, somewhat aromatic, feebly astringent, and rather durable. The powder is of a fine cinnamon hue.

Weddell speaks of a variety of Calisaya bark having a dark-coloured external surface, which is often wholly of a vinous black, and of another which has a less uneven surface, sometimes semi-cellular, and of a paler colour. The former he says is denominated in Bolivia *Colisaya zamba*, *C. negra*, or *C. macha*; the latter *Colisaya blanca.*

Thiel obtained from the flat calisaya 2·3 per cent. of quinia, and 0·08 of cinchonia; *Michaelis* from the flat 3·7 per cent., and from the quill 2·0 per cent. of quinia, but no cinchonia; *Von Santen* from the flat, an average of 2·0 per cent. of quinia, and little or no cinchonia; *Wittstock*, on an average, 3·0 per cent. of sulphate of quinia, and 0·12 of cinchonia. (*Geiger.*) Riegel obtained as the lowest product 2·18 per cent., and the highest 3·8 per cent. of quinia. (*Pharm. Journ. and Trans.*, xii. 249.) Calisaya bark should yield from 3 to 3·5 per cent. of officinal sulphate of quinia.

† By the epidermis is here understood the whole of the external layers which are accumulated upon the outer surface of the bark by the annual renewal of the cortical layers, and the consequent separation of those of former years, which remain, but without life, attached to the external surface. A different meaning is attached to the term by Von Bergen; but, as we have taken pains to make the description in every instance correspond with our definition, we do not misrepresent his meaning.

Until the recent most valuable researches of Weddell, nothing was known with certainty as to the particular species which yields Calisaya bark. At present there is no variety of which, in this respect, we have such accurate

False or Spurious Calisaya Barks.

The great value of Calisaya bark has led to the substitution for it, or fraudulent admixture with it, of other varieties bearing a more or less close resemblance to it in character or appearance. Some of these are probably not much inferior in virtues to the genuine bark, others of little value; and it is highly important that they should be distinguished. We give below a brief notice of such as are described in pharmacological works, or have come under our own observation. Weddell states that the characters by which the true Calisaya bark may be best distinguished from all others are, 1. the shortness of the fibres in the whole surface of its transverse fracture, 2. the facility with which these may be separated, 3. the uniform fawn colour, without any white marking in its thickness, 4. the *great density* of the bark, which is such that when the nail is drawn across it, a shining track is often left, 5. the depth of the depressions on its outer surface, and the prominence of the ridges that separate them. These remarks refer to the flat variety. The quills are not so easily distinguished, as they closely resemble certain other varieties, especially the bark of C. scrobiculata and C. rufinervis, and the fracture does not afford signs so precise as in the older barks. The surest test is the greater bitterness of the genuine. From their deficiency in compactness, spurious Calisaya barks are called by the French *Calisaya léger* or *light Calisaya.*

1. *Bark of C. Calisaya, variety Josephiana* of *Weddell.* This is not known as a distinct variety in Europe or this country; but is very probably mingled more or less with the genuine, as it is collected in Bolivia. It is in quills, of a brown, or grayish-black, or slate colour on the outer surface, which is also covered with pale lichens. The inner surface is irregular, in consequence of the difficulty with which it is separated from the wood. From the *roots of the same variety*, which are probably the remains of former forest trees, is obtained another kind of bark, in short pieces, flattish, undular, or more or less contorted, destitute of epidermis, internally fibrous or almost smooth, slightly cellular externally, of a uniform ochreous yellow, and of a decided bitterness, though not so strong as that of good Calisaya, which it resembles in its internal structure. The Peruvians call it *ichu-cascarilla.* (Weddell.) These barks can scarcely be considered as adulterations, as they have the virtues of the genuine.

2. *Bark of C. Boliviana.* Weddell states that this is almost always mixed in commerce with the genuine Calisaya, from which it is often difficult to distinguish it. This is of the less consequence, as it is probably not much inferior in virtue. The following is Weddell's description. The quilled is in all points similar to the quilled Calisaya. The flat consists exclusively of the inner bark. It is generally not so thick as the Calisaya, but of equal density. The furrows on the outer surface are not so deep, and the ridges which separate them more rounded. The colour of this surface is a brownish-yellow fawn, with here and there greenish shades; of the inner a somewhat reddish or orange fawn. The fracture is like that of the Calisaya, but exhibits spots of a light almost white colour, which are never seen in that variety. The taste is a strong and agreeable bitter, which is developed more quickly than in the Calisaya.

3. *Bark of C. ovata*, var. *rufinervis* of Weddell. This variety of C. ovata inhabits Bolivia and the Southern province of Peru called *Carabaya*, where the bark is said by Weddell to be largely employed for adulterating the Calisaya. It is known in Peru by the name of *Cascarilla Carabaya.* It sometimes so closely resembles Calisaya as to be with difficulty distinguished. In the *quilled*, the outer coating sometimes differs only in being somewhat less thick. In other instances it has but a few annular fissures, is finely wrinkled longitudinally, and varies in colour from a light gray to a deep brown, being often completely covered with mosses and lichens. It is generally easily separable from the inner coat, the uncovered surface of which is of a light brownish fawn, and smooth, or marked with longitudinal depressions corresponding to rents in the outer coat. The inner surface is grayish or reddish-yellow, and finely fibrous; the transverse fracture fibrous; the resinous circle scarcely observable; the taste quickly bitter and astringent. The *flat* kind is of variable form, often closely resembling the Calisaya, but generally much lighter. Sometimes it consists solely of the inner bark, but more frequently has a portion greater or less of the cellular coat attached. The outer surface is sometimes smooth, with a few linear transverse depressions, and wholly cellular; in other instances uneven, with roundish depressions, fibrous at bottom; and is of a grayish-fawn or reddish colour, sometimes marbled with darker shades. The

knowledge. The genuine bark is derived from the newly described species, named *C. Calisaya;* but the bark of *C. Boliviana*, another of the species discovered by Weddell, is sometimes mixed with it in the same seroons. It

inner surface is of a dull grayish-yellow, or brilliant orange, with fine parallel fibres. The transverse fracture is more or less corky exteriorly, and fibrous-stringy within, or of the latter character in the whole thickness. It has considerable bitterness, which is rapidly developed in the recent barks.

Carabaya Bark. Under this name a bark has within a few years been introduced into the commerce of this country and Europe, derived from the Province of Carabaya, through the port of Islay or that of Arica. Dr. Pereira describes it as follows.—It is thin and flimsy, of a more or less rusty colour, and in some of the pieces very similar to the *Huamalies.* The *quills* are about as thick as the finger, and of variable length, sometimes even two feet, coated or uncoated; the coated having a dull rusty, or grayish-rusty, warty surface, marked by longitudinal furrows, but rarely by transverse; the uncoated sometimes presenting a dark or more or less tea-green tint. The *flat pieces* consist of the liber alone, or of this with a portion of the cellular coat. The outer surface of the liber, in some of the uncoated pieces, is blackish with rusty round flattish warts. Sometimes it looks as if dusted over with a yellowish powder. The liber itself is more or less orange; but some pieces resemble red bark in colour. Whether this is the product of *C. ovata* is uncertain; but, taking its source into consideration, and the fact stated by Weddell that the bark of that species is gathered largely in Carabaya, and known by the same name in Peru, the probabilities seem to be greatly in favour of this opinion. Pereira states that its total yield of alkaloids, including quinia, cinchonia, and quinidia, is from 3 to 4 per cent. It is, therefore, a very good bark, and is less valuable than the Calisaya, only because the predominant alkaloid is cinchonia.

A variety of *flat bark* imported into the U. States as *Carabaya*, is in irregular pieces, some very small, the largest about 9 inches in length, generally very thin; for the most part destitute of epidermis, but sometimes with portions of the outer coat attached; on the *outer surface*, when uncoated, of a dull cinnamon hue, with spots of a different colour sometimes much darker, more or less irregular from slight elevations and shallow depressions, somewhat furrowed longitudinally, seldom so transversely; on the *inner surface*, of a lighter hue than on the outer, smooth and somewhat shining when viewed obliquely, with fine compact straight fibres; with a decided fibrous fracture, sometimes smooth toward the outer edge; and, when handled, readily yielding spicula, which penetrate the fingers like those of Calisaya. In one specimen shown us by Messrs. Powers & Weightman, the outer surface was almost completely covered over with the sub-epidermic layer, with little or none of the epidermis itself, and was remarkably uniform in its aspect, though sometimes presenting numerous slight longitudinal wrinkles from drying, and a few shallow transverse impressions. We are informed that this variety contains more cinchonia than quinia; and have little doubt that it is the bark referred to by Weddell as the product of *C. ovata*, var. *rufinervis.*

4. *Bark of C. scrobiculata.* The younger bark of this tree has, we think, undoubtedly been imported among the pale or gray barks. The larger or flat pieces have been fraudulently substituted for Calisaya. Of these, according to Pereira, there are two varieties; derived from different varieties of the tree.

a. *Cusco Bark. Bark of St. Ann. Bark of C. scrobiculata*, var. *genuina.* This is collected in the Province of Cusco, in the south of Peru; and the town of Cusco, according to Weddell, is the centre of its commerce. It is the kind to which Guibourt has especially attached the name of *light Calisaya.* Weddell thus describes it: "Less dense than the Calisaya; consisting generally of the liber and a thin layer of the cellulo-resinous tissue; thickness from 5 to 10 millimètres (about 2 to 4 lines). Outer surface obscurely *red*, smooth, with some linear transverse impressions, or more or less irregular; exhibiting often superficial cavities filled with fungous detritus; raised in other instances into asperities or irregular warts. *Interior surface* uniform, of fine and straight grain, and of a handsome *reddish-orange* colour. *Transverse fracture* more or less cork-like on the outside, according to the thickness of the cellular portion, on the inside very fibrous, with long, pliable, stringy fibres, and of a lighter colour than the outer part. *Longitudinal fracture* presenting numerous splinters with shining points, less marked than in the Calisaya, and medullary rays more numerous and visible. *Taste* bitter, quite strong and quickly developed in the middling sized barks, with very perceptible astringency. This bark yields from 0·7 to 0·8 per cent. of sulphate of cinchonia, and from 0·3 to 0·4 of sulphate of quinia." (*Hist. Nat. des Quinquinas*, pp. 44, 45.)

is produced exclusively in Bolivia, formerly Upper Peru, and in the southern portion of the adjoining Peruvian province of Carabaya. Before these countries were separated from Spain, it was shipped as well from Buenos Ayres

b. *Peruvian Calisaya.* Bark of *C. scrobiculata*, var. *Delondriana*, Weddell. This is imported from Lima. Pereira describes it as occurring in flat pieces, closely resembling the genuine Calisaya in colour, for which it is often sold. They are thicker and denser than the last mentioned variety, from which they also differ in colour. Externally the bark is smoother than the Calisaya; and the ridges between the furrows are more rounded. The fracture is fibrous, and the taste, in the larger pieces, less bitter than that of Calisaya. (*Mat. Med.*, 3d ed., p. 1629.)

This bark is probably the same with that referred to in the eighth and ninth editions of this Dispensatory (p. 236 of the 9th), as having been imported into the U. States about the year 1848, having been consigned to a manufacturing chemist of this city by a commercial house in Valparaiso, with the information that it had been sent to them by Dr. J. Villamil, and had been gathered in the forests of Huanuco in Peru. The pieces are generally without the epidermis, which appears to have separated spontaneously, and, when retained, has the transverse fissures, and longitudinal furrows characteristic of the Calisaya. The colour and consistence of the bark are the same as in the genuine; and it even presents the shining spicula which characterize the latter, though they are less numerous, and do not so readily penetrate the fingers. The taste is very bitter. Examined chemically by Professor Procter, it was found to afford a precipitate with sulphate of soda, in consequence of containing kinate of lime, and thus in another point approaches the Calisaya; but Prof. Procter could not detect in it a trace of quinia. The only alkali it was found to contain was cinchonia, of which there was the large proportion of 2·8 per cent.; so that this must rank with the valuable barks. For a more particular account of it the reader is referred to a paper by Prof. Procter in the *American Journal of Pharmacy* (xix. 178).

5. Bark of *Cinchona pubescens*, var. *Pelleteriana* of Weddell. *Cusco Bark. Arica Bark.* This was first known in France by the name of Arica Bark from the port at which it was shipped; but both in French and English commerce this name has given way to the more appropriate one of *Cusco* bark, derived from the Peruvian province in which it is collected. Dr. Pereira says that it was first introduced into Europe in 1829 as yellow or Calisaya bark. From the statements of Weddell, there seems to be little doubt that it is the product of the tree referred to at the heading of this paragraph; as specimens collected by himself in the mountains of Cusco were found identical with the bark as known in Europe. The following is his description condensed. In the *quilled*, the outer coat is thin, very adherent, almost smooth, sometimes with traces of annular fissures, of a uniform dirty gray colour, or marbled with darker shades. The proper bark is, without, of an obscure yellow, sprinkled with little brown spots when artificially denuded, and marked with some superficial longitudinal wrinkles; within, is obscurely yellow and a little reddish, coarsely fibrous, and often rough to the touch. The transverse fracture is exteriorly corky and quite short, without resinous circle, and inwardly with a few short thick fibres. *The flat pieces* are very dense, and consist about equally of cellular coat and liber. The outer surface is smoothish, sometimes slightly wrinkled longitudinally, of an ochre-yellow more or less brownish, and frequently marbled with grayish or silvery spots which are the remains of the epidermis. The inner surface is brownish or reddish, thick, and fibrous. The transverse fracture is cork-like outwardly, of short woody fibres inwardly. A fresh cut surface in the same direction shows inwardly rows of large isolated semitranslucent points, corresponding to the section of the cortical fibres, agglutinated in bundles. The longitudinal fracture is almost without splinters. The epidermis, when it remains on the large barks, is thin, unequal, sometimes warty, of an obscure gray, and more or less brownish or even greenish in some spots. When it has been scraped, the bark sometimes presents deep brown spots, which are the points where prominences in the cellular coat had raised the epidermis so as to form the little warts referred to. These are sometimes decayed, and upon falling leave roundish depressions. The taste of the bark is bitter, astringent, and somewhat pungent. (*Hist. Nat. des Quinquin.*, p. 56.)

Von Bergen says that this bark somewhat resembles the fibrous Carthagena. Inexperienced persons might mistake it for the Calisaya. Guibourt says that it may be readily distinguished by a more regularly cylindrical form, its smoother outer surface, the remains of the white and fungous layer, by its two shades of colour, orange or brownish externally, and whitish or very pale internally, and by not yielding a precipitate with sulphate of soda.

as from the ports on the Pacific; but at present it comes only from the latter. As first announced in this work, from information derived from merchants long personally engaged in commercial transactions on the Pacific coast of South America, the bark is brought from the interior to the port of Arica, whence it is sent to various other ports on the coast. The interior commerce in the drug has its centre chiefly in the town of La Paz. At present the trade in this bark is much diminished, in consequence of restrictions by the Bolivian government, which issued a decree forbidding the cutting of it entirely for three years, from the first of January, 1851.

It is generally supposed to have been first introduced into commerce towards the end of the last century, and it was probably not known by its present name till that period; but La Condamine states that the Jesuits of La Paz, at a period anterior to the discovery of the febrifuge of Loxa, sent to Rome a very bitter bark by the name of *quinaquina*, which, though supposed by that traveller to have been derived from the Peruvian balsam tree, was very probably, as conjectured by Guibourt, the true cinchona. Besides, Pomet, in his *History of Drugs*, published in 1694, speaks of a bark more bitter than that of Loxa, obtained from the province of Potosi, which borders upon that of La Paz; and Chomel also states that the cinchona tree inhabited the mountains of Potosi, and produced a bark more esteemed than that which grew in the province of Quito. (Guibourt, *Journ. de Pharm.*, xvi. 235.) It is possible that, though known at this early period, it may have gone out of use; and its re-introduction into notice, towards the end of the last century, may have been mistaken for an original discovery.*

Pelletier supposed that he had found a new alkali in this bark, which he named *aricina;* but the substance he obtained is now thought to have been some modification of one of the other alkaloids. The chief alkaloid in the bark is cinchonia. Frank obtained 48 ounces of it from 100 lbs. of the bark, and only a trace of quinia; Winkler, 256 grains from 16 ounces of a good specimen, and only 77 grains from the same quantity of an inferior one. Guibourt estimates the proportion at a drachm for every pound, and observes that the bark is rich in cinchonic red.

6. Bark of *C. micrantha*, var. *rotundifolia* of Weddell. As this variety of Cinchona grows in Bolivia, and the flat bark derived from it simulates Calisaya, it is very probable that its product has been sometimes used to adulterate the latter bark. Weddell says of it that it has little density, and consists of the liber alone, or of this and the cellular coating, which is generally semi-fungous and imperfectly exfoliated. The *external surface* is unequal, presenting superficial concavities similar to those of Calisaya, and separated by irregular corky eminences, but sometimes though rarely smooth from the persistence of the whole cellular coating, and is of a bright and grayish orange-yellow. The *internal surface* is considerably fibrous, of the same colour as the external, but of a more lively tint. The *transverse fracture* is stringy; the *longitudinal* fracture but slightly splintery, and of a dull surface. The *taste* is decidedly bitter, and quickly developed, a little pungent, scarcely astringent. (*Hist. Nat. des Quinquin.*, p. 53.)

7. Bark of *C. amygdalifolia.* This species also inhabits Bolivia, and its bark may possibly sometimes contaminate the Calisaya, as it has been largely collected. Pereira states that it is imported alone or mixed with other Bolivian barks, both quilled and flat. According to the same author, it is distinguished from the Calisaya by its lightness, its more orange colour, the presence of the cellular coat in the pieces deprived of epidermis, the stringy transverse fracture, the splintery longitudinal fracture, the want of marked annular fissures in the epidermis, and the astringent and but slightly bitter taste. Mr. Howard obtained from a portion of the quills 0·7 per cent. of quinidia and a trace of cinchonia, from the flat 0·23 of quinidia and the same of cinchonia. (Pereira's *Mat. Med.*, 3d ed., p. 1629.)—*Note to the tenth edition.*

* The great value of Calisaya bark will justify us in giving a brief account of its mode of collection, as described by Weddell from personal observation. The tree producing it grows in the Bolivian provinces Enquisivi, Yungos, Larecaja, and Caupolican. At present it is necessary to travel for eight or ten days from the nearest inhabited place, in order to reach the forests where it is found of a size and in numbers which will repay the trouble of gathering the bark. The Cascarilleros are persons educated

3. Red Bark.

The name of this variety is very appropriately applied; as the colour is usually distinct both in the bark and the powder. In South America it is called *cascarilla roxa* and *colorada*. Some writers have divided it into several sub-varieties; but in relation to the true red bark there does not seem to be ground for such division in any essential difference of properties. Like the *Calisaya*, it comes in quills and flat pieces, which are probably derived from different parts of the same tree. It is imported in chests.

Some of the pieces are entirely rolled, some partially so, as if they had been taken from half the circumference of the branch; others are nearly or quite flat. They vary greatly in size, the quill being sometimes less than half an inch in diameter, sometimes as much as two inches; while the flat pieces are occasionally very large and thick, as if derived from the trunk of a tree. They are covered with a reddish-brown or gray, sometimes whitish epidermis, which is rugged, wrinkled longitudinally, and in the thicker pieces marked with furrows, which in some places penetrate to the surface of the proper bark. In many specimens, numerous small roundish or oblong eminences, called warts, may be observed upon the outer surface. Beneath the epidermis is a layer, dark-red, brittle, and compact, which possesses some bitterness and astringency, but much less than the interior parts. These are woody and fibrous, of a more or less lively brownish-red colour, which is usually very distinct, but in some specimens passes into orange and even yellowish-brown; so that it is not always possible to distinguish the variety by this property alone. The taste is bitter and astringent, and the odour similar to that of other good barks. Red bark is chemically distinguished

from infancy to the business. Several of them are engaged in the service of a merchant or small company, by whom they are sent, at any period of the year except during the rains, upon an expedition under the charge of a leader called a Mayordomo. Having previously received information which governs the direction of their journey, they proceed to the vicinity of their intended operations, and establish a camp in a convenient position. Henceforward the neighbourhood is considered as belonging exclusively to the party, and no other bark-gatherers pretend to interfere. From the camp the Cascarilleros are despatched, singly or in small bands, in different directions into the forests, through which they have to make their way often with great labour and fatigue. Each man carries with him provisions for a long absence. The trees do not form forests of themselves, but are scattered singly or in groups more or less close. From some convenient point of view the explorer scans the top of the forest, and is able to recognise, at a great distance, from the peculiarity of its aspect, not only one of the Cinchonas, but the particular species of which he is in search. Sometimes he is directed by the appearance of the dry leaves upon the ground. Having found a suitable tree, he first fells it, cutting as near the soil as possible, then tops off the branches, and separates by blows with a wooden mallet, or the back of his axe, the outer or dead layers of the bark, which easily separate. He next makes incisions through the bark, so as to isolate pieces usually fifteen or twenty inches long by three or four broad, which he removes by means of a knife or other instrument. The branches are decorticated without separating the epidermis. The pieces obtained from these are simply allowed to dry in the sun, and, rolling themselves up, form the quilled variety. The pieces of the trunk are disposed in square piles, one being placed over the other, and the whole kept down by some heavy body. They are thus prevented from rolling as they dry. When sufficiently dried they are carried to the camp on the back of the gatherer, who often consumes several days in his returning journey, and undergoes incredible fatigue. At the camp, the bark is assorted, and the portion deemed fit for commerce is sent to the town, on the back of men or of mules, where it is packed in bales or seroons, covered with fresh hides. The most wasteful methods of collecting the bark prevail, the only object being present convenience. Not only is the tree felled, but the bark is frequently removed from the stump down into the very earth, so as to prevent the growth of sprouts, which would otherwise spring up from the old roots, and in the course of time afford another crop.—*Note to the ninth edition.*

by *containing considerable quantities both of quinia and of cinchonia.** It yields a turbid salmon-coloured decoction with water.

The species of Cinchona which produces red bark is unknown; the notion derived from Mutis, and formerly generally prevalent, that it was obtained from the *C. oblongifolia* of that botanist, having been demonstrated to be incorrect. For the proofs upon this point, which have now ceased to have

* The *red bark* is described by Von Bergen under the name of *China rubra*, or *rothe China*. The following is an abstract of his description. The quills are from two lines to an inch and a quarter in diameter, from one-third of a line to two lines thick, and from two to twelve inches or more in length. The smaller quills are often spiral. The flat pieces are from one to two inches broad, from three-eighths to a quarter of an inch thick, and of the same length as the quills. In the smaller and middling-sized quills, the external surface exhibits longitudinal wavy wrinkles. In the thicker pieces, these wrinkles, between which are here and there longitudinal furrows, often elevate themselves into roundish or oblong warts, which are of a somewhat friable and granular consistence. The longitudinal furrows sometimes penetrate to the bark. Transverse fissures seldom occur. The colour in the smaller quills varies from a fawn-gray to a dull reddish-brown, in the larger is reddish-brown or chestnut-brown with a tinge of purple. When the wrinkles and warts are rubbed off, the peculiar brownish-red colour of the bark appears. The pieces are often in part or almost wholly covered with a whitish-gray or yellowish-white coat, either belonging to the epidermis or consisting of lichens. In some of the quills the epidermis is wanting in spots, which exhibit a dirty reddish cinnamon-colour. The inner surface is delicately fibrous and almost uniform in the small quills, but becomes more fibrous and uneven in the larger, and in the flat pieces is splintery and very irregular. Its colour varies with the size of the pieces, being a reddish-rusty brown in the least, redder in the larger, and a full brownish-red in the largest. The inner surface is also sometimes yellowish or brownish, or of a dirty appearance. It becomes darker when scraped with the nail. The fracture exhibits the different colours of the epidermis and inner bark, as also of a resinous layer which lies between the two. It is usually smooth in the smaller quills, fibrous in the larger, and at the same time fibrous and splintery in the largest pieces. The fracture of the epidermis, however, is in all either smooth, or only here and there somewhat granular. The odour is like that of tan, and earthy, the taste strongly but not disagreeably bitter, somewhat aromatic, and not lasting. The powder is of a dull brownish-red colour.

Experiments upon many different specimens of red bark, as stated by Pfaff, give as an average result 1·7 per cent. of pure cinchonia, and 0·44 of sulphate of quinia. The highest product obtained was 3·17 per cent. of cinchonia, and 0·15 of sulphate of quinia. Another specimen yielded 1·21 per cent. of the former, and 1·33 of the latter. Pelletier and Caventou obtained 0·8 per cent. of cinchonia, and 1·7 of quinia. (*Geiger.*) Dr. E. Riegel, of Carlsruhe, obtained from one specimen of the best red bark 4·16 per cent. of alkaloids (2·65 of quinia and 1·51 of cinchonia), and from another 3·85 per cent. (See *Pharm. Journ. and Trans.*, xii. 250.) It appears, therefore, that the proportion of the alkalies is exceedingly different in different specimens; and it is highly probable that some of the barks experimented upon were inferior red barks not properly belonging to this variety. The degree of bitterness is, perhaps, the best criterion of their efficacy.

Guibourt divides the red bark into two principal varieties, which he distinguishes by the names of *quinquina rouge verruqueux*, and *quinquina rouge non verruqueux*, from the presence or absence of the warts upon the outer surface. He describes also four other red barks; *Rouge orangé verruqueux*, differing from the true warty kind by its more orange colour, its very thin epidermis, its finer fibres, and the less thickness of the large barks; 2. *Rouge blanchissant à l'air*, characterized by the whitening of its fracture in the air, and by its little bitterness; 3. *Rouge de Lima*, with a whitish epidermis, an ochreous reddish liber, and of excellent qualities (see *Fine Gray Bark*, p. 230); and 4. *Rouge pâle à surface blanche*, resembling the first of these varieties, but distinguishable by its whiter epidermis, and generally lighter colour. Under the same head may be ranked his *quinquina de Jaën ou de Loxa rougeâtre*, which has a dark-gray epidermis, and a uniform fibrous proper bark, reddish or deep-brown, and of a very astringent taste with little bitterness.—*Note to the second, fourth, and ninth editions.*

A specimen of bark in our possession, brought by Dr. Dillard, of the U. S. Navy, from the Pacific, and labelled *red bark of Cuença*, has a thick epidermis like that of the ordinary red barks, is of a very deep dark-red colour, and possesses little bitterness.

any practical importance, the reader is referred to the article CINCHONA, section RED BARK, in early editions of this work. It has been supposed that red bark may be derived from the same species with one or more of the pale barks, but taken from the larger branches or the trunk. This opinion receives some support from a statement made by La Condamine, in his memoir upon cinchona. We are told by this author that three kinds of bark were known at Loxa; the white, the yellow, and the red. The white, so named from the colour of the epidermis, scarcely possessed any medicinal virtue, and was obtained from a tree entirely distinct from that which yielded the two other varieties. The red was superior to the yellow; but he was assured, on the very best authority, that the trees producing them grew together, and were not distinguishable by the eye. Of the three varieties mentioned by La Condamine, the white, which was probably one of the inferior barks with micaceous epidermis, does not reach us; and that which he calls yellow is probably identical with the pale variety of the Pharmacopœias, as this grows abundantly about Loxa. Should it be admitted that the red bark is furnished by the same tree which yields the pale, we have a ready explanation of the difference in size of the two varieties. Weddell seems to be of this opinion; as he observes that the pale barks are almost constantly nothing else than the young barks of the same trees which yield the yellow and red barks.

NON-OFFICINAL OR CARTHAGENA BARKS.

Under this head may be classed all the Cinchona barks brought from the northern Atlantic ports of South America. In commerce, they are variously called *Pitaya*, *Bogota*, *Carthagena*, *Maracaybo*, and *Santa Martha barks*, according to the place in the vicinity of which they are collected, or the particular port at which they may be shipped. Formerly these barks were for the most part of inferior quality, and were therefore not recognised in the Pharmacopœias; but the deficient supply and consequent high price of Calisaya have directed enterprise into other quarters; and within a few years large quantities of very good bark have been imported from New Granada, derived chiefly from the neighbourhood of Bogota and Popayan, and brought down the river Magdalena. There can be little doubt that the commerce in these barks will continue and increase; as some of them are inferior in their yield of alkaloids only to the Calisaya, and the region from which they are procured is almost virgin soil. It has appeared to us, from an examination of such of them as have come under our notice, that they may all be referred without violence to some one or another of the varieties of Carthagena bark already recognised: but these better kinds formerly seldom reached the market; because, partaking of the general reputation of the inferior barks from the same country, it was feared that they might not pay the cost of importation. Most of the Carthagena barks are characterized by a soft, whitish or yellowish-white, micaceous epidermis, which may be easily scraped by the nail, and which, though often more or less completely removed, almost always leaves behind traces sufficient to indicate its character. Those of them which may, in other respects, bear some resemblance to Calisaya, are in general readily distinguishable by this character of the epidermis when it remains, and, when it is wanting, by the peculiar appearance of the outer surface, showing that the exterior coating has been scraped off, or shaved off with a knife. They all contain the alkaloids in greater or less proportion, though they differ much in this respect. In reference to the relative proportion of the three alkaloids, they have nothing in common, except perhaps that they yield proportionably more cinchonia and quinidia than the Calisaya, resembling, in this respect, the pale and red barks. Similar barks are found

on the Western coast of South America, where they are known as *white barks;* but they seldom reach us. In the state of powder, the inferior Carthagena barks were formerly, and are still to a certain extent, kept in the shops, and sold for tooth-powder, &c., under the name of *common bark.* They have not unfrequently been substituted, either fraudulently or by mistake, for the better kinds.

The Carthagena barks were formerly classified, according to their colour, into the *yellow*, *orange*, *red*, and *brown;* but this mode of distinction must now be abandoned; for all these varieties of colour may be found in barks identical in other respects, and derived from the same species of Cinchona. The well characterized Carthagena barks may all be referred to one of the three following varieties.

1. *Hard Carthagena Bark. Hard yellow Carthagena Bark. Yellow Bark of Santa Fé. Common yellow Carthagena Bark.* — *China flava dura.* Von Bergen. — *Quinquina de Carthagène jaune pale.* Guibourt. This is in pieces of various size and form, sometimes wholly or partially quilled, and sometimes flat; and the flat pieces present the appearance of having been warped in drying, being frequently curved longitudinally backward, and sometimes also in the transverse direction or spirally. The quills are from three to eight lines in diameter, from half a line to a line and a half thick, and from five to nine and rarely fifteen inches long. The flat pieces are thicker, from half an inch to two inches broad, and from four to eight and sometimes twelve inches in length. As found in this market, the bark is sometimes in small, irregularly square or oblong, flattish, and variously warped pieces, from one to four inches long, and from one to three lines in thickness, mixed with small quills or fragments of quills; the former appearing as if chipped from the trunk or large branches, the latter evidently derived from the small branches. In this shape it was treated of in some former editions of this work, as a distinct variety, under the name of *Santa Martha bark*, which it at one time held in the market; but a closer examination has convinced us that it is the same bark as the one above described, though collected in a different manner. The quills are generally more covered with the white epidermis than the flat pieces, in which it is often nearly or quite removed. The inner surface of the latter, though sometimes smooth, is often rough and splintery, as if forcibly separated from the wood. The colour of the proper bark is a pale, dull, brownish-yellow, darker in parcels which have been long kept; and the surface often appears as if rubbed over with powdered bark. The texture is rather firm and compact, and the fracture abrupt, without being smooth or presenting long splinters. The taste is bitter and nauseous. This variety of bark is now universally ascribed to the C. cordifolia of Mutis.*

* We introduce, in the form of a note, more detailed and precise information on the subject of the Carthagena barks than our space allows in the text; because, in the present condition of the manufacture of the Cinchona alkaloids, it is important to be able to distinguish the several varieties, and estimate their value.

Hard Carthagena Bark. The following is a somewhat precise description of this variety, taken from Von Bergen. The account of the dimensions and shape of the pieces, given in the text, is sufficiently particular. The epidermis is in many pieces partially or almost wholly wanting. The outer surface is on the whole rather smooth, though it usually exhibits a few faint longitudinal furrows and transverse fissures, and pieces are occasionally found with hard warts or protuberances. In the flat pieces, the epidermis, when present, has somewhat the consistence of cork, and is composed of several layers. The colour of the epidermis varies from yellowish-white to ash-gray, and is sometimes diversified by bluish-gray or blackish lichens. When it is wanting, the colour is between a dark cinnamon and brownish-yellow. These shades, however, are seldom clear, and the flat pieces have usually a somewhat dusty aspect. The inner surface of the quills is tolerably uniform, that of the flat pieces uneven or

2. *Fibrous Carthagena Bark. Fibrous Yellow Carthagena Bark. Spongy Carthagena Bark. Bogota Bark. Coquetta Bark.* — *Quina naranjanda.* Mutis.— *Quinquina Orangé.* Humboldt.— *China flava fibrosa.* Von Bergen. — *Quinquina Carthagène spongieux.* Guibourt. This is in quills or half-quills, or is slightly rolled; and there are comparatively few pieces which are quite flat, even among the largest barks. The quills are from half an inch to an inch and a half in diameter, and of extremely variable length, with a yellowish-brown epidermis, often covered with crustaceous lichens so as to render the surface of the bark whitish and smooth, and exhibiting not unfrequently longitudinal and transverse fissures. The larger barks, which are much the most frequent in commerce, are usually from six to twelve inches long, from one to two inches broad, and from two to five lines in thickness; but they often vary much from these dimensions, being sometimes in the smallest fragments, and sometimes forming semi-cylinders four or five inches in diameter, a foot and a half long, and nine inches thick. They are usually without epidermis, which has been scraped off, or pared off with a knife, having the surface smooth and uniform in the former case, and somewhat angular in the latter. Sometimes, however, the epidermis either partially or wholly remains, when it generally exhibits the whitish micaceous surface characteristic of most of the Carthagena barks. The bark is very fibrous, presenting generally, when broken, long, sometimes stringy splinters, though the outer edge of the fracture is occasionally short from the cellular, or remains of the suberous coat. Its texture is loose, soft, and spongy under the teeth, and the bark itself is usually light. The colour both on the trimmed outer surface, and the inner, and of the bark itself, varies from an ochreous or light brownish-yellow, to orange, and red; but, for the most part, it presents more or less of the orange tint, which induced Mutis to give it the title of *orange bark.* The red colour is found especially in the largest barks. The larger pieces are sometimes marked on the outside with a deep spiral impression, produced probably by a climbing plant winding around the stem of the tree. The colour of the powder is yellowish, with not unfrequently an orange tint. The taste is more or less bitter; but varies in this respect extremely; some barks being almost insipid, while others have a very decided taste. There can be little doubt that these barks are all derived from the Cinchona lancifolia of Mutis. It is asserted that the red variety of the bark is obtained from trees which grow side by side with those which yield the yellow or orange.

The productiveness of the fibrous bark in alkaloids varies greatly in the different specimens. Thus, while some have scarcely yielded any product, others have been found to afford more than three per cent. They probably all contain quinia, quinidia, and cinchonia; but some have been found more abundant in one, and others in another of these alkaloids. Thus, the red is said to be especially rich in quinidia (Pereira); a Pitaya bark which we believe to belong to the fibrous Carthagena has yielded a very large product of quinia; while, in not a few specimens which have been examined,

faintly furrowed and even splintery, the points of the splinters often projecting. Its colour, which is almost always dull, as if the surface were dusty, varies between a light cinnamon and a dull ochre yellow, and in some pieces is rusty-brown, or fawn-gray, or even whitish-yellow. The bark does not readily break in the longitudinal direction. The transverse fracture presents short splinters, and is sometimes fibrous. When cut transversely, the bark obscurely exhibits a very small darker coloured resinous layer beneath the epidermis. The odour is feeble, the taste astringent and bitter, but not strongly so. The powder is of the colour of cinnamon. This bark yielded, according to Von Bergen, on an average of two experiments, 0·57 of cinchonia, and 0·33 of sulphate of quinia. Goebel and Kirst found in a pound 56 grains of quinia and 43 of cinchonia. Dr. Pereira states that it contains quinidia.

the cinchonia predominates. (*Am. Journ. of Pharm.*, xxv. 308.) It is probable that the richness in these principles depends in some degree on the natural position of the plants; those growing in low situations being less productive than those higher on the mountains.

A specimen labelled *yellow bark of Loxa*, brought from South America several years since by Dr. Dillard, of the U. S. Navy, and said to be used in Loxa for making extract of bark, presents characters closely analogous to those of fibrous Carthagena bark, and sufficient to justify the supposition that it was derived from the same species of Cinchona; and we have recently seen a specimen sent hither from Guayaquil, which has the same character, and is sufficiently rich in alkaloids to be worked with advantage.*

* *Fibrous Carthagena Bark.* The following is an abbreviation of Von Bergen's description of this variety. In shape and dimensions, it does not materially differ from the preceding; but the flatter pieces are almost always a little rolled, or curved laterally. The epidermis is in general either in part or wholly rubbed off. When it is present, the outer surface is nearly smooth, only marked here and there with faint, irregular transverse fissures and longitudinal furrows. Its colour varies from a dirty whitish-gray to yellowish, but is sometimes more or less dark. When the outer surface is rubbed off, as is almost always the case in the flat pieces, the colour is a nearly pure ochre yellow. Where the whole thickness of the outer coat is wanting, as happens here and there in spots, the surface is dark cinnamon, or dark ochre yellow, and commonly dull or powdery. The inner surface is usually even, but sometimes irregular and splintery, and always harsh to the fingers, leaving small splinters sticking in the skin when drawn over it. It is of a nearly pure ochre-yellow colour, and is very powdery. The fracture distinguishes this variety from the preceding, and from all others. The longitudinal fracture is strikingly fibrous, and in the flat pieces the fragments still hang together by connecting fibres. The bark, moreover, breaks obliquely, and the fracture even of the outer coat, which in other varieties is almost always smooth, is here uneven or rough-grained. The transverse fracture exhibits very long and thin splinters or fibres, which are very flexible and may almost be said to be soft. No traces of a resinous appearance are observable in the fracture. The odour is feeble, the taste at first woody and flat, afterwards slightly bitter and astringent, and weaker in this than in any other variety of bark. The colour of the powder is intermediate between that of cinnamon and yellow ochre. The highest product of this bark in alkaloids was about 0·59 per cent. of cinchonia, and 0·52 of sulphate of quinia.

The above description does not embrace all the varieties of this bark which have since been introduced into commerce; nor does it by any means represent the finest specimens. The *highly fibrous character of the bark, its looseness of texture, relative lightness, and sponginess under the teeth*, are properties common to all the specimens; but in appearance and virtues they vary considerably; so much so, indeed, that it is only of late that they have been united under one name, and traced to one source.

In the edition of this work for 1843 we described a kind of bark of which large quantities had then recently been imported in a vessel from *Maracaybo*, and which, from its possession in a high degree of the properties just referred to, we were disposed to rank with this variety; and subsequent observation has tended to prove the correctness of this reference. In general aspect it bore some resemblance to the flat Calisaya, particularly in the appearance of its inner surface; but it differed in being thicker, less hard, compact, and heavy, and much more fibrous, and especially in the character of its outer surface, which had the appearance as though the exterior coating had been removed by scraping or cutting with a knife, and not spontaneously separated at the natural juncture, as in the Calisaya. The pieces were considerably larger than those we had previously seen of the fibrous Carthagena, and differed somewhat in colour, having much more of the orange tint, especially in the outer portion, where it was decidedly reddish in some of the pieces. Though less bitter than the Calisaya, and without the property of precipitating sulphate of soda, it nevertheless had a decided bitterness, and its infusion afforded a copious precipitate with infusion of galls, indicating the presence of no inconsiderable portion of the alkaline principles.

Recently we have had opportunities, through the kindness of Messrs. Powers & Weightman, of examining several varieties of the fibrous bark brought from Bogota and Popayan, which have proved of great value as sources of the cinchona alkaloids, and which we propose briefly to describe, in connexion with a statement derived from the same highly respectable source of their yield of these valuable principles.

3. *Hard Pitaya Bark.—Pitaya Condaminea Bark.* Pereira.—*Quinquina brun de Carthagène. Quinquina Pitaya, ou de la Colombia, ou d'Antioquia.* Guibourt. This bark, though seen by Guibourt so long since as 1830, has but recently become generally known. Many seroons of it have within a short time been imported into Philadelphia, and the following description is drawn from an examination of the bark contained in several that have come under our notice. It is in small irregular pieces, from less than an inch to about four inches long, which are obviously the fragments of larger pieces both quilled and flat. Dr. Pereira states that he had pieces more than a foot in length. In thickness it varies from less than a line to four or five lines. Most of the fragments are covered with the whitish, soft epidermis, characteristic of the Carthagena barks; but some of them have a dark-brown epidermis, rugose with innumerable cracks in all directions; and others are partially or wholly destitute of the outer covering, presenting generally, in the denuded part, a dark uniform or somewhat wrinkled surface. The inner surface is finely and compactly fibrous, and of a dull yellowish-brown colour with a

Bogota Bark. Fusagasuga Bark. Coquetta Bark. The first of these names is derived from the entrepot of the trade in this bark; the second, from the particular district where it is collected. Of the origin of the third, by which it is known in English commerce, we are not informed. The bark is in pieces of various lengths, often exceeding a foot, sometimes nearly flat, but generally more or less rolled, and occasionally forming semi-cylinders more than an inch in diameter. It is often either partially or wholly covered with the whitish, soft, micaceous epidermis characteristic of Carthagena barks. In other instances this has been removed by scraping, or sometimes by chipping, and the deep strokes of the knife or hatchet are not unfrequently observable. The pieces are often of considerable thickness, usually rather firm, though very fibrous, and spongy under the teeth. The colour is brownish-yellow with a tinge of red. Mr. Weightman obtained from it from 1 to 1·3 per cent. of sulphate of quinia, and from 0·3 to 0·4 per cent. of sulphate of cinchonia. An inferior variety of Bogota bark, not designated as Fusagasuga, yielded him only 0·4 of sulphate of quinia. In the *Am. Journ. of Pharm.* (xxv. 308), is a statement of results obtained in the examination of the Bogota (Fusagasuga) bark, which were, on the average of four specimens, 0·95 per cent. of cinchonia or quinidia or both, 1·45 of sulphate of quinia (equivalent to about 1·09 of the uncombined alkaloid), and 1·0 of extractive residue, which is presumed to consist mainly of amorphous quinia; so that the whole of the alkaline ingredients amounted to about 3·04 per cent.

Soft Pitaya Bark. This, though said to be brought from the Pitaya mountain near Popayan, is wholly different from the *hard Pitaya* described in the text as one of the varieties of Carthagena bark. From the specimens we have seen of the soft Pitaya, we have no hesitation in classing it with the fibrous Carthagena barks, though superior to the others, probably in consequence of the more elevated site of its growth. It comes broken up into small irregular fragments of larger pieces, either quilled, partially rolled, or flat. Few of the fragments exceed four inches in length, and many are very minute. Indeed, in some of the seroons, much of their contents seem to be almost in the state of a very coarse powder. This condition of the bark no doubt depends partly on its great fragility; but it is probable that it is purposely broken up for the convenience of close package in the hide seroons. The fragments are almost all destitute of epidermis, but, when portions of it remain, it has the usual whitish, soft, micaceous character common to all these barks. The outer surface, which consists of a thin subepidermic suberous layer, is remarkably uniform and smooth, apparently from the careful scraping to which it has been subjected. By far the greater part of the bark consists of the liber, which is highly fibrous, though very soft, easily broken, and yielding with great facility under the teeth. The colour is externally and internally a uniform fine brownish-yellow, with an orange tint, and is brighter than in most others of the analogous barks. The taste is very bitter. Mr. Weightman obtained from ordinary specimens of this bark 2·0 per cent. of sulphate of quinia, and 0·05 of sulphate of cinchonia; from a very fine specimen 3·0 per cent. of the former, and but a trace of the latter. It is, therefore, one of the most valuable varieties of bark, scarcely yielding in productiveness to Calisaya. The results stated in the *Am. Journ. of Pharm.* (xxv. 308) even exceed these. The average yield of four different specimens, including the uncrystallizable product, was 4·42 of alkaloids, probably in the state of sulphates, and, without the uncrystallizable matter, about 3·4 per cent.—*Note to the tenth edition.*

reddish tinge; and the whole of the liber or true bark has the same colour and texture. But outside of the liber there is in many pieces a very distinct resinous layer, which is sometimes of considerable thickness, and, when cut across by a knife, exhibits a dark reddish-brown shining surface. The resinous layer is the most striking peculiarity of the bark, though not present in all of the pieces, which sometimes consist of the liber alone. The fracture is towards the interior shortly fibrous, towards the exterior often smooth, in consequence of the layer just referred to. The whole bark is rather hard, compact, and heavy; differing in this respect very decidedly from the last mentioned variety. It has more resemblance to the hard Carthagena, from which, however, it differs by its deeper and redder colour, its much more developed resinous coat, and its occasional grater-like epidermis. The taste is very bitter, and the yield in alkaloids considerable. Mr. Weightman informed us that he had obtained from it an average product of 1·6 per cent. of sulphate of quinia, and 0·34 of sulphate of cinchonia, independently of the amorphous or uncrystallizable alkaline matter. It must, therefore, be ranked among the efficient barks, though not so productive as the fine variety of fibrous bark denominated soft Pitaya. It contains also a large proportion of resin.

This bark comes from the Mountain of Pitaya near Popayan, and the particular seroons examined by ourselves were said to have been brought down the Magdalena River from the town of Honda. It is referred by Dr. Pereira and Mr. Howard to the *Cinchona Condaminea*, var. *Pitayensis* of Weddell, of which that author has more recently made a distinct species, under the name of *Cinchona Pitayensis*. (*Ann. des Sci. Nat.*, May, 1849.)*

False Barks.

Before dismissing the subject of the varieties of cinchona, it is proper to observe that numerous barks have at various times been introduced into the market, and sold as closely resembling or identical with the febrifuge of Peru, which experience has proved to differ from it materially, both in chemical

* *Hard Pitaya Bark.* The following is Guibourt's description of this bark. "In the young barks, the crust is fine, whitish externally, fissured, almost like the young red Lima bark. In the large barks, and in the parts not worn by rubbing, the crust is always whitish exteriorly, but interiorly it is rust-coloured and fungous. The liber presents a very fine fibrous texture, joined to a considerable density and hardness; the internal surface is smooth and reddish; its taste is very bitter and disagreeable, and its watery infusion strongly precipitates with sulphate of soda. It yields largely of the alkalies, but proportionably more cinchonia than quinia." Guibourt obtained 2·3 per cent. of crystallized cinchonia, and 1·15 of sulphate of quinia; or about 3·16 per cent. of pure alkaloids. (*Hist. Nat. des Drogues*, 3e ed. iii. 141.)

Under the title of *Pitaya Condaminea Bark*, Pereira describes this variety as follows. "Bark consisting of single or double quills, or half-rolled pieces. I have specimens which are more than a foot in length. Some samples, however, which I have received, consist of pieces not more than two or three inches in length, sometimes entirely, at others only partially coated; the partially coated pieces consist of the suberous and cellular coats and liber. Epidermis, when present, dark brown, frequently coated by crustaceous lichens, marked by numerous, closely set, transverse cracks, with prominent or slightly everted borders, which give the bark a grater-like feel; and here and there presenting round or oval warts or fungoid rusty tubercles, varying in size from a grain of wheat to a seed of coffee, and usually marked like the latter with a longitudinal, sometimes also with a transverse fissure. The suberous coat in some pieces much developed, spongy or fungous, fawn-yellow, sometimes brown in the interior, and yellow externally and internally. Resinous tissue on the inside of the suberous coat, from which it is definitely separated, shining, of a dark reddish colour. Liber gradually passing into the resinous coat, hard, dense, dark, reddish-brown; cortical fibres small and short. Pitaya-Condaminea bark is firm and heavy, and has a very bitter, rather disagreeable taste, which is slowly developed." It contains cinchonia, quinidia, and quinia. (*Mat. Med.*, 3d ed. p. 1643.)—*Note to the tenth edition.*

composition and medicinal virtues. These barks are generally procured from trees formerly ranked among the Cinchonas, but now arranged in other genera. They are distinguished from the true Peruvian bark by the absence of quinia, quinidia, and cinchonia. Among them are 1. a bark known to the French pharmaceutists by the name of *quinquina nova* or *new bark*, which, though at one time thought to be possessed of some virtues, has been proved to be worthless, and was ascertained by Guibourt to be the produce of the *C. oblongifolia* of Mutis, now ranked in Weddell's genus Cascarilla;* 2. the *Caribæan bark*, from Exostemma Caribæa; 3. the *St. Lucia bark*, or *quinquina piton* of the French, derived from Exostemma floribunda; and 4. a bark of uncertain botanical origin, called in France *quinquina bicolore*, and in Italy *china bicolorata*, and sometimes erroneously named *Pitaya bark*. Of these the last only is known in this country. A considerable quantity of it was some time since imported into New Orleans, whence a portion reached this city. The specimen in our possession is in quills, for the most part singly, but in some instances doubly rolled, from eight or ten inches to more than two feet in length, and from a quarter of an inch to an inch or more in diameter. The outer surface is of a dull grayish-olive colour, with numerous large oval or irregular spots much lighter coloured, sometimes even whitish, and slightly depressed beneath the general surface, as if a layer of the epidermis had fallen off within their limits. It is to this appearance that the bark owes the name of *bicolorata*. The colour of the internal surface is deep brown or almost blackish; that of the fresh fracture, brownish-red. The bark is hard, compact, and thin, seldom as much as a line in thickness, and breaks with a short rough fracture. It is inodorous, and has a very bitter taste not unlike that of some of the inferior kinds of cinchona.†

Chemical History.

In the analysis of Peruvian bark, the attention of chemists was at first directed exclusively to the action of water and alcohol upon it, and to the determination of the relative proportions of its gummy or extractive and resinous matter. The presence of tannin and of various alkaline or earthy salts

* This was formerly called *red Carthagena bark*, but must not be confounded with the genuine red Carthagena bark, which belongs to the *fibrous Carthagena*, and has been already noticed. As described by Guibourt, it is in pieces a foot or more long, rolled when small, open or nearly flat when larger, in general perfectly cylindrical, with a whitish, thin, uniform epidermis, showing scarcely any cryptogamia, and but a few transverse fissures which are sometimes entirely wanting; one to three lines thick without the epidermis; of a pale carnation colour, becoming deeper in the air, especially upon the outer surface, which, when destitute of epidermis, is always reddish-brown; of a fracture which is foliaceous in the outer part, and short-fibrous in the inner; and exhibiting, under the microscope, between its fibres, and especially between the laminæ, a great abundance of two granular matters, of which one is red and the other whitish. In some pieces the fracture exhibits, nearer the external than the internal surface, a yellow, transparent, resinous or gummy exudation. The taste is flat and astringent like that of tan, the odour feeble, between that of tan and of the pale barks. The powder is fibrous and decidedly red. It contains neither quinia nor cinchonia. Its most interesting constituents are a *peculiar tannic acid*, *kinic acid*, *kinovic acid* discovered by Winckler, and a peculiar red colouring matter called *kinovic red*. (Hlasiwetz, *Chem. Gaz.*, ix. 419 and 441.)

† In previous editions of this *Dispensatory* it was stated that this bark had been employed in Italy successfully in intermittents; and that Folchi and Peretti had discovered in it a new alkali, which they named *pitayna*. But there is reason to believe that this was a mistake, caused by the confused application of the name Pitaya bark; and that the bark employed in Italy, and analyzed by the chemists mentioned, was that described as *hard Pitaya* in a preceding page. It is conjectured that the alkaloid *pitayna* may have been that now known as quinidia or quinidine.—*Note to the tenth edition.*

in minute quantities was afterwards demonstrated. Fourcroy made an elaborate analysis, which proved the existence of other principles in the bark besides those previously ascertained. Dr. Westring was the first who attempted the discovery of an active principle in the bark, on which its febrifuge virtues might depend; but he was not successful. Seguin afterwards pursued the same track, and endeavoured, by observing the effects of various reagents, to discover the relative value of different varieties of the drug; but his conclusions have not been supported by subsequent experiment. M. Deschamps, an apothecary of Lyons, obtained from bark a crystallizable salt of lime, the acid of which Vauquelin afterwards separated, and called *kinic acid.* The latter chemist also pushed to a much further extent the researches of Seguin, as to the influence of reagents; and arrived at the conclusion that those barks were most efficient which gave precipitates with tannin or the infusion of galls. Reuss, of Moscow, succeeded in isolating a peculiar colouring matter from red bark, which he designated by the name of *cinchonic red,* and obtained a bitter substance, which probably consisted in part of the peculiar alkaline principles subsequently discovered. The first step, however, towards the discovery of cinchonia and quinia appears to have been taken by the late Dr. Duncan, of Edinburgh, so early as 1803. He believed the precipitate afforded by the infusion of cinchona with that of galls, to be a peculiar vegetable principle, and accordingly denominated it *cinchonine.* Dr. Gomez, a Portuguese physician, convinced that the active principle of bark resided in this cinchonine, but mixed with impurities, instituted experiments upon some pale bark, which resulted in the separation of a white crystalline substance, considered by him to be the pure *cinchonine* of Dr. Duncan. It was obtained by the action of potassa upon an aqueous infusion of the alcoholic extract of the bark, and was undoubtedly the principle now universally known by the name of *cinchonine* or *cinchonia.* But Dr. Gomez was ignorant of its precise nature, considering it to be analogous to resin. M. Laubert afterwards obtained the same principle by a different process, and described it under the name of *white matter,* or *pure white resin.* To Pelletier and Caventou was reserved the honour of crowning all these experiments, and applying the results which they obtained to important practical purposes. In 1820, they demonstrated the alkaline character of the principle discovered by Gomez and Laubert, and gave it definitively the name of *cinchonine.* They discovered in the yellow or Calisaya bark another alkaline principle which they denominated *quinine.* Both these bases they proved to exist in the barks, combined with the *kinic acid,* in the state of *kinate of cinchonine and of quinine.* It was, moreover, established by their labours, that the febrifuge property of bark depends upon the presence of these two principles. In 1833, MM. O. Henry and Delondre discovered a new alkaloid, but afterwards finding its composition in its anhydrous state the same as that of quinia, concluded that it was a hydrate of that base. About 1844, Winckler announced anew the existence of the same principle, which he considered distinct, and named *chinidine;* and, under the similar title of *quinidine,* it is now generally admitted to a place among the cinchona alkaloids. As the termination *a* or *ia* has been generally adopted by English and American chemists to distinguish the organic alkaloids from other organic proximate principles, the names of which terminate in *in* or *ine,* the terms quinine and cinchonine of the French writers have been changed with us into *quinia* and *cinchonia.* On the same principle, *quinidine* should be called *quinidia.* This method of designating the vegetable alkaloids is uniformly followed in the present work. Other views have been put forth in relation to the alkaline principles of Peruvian bark, which have much interest; but as they cannot yet be considered as established, and their detail

in the text might embarrass the learner, we shall notice them in a foot-note, when treating of the three admitted alkaloids above referred to.*

It has before been stated, on more than one occasion, that the three officinal varieties of bark are distinguished by peculiarities of composition. We give the result of the analysis of each variety, as obtained by Pelletier and Caventou. (*Journ. de Pharm.*, vii. 70. 89. 92.)

Pale bark of Loxa contains, 1. a fatty matter; 2. an insoluble red colouring matter; 3. a yellow colouring matter; 4. tannin, or soluble red colouring matter; 5. gum; 6. starch; 7. lignin; 8. kinate of lime; 9. *kinate of cinchonia, with a very minute proportion of kinate of quinia.*

Yellow Calisaya bark contains the fatty matter, the cinchonic red, the yellow colouring matter, tannin, starch, lignin, kinate of lime, and *kinate of quinia, with a comparatively small proportion of kinate of cinchonia.*

Red bark contains the fatty matter, a large quantity of the cinchonic red, the yellow colouring matter, tannin, starch, lignin, kinate of lime, and *a large proportion both of kinate of quinia, and of kinate of cinchonia.*

Carthagena bark contains the same ingredients with the red bark, but in different proportions. It has less of the alkaline matter, which it also yields with much greater difficulty to water, in consequence of the abundance of insoluble cinchonic red which it contains, and which either involves the salts of quinia and cinchonia so as to prevent the full contact of water, or retains these alkalies in combination. (*Journ. de Pharm.*, vii. 105.)

Besides quinia and cinchonia, there can be no doubt that at least one other alkaloid, *quinidia*, as it is denominated in this work, exists in Peruvian bark; and it is highly probable that, though found most abundantly in the pale, and some of the Carthagena barks, it is contained occasionally at least to a greater or less extent in all.

Another bitter principle has been extracted from Calisaya bark by Winckler. He named it *kinovic* bitter; but, having been found to possess acid properties, it is now denominated *kinovic acid.* It is thought to exist in the bark in a free state. (Schwartz, *Pharm. Cent. Blatt*, 1852, p. 194.)

By the experiments of Henry, Jun., and Plisson, it may be considered as established, that the alkalies of the different varieties of bark are combined at the same time with kinic acid, and with one or more of the colouring matters, which, in relation to these substances, appear to act the part of acids. This idea was originally suggested by Robiquet. (*Journ. de Pharm.*, xii. 282. 369.) The compounds of quinia and cinchonia with the colouring matter are scarcely soluble in water, while their kinates are very soluble.

From these statements it appears that the three officinal varieties of bark differ little except in the proportion of their constituents. All contain quinia and cinchonia; the yellow bark most of the first, the pale of the second, and the red a considerable quantity of both. All probably contain quinidia.

* Reference has been made in a note to the discovery by Pelletier and Coriol of an alkali called *aricina* in the Arica or Cusco bark. It was obtained by the same process as that employed in the extraction of quinia from yellow bark. It is white, crystallizable, and distinguishable from cinchonia, which it in many respects resembles, by exhibiting a green colour under the action of nitric acid, and by the property, possessed by its sulphate, of forming a tremulous jelly when a saturated boiling solution of the salt is allowed to cool. Manzini obtained from Jaën bark an alkaline substance which he supposed to be peculiar, and named *cinchovatin;* but the same had been obtained by Bouchardat, and considered by him, as well as by Pelletier, to be identical with *aricina;* and Winckler, having extracted a portion from the bark, and examined it with great care, coincides in this conclusion. (*Journ. de Pharm. et de Chim.*, 3*e sér.*, ii. 95 et 313; *Central Blatt*, A. D. 1844, p. 126.) Much doubt, however, exists on the subject of this supposed new alkaloid, and by Mr. Howard it is thought most probably to have been quinidia.

Gum was found in the pale, but not in the red or yellow. Kinovic acid, though first discovered in the yellow, probably exists in others.

The odour of bark appears to depend on a *volatile oil*, which Fabroni and Trommsdorff obtained by distillation with water. The oil floated on the surface of the water, was of a thick consistence, and had a bitterish, acrid taste, with the odour of bark.

The *fatty matter*, which was first obtained pure by M. Laubert, is of a greenish colour as obtained from the pale bark, orange-yellow from the yellow. It is insoluble in water, soluble in boiling alcohol, which deposits a part of it on cooling, very soluble in ether even cold, and saponifiable with the alkalies.

The *cinchonic red* of Reuss, the *insoluble red colouring matter* of Pelletier and Caventou, is reddish-brown, insipid, inodorous, largely soluble in alcohol, especially when hot, and almost insoluble in ether or water, though the latter dissolves a little at the boiling temperature. The acids promote its solubility in water. It precipitates tartar emetic, but not gelatin; but, if treated with a cold solution of potassa or soda, or by ammonia, lime, or baryta, with heat and then precipitated by an acid, it acquires the property of forming an insoluble compound with gelatin, and seems to be converted into tannin. It is precipitated by subacetate of lead. It is most abundant in the red bark, and least so in the pale. Berzelius supposed it to be formed from tannin by the action of the air. According to Schwartz it results from the absorption by the tannin of 3 eqs. of oxygen, and the elimination of 2 eqs. of carbonic acid, and 1 eq. of water. (*Pharm. Cent. Blatt*, 1852, p. 194.)

The *yellow colouring matter* has little taste, is soluble in water, alcohol, and ether, precipitates neither gelatin nor tartar emetic, and is itself precipitated by subacetate of lead.

The *tannic acid*, *tannin*, *cincho-tannic acid*, or *soluble red colouring matter* of Pelletier and Caventou, has been considered as possessing all the properties which characterize the proximate vegetable principles associated together under the name of tannic acid. It has a brownish-red colour and austere taste, is soluble in water and alcohol, combines with metallic oxides, and produces precipitates with the salts of iron, which vary in colour according to the variety of bark; being deep green with the pale bark, blackish-brown with the yellow, and reddish-brown with the red. It also forms white precipitates with tartar emetic and gelatin, and readily combines with atmospheric oxygen, becoming insoluble. It must, however, differ materially from the tannic acid of galls, which could not exist in aqueous solutions containing cinchonia and quinia without forming insoluble compounds with them.

But the most interesting and important constituents of Peruvian bark are the alkaline and active principles quinia, cinchonia, and quinidia, and the kinic and kinovic acids, with the former of which these principles are combined. In relation to these, therefore, we shall be more minute in our details.

Quinia, as usually prepared, is whitish, rather flocculent, and not crystalline; but it may be crystallized from its alcoholic solution by careful management in pearly silky needles; and Liebig obtained it from a somewhat ammoniacal watery solution in the same form. It is inodorous and very bitter. At about 300° F. it melts without chemical change, and on cooling becomes brittle. It is soluble in about 400 parts of cold and 250 of boiling water, is very soluble in alcohol and ether, and soluble also in the fixed and volatile oils. The alcoholic solution is intensely bitter. Quinia is unalterable in the air. It forms salts with the acids which readily crystallize. The tannate, tartrate, and oxalate, are said to be insoluble or nearly so, but are dissolved by an excess of acid. Quinia and its salts may be distinguished from all other vegetable alkalies and their salts, by

the beautiful emerald-green colour which results, when their solution is treated first with solution of chlorine and then with ammonia, and which changes to a white or violet upon saturation with a dilute acid. The least quantity of quinia may be detected by powdering the substance supposed to contain it, then shaking it with ether, and adding successively the tests just mentioned. Its salts are precipitated by the bichlorides of mercury and platinum, and of a buff colour by that of gold. The composition of quinia is differently given. According to Liebig, it consists of 1 eq. of nitrogen, 20 of carbon, 12 of hydrogen, and 2 of oxygen ($NC_{20}H_{12}O_2$), and its combining number is 162. This formula is based on the supposition that, of the two salts which quinia forms with most acids, the one containing the smallest proportion of acid is a di-salt, consisting of 2 eqs. of base and 1 of acid, and the other neutral, consisting of 1 eq. of each. Another view is, that the first of these salts is neutral, and the second a bi-salt; and, if this be admitted, the above combining number must be doubled. Upon the latter supposition, the formula, according to Laurent, is $N_2C_{38}H_{22}O_4$ and the combining number 370.

There is reason to believe that quinia may become uncrystallizable without change of composition, and impart to its salts the same uncrystallizable character. In this state it is called *amorphous quinia*. This is always among the substances left in the mother waters after the crystallization of sulphate of quinia, in its preparation from Calisaya bark. More will be said of this under sulphate of quinia in the second part of this work.

Quinia is obtained by treating its sulphate with the solution of an alkali, collecting the precipitate, washing it till the water comes away tasteless, then drying it, dissolving it in alcohol, and slowly evaporating the solution.

The most important artificial salt of quinia is the sulphate, the process for procuring which, as well as its properties, will be hereafter described. The muriate and valerianate have been adopted by the Dublin College, which gives processes for their preparation. (See *Quiniæ Sulphas*, &c., among the preparations.) The *phosphate*, *acetate*, *citrate*, *lactate*, *ferrocyanate*, and *tannate* have also been employed and recommended; but none of them has yet gained admittance into the Pharmacopœias, and none probably is superior to the officinal sulphate. The first four may be prepared by saturating a solution of the acids respectively with quinia, and evaporating the solutions. The *ferrocyanate* is directed to be made by boiling together two parts of sulphate of quinia and three of ferrocyanuret of potassium in a very little water, pouring off the liquor from a greenish-yellow substance of an oily consistence which is precipitated, washing the latter with distilled water, then dissolving it in strong alcohol at 100° F., filtering immediately, and afterwards evaporating the solution. (*Am. Journ. of Pharm.*, xii. 351.) M. Pelouze, however, found this preparation to be pure quinia, mixed with a little Prussian blue. (*Archives Gén.*, 3e *sér.*, xv. 236.) The *tannate* may be prepared by precipitating the infusion of bark, or solution of sulphate of quinia, by the infusion of galls or solution of tannic acid, and then washing and drying the precipitate. It has the advantage of possessing little taste, while experience has shown that it is little if at all inferior in antiperiodic powers to the sulphate; but its amorphous condition renders it more liable to adulteration. Either of these salts may be given in the same dose as the sulphate. *Arsenite of quinia* has been recommended by Dr. Ringdon, especially in chronic cutaneous affections. He prepares it by boiling 64 grains of arsenious acid, with half the quantity of carbonate of potassa, in four fluidounces of distilled water, until dissolved, adding water enough to make the solution measure four fluidounces, and then mixing five drachms of this solution with two scruples of

sulphate of quinia, previously dissolved in boiling distilled water. The arsenite (diarsenite) of quinia is thrown down in the form of a white curdy precipitate, which is to be washed on a filter and dried. It is uncrystallizable, insoluble in water, and soluble in alcohol. The dose is one-third of a grain, given at first twice a day, and afterwards three and four times a day. (*Prov. Med. & Surg. Journ.*, Aug. 25, 1847.)

Cinchonia when pure is white, crystallizable from its alcoholic solution in four-sided prisms with oblique terminal facets, soluble in 2500 parts of boiling water, almost insoluble in cold water, soluble in boiling alcohol which deposits a portion upon cooling, scarcely soluble in ether, and but slightly so in the fixed and volatile oils. Its bitter taste, at first not very obvious in consequence of its difficult solubility, is developed after a short time by the solution of a minute portion in the saliva. Its alcoholic, ethereal, and oleaginous solutions are very bitter. By heat it is melted and partially changed, and, if the heat be cautiously increased, sublimes into a matted tissue of fine crystals, which have the same formula as the pure alkaloid. (Hlasiwetz, *Chem. Gaz.*, ix. 90.) Its alkaline character is very decided, as it neutralizes the strongest acids. Of the salts of cinchonia, the sulphate, nitrate, muriate, phosphate, and acetate are soluble in water. The neutral tartrate, oxalate, and gallate are insoluble in cold water, but soluble in hot water, alcohol, or an excess of acid. Winckler has shown that cinchonia is rendered uncrystallizable or amorphous by sulphuric acid in excess, aided by heat; a fact of importance in the preparation of the sulphate of this alkali. (*Chem. Gaz.*, March 15, 1848.) Several processes have been employed for the preparation of cinchonia. One of the simplest is the following. Powdered pale bark is submitted to the action of sulphuric or muriatic acid very much diluted, and the solution obtained is precipitated by an excess of lime. The precipitate is collected on a filter, washed with water, and treated with boiling alcohol. The alcoholic solution is filtered while hot, and deposits the cinchonia when it cools. A further quantity is obtained by evaporation. If not perfectly white, it may be freed from colour by converting it into a sulphate with dilute sulphuric acid, then treating the solution with animal charcoal, filtering, precipitating by an alkali, and redissolving by alcohol in the manner already mentioned. It may also be obtained from the mother waters of sulphate of quinia by diluting them with water, precipitating with ammonia, collecting the precipitate on a filter, washing and drying it, and then dissolving it in boiling alcohol, which deposits the cinchonia in a crystalline form upon cooling. It may be still further purified by a second solution and crystallization. The same remarks in relation to equivalent composition apply to cinchonia, as those already made in reference to quinia. According to the view which considers the salts as basic and neutral, cinchonia consists of 1 eq. of nitrogen, 20 of carbon, 12 of hydrogen, and 1 of oxygen ($NC_{20}H_{12}O$); and its combining number is 154. The other view would require these numbers to be doubled. The above formula is that of Liebig. Others have been given; but Hlasiwetz constantly obtained results with true cinchonia confirmatory of those stated. (*Chem. Gaz.*, ix. 91.) Exposed to the air, cinchonia does not suffer decomposition, but very slowly absorbs carbonic acid, and acquires the property of effervescing slightly with acids. It is precipitated of a sulphur-yellow by the perchloride of gold. Chlorine water dissolves it or any of its salts without change; but if ammonia be now added, a white precipitate is produced. It is thus distinguished from the other cinchonia alkaloids.

Sulphate of cinchonia (*disulphate*), the only salt of this base which has been employed to any extent in a separate state, may be prepared by heating cinchonia with a little water, adding dilute sulphuric acid gradually till

the alkali is dissolved, then boiling with purified animal charcoal, filtering the solution while hot, and setting it aside to crystallize. By alternate evaporation and crystallization, the whole of the sulphate may be obtained. The salt is, however, most frequently procured from the mother waters of sulphate of quinia. It crystallizes in short, oblique, shining prisms with dihedral summits, which melt at 212°, and at a somewhat higher temperature lose their water of crystallization. Its taste is very bitter. It is soluble in fifty-four parts of water at common temperatures, and in a smaller quantity of boiling water, and is readily dissolved by alcohol. According to the views above given of the composition of cinchonia, it is a *disulphate*, consisting of 2 eqs. of cinchonia 308, 1 of sulphuric acid 40, and 2 of water of crystallization 18 = 366. By the addition of the necessary quantity of acid, it passes into the neutral sulphate, which is soluble in less than half its weight of water at 58°.*

Quinidia (*quinidine*, *quinidina* of Pereira, *chinidine* of Winckler, β *quinine* of Van Heijningen) has been satisfactorily determined to be a distinct alkaloid of Peruvian bark. Its properties have been carefully examined by H. G. Leers, from whose paper, published originally in the *Ann. der Chem. und Pharm.* (Mai, 1852), the following account of its properties has been chiefly derived. It readily crystallizes from its alcoholic solution, by spontaneous evaporation, in hard, shining, colourless crystals, which are easily pulverized, and yield a snow-white powder. They melt without decomposition or loss of water at 347° F., and on cooling concrete into a grayish-white crystalline mass. At a higher heat they take fire, and burn with the odour of kinole, and volatile oil of bitter almonds. Their taste is bitter, but less intensely so than that of quinia. Quinidia is soluble, according to Leers, in 2580 parts of water at 62°, and in 1858 parts at 212°, in 143 (169 Winckler) of ether, and 12 of alcohol of 0·835, both at 62° F. With the acids it forms salts, most of which are beautifully crystallizable, and much more soluble than those of quinia. There are, as of quinia and cinchonia, two sets of the salts of quinidia, which may be considered either as basic and neutral, or as neutral and acid. In the former view, quinidia would have the formula $NC_{18}H_{11}O$, and the equivalent number 141; in the latter, which is the one generally adopted, $N_2C_{36}H_{22}O_2$, and 282. When treated first with chlorine and then with ammonia, it does not like quinia yield a green colour, nor like cinchonia a white one, but remains unaffected.† It differs from quinia also by its much less solubility in ether. From the aqueous solution of its salts, the

* Cinchonia, quinia, quinidia, and strychnia, when heated with caustic potassa, yield acrid vapours, which condense into an oily liquid having alkaline properties, for which the name of *quinolëin* was proposed by its discoverer M. Gerhardt, and which is also called *cincholin*. It has a peculiar odour, not unlike that of the bean of St. Ignatius, and an extremely acrid and bitter taste, is slightly soluble in water, and freely so in alcohol, ether, and the volatile oils; forms crystallizable salts with the acids; and is characterized by producing a yellow crystalline precipitate with chromic acid. It results also from the dry distillation of quinia. (*Journ. de Pharm. et de Chim.*, 3e sér., ii. 341.) Dr. A. W. Hoffmann has found that the substance called *leucol*, existing in coal-gas naphtha, is identical with cincholin. (*Chem. Gazette*, June, 1845, p. 251.) Mr. Stenhouse proposes, as a test of the presence of alkaline principles in bark, to macerate with dilute sulphuric acid, precipitate with an excess of carbonate of potassa or soda, and distil the precipitate with a great excess of caustic potassa or soda. Cincholin will distil over in oily drops, recognizable by their peculiar odour and strong alkaline properties. (*Philos. Mag.*, xxvi. 199.)

† Mr. E. N. Kent of New York proposes another test to distinguish this alkaloid from quinia. If to a solution of sulphate of quinia in acetic acid, a few drops of tincture of iodine be added, and the mixture be heated, and then allowed to cool, a beautiful emerald-green compound is formed; while sulphate of quinidia, treated in the same manner, furnishes a brown precipitate. (*N. Y. Journ. of Pharm.*, ii. 129.)

alkalies, their carbonates, and bicarbonates throw down pulverulent precipitates not soluble in an excess of the precipitant. With phosphate of soda, nitrate of silver, and bichloride of mercury it forms white, with chloride of gold light-yellow, and with chloride of platinum orange-yellow precipitates. It may be obtained pure by first precipitating it from the solution of one of its salts by an alkali, and then repeatedly dissolving in alcohol and crystallizing, until it is entirely freed from a greenish-yellow resinous substance which is apt to attend it. From quinia it may be separated by repeated washing with ether, until the ethereal solution no longer affords evidence of the presence of quinia by the test of chlorine and ammonia.

Sulphate of quinidia is, according to one view, neutral, consisting of 1 eq. of quinidia 282, 1 of sulphuric acid 40, and 1 of water 9; according to another, basic, containing 2 eqs. of base, 1 of acid, and 1 of water, and therefore a disulphate. It is in long, shining, silky acicular crystals, soluble in 130 parts of water at 62° F., in 16 parts at 212°, readily soluble in alcohol, but almost insoluble in ether. It is obtained from the quinidia barks by the same process as that by which sulphate of quinia is procured from the Calisaya. When the two alkaloids are contained in the same bark, the sulphate of quinidia remains in the mother waters in consequence of its greater solubility. By the addition to its solution of a quantity of sulphuric acid equal to that which it contains, it is converted into the bisulphate (sulphate on the basic view), crystallizable in fine acicular crystals like asbestos.*

* There is still considerable uncertainty upon the subject of the alkaline constituents of Peruvian bark. What has been stated in the text may be considered as pretty well established; but, various other results have been obtained, which need confirmation by repeated experiment, before they can be entirely relied on. Among the most recent and interesting are those of Van Heijningen, Guibourt, and Pasteur.

According to *Van Heijningen* there are three kinds of quinia, differing from one another by the quantity of water which they contain, and of which they may be deprived by a heat of 266° F. He distinguishes them as *α quinia*, *β quinia*, and *γ quinia*, the first containing three eqs. of water, the second two, and the third one. The *α quinia* is common quinia, *β quinia* is the alkaloid denominated in the text quinidia, and *γ quinia* is a crystalline variety, which is formed out of recently precipitated amorphous quinia, exposed in a thin layer to the atmosphere. Each of these varieties forms salts having distinctive properties. They are produced one from the other, and not necessarily pre-existent in the bark. (See *Pharm. Journ. and Trans.*, xi. 521.)

Guibourt gives as the result of his examinations, that quinia and quinidia are distinct alkaloids, possessing different physical and chemical properties. 1. *Quinia* separates from its hydro-alcoholic solutions in the form of a syrupy liquid, which preserves its transparency in the air. Nevertheless, when in a very thin layer upon glass, it becomes opaque, assuming a very fine and indeterminate crystalline structure. In the first state it contains 3 eqs. of water, corresponding to Van Heijningen's *α quinia;* in the second, only 1 eq., corresponding to the *γ quinia* of that chemist. *Quinidia* separates from its hydro-alcoholic and alcoholic solutions in the form of crystals which belong to the system of right rectangular or rhomboidal prisms. These crystals are anhydrous. 2. *Quinia* is soluble in all proportions in cold ether and absolute alcohol, and in almost all proportions in alcohol of 90 to the hundred. *Quinidia* is soluble in 140 to 150 parts of ether, 45 of cold absolute alcohol, 105 of alcohol of 90, and in 3·7 parts of boiling absolute alcohol. 3. *Sulphate of quinia* crystallized (common sulphate) is soluble, in the cold, in 57 parts of absolute alcohol, and 63 of alcohol of 90. The corresponding *sulphate of quinidia* is soluble in from 30 to 32 parts of cold absolute alcohol, and 7 of alcohol of 90. 4. *Oxalate of quinia* is quite insoluble in water; *oxalate of quinidia* is very soluble, and easily crystallizable by refrigeration or evaporation. (*Journ. de Pharm.*, 3*e sér.*, xxii. 414.)

M. Pasteur has arrived at the following extremely interesting conclusions as to the cinchona alkaloids. There are four principal bases in bark, viz. 1. *quinine* (quinia), 2. *quinidine* (quinidia), 3. cinchonine (cinchonia), and 4. cinchonidine (cinchonidia). By exposing any salt of quinia with certain precautions to heat, the alkaloid is changed into another isomeric with itself called by M. Pasteur, *quinicine*. Under similar circumstances cinchonine is changed into an isomeric alkaloid which he calls *cinchonicine*.

Kinic Acid (*called also Cinchonic or Quinic Acid*), *and the Kinates of Cinchonia and Quinia.*—It may be desirable to procure the alkaline principles in the state of saline combination in which they exist in the bark; as it is possible that they may exert an influence over the system in this state, somewhat different from that produced by their combinations with the sulphuric or other mineral acid. As it is impossible to procure the kinates immediately from the bark in a pure state, it becomes necessary first to obtain the kinic acid separately, which may thus become of some practical importance. We shall, therefore, briefly describe the mode of procuring it, and its characteristic properties. By evaporating the infusion of bark to a solid consistence, and treating the extract thus obtained with alcohol, we have in the residue a viscid matter consisting chiefly of mucilage with kinate of lime, which is insoluble in alcohol. If an aqueous solution of this substance be formed, and allowed to evaporate at a gentle heat, crystals of the kinate are deposited, which may be purified by a second crystallization. The salt thus obtained, being dissolved in water, is decomposed by means of oxalic acid, which precipitates the lime, and leaves the *kinic acid* in solution. This may be procured in the crystalline state by spontaneous evaporation, though, as usually prepared, it is in the form of a thick syrupy liquid. The crystals are transparent and colourless, sour to the taste, and readily soluble in alcohol and in water. The kinates of cinchonia and quinia may be obtained either by the direct combination of their constituents, or by the mutual decomposition of the sulphates of those alkalies and the kinate of lime. The *kinate of cinchonia* has a bitter and astringent taste, is very soluble in water, is soluble also in alcohol, and is crystallized with difficulty. The *kinate of quinia* is also very soluble in water, but less so in rectified alcohol. Its taste is very

These new bases have striking analogies with those from which they were derived, and moreover strongly resemble each other. They are almost insoluble in water, but very soluble in ordinary and absolute alcohol. Both combine readily with carbonic acid, and separate ammonia from its saline combinations. Both are deposited from these solutions in the form of resinous fluids, and both deviate to the right the plane of polarization. Both are very bitter and febrifuge. Under the name of quinidine two alkaloids have been confounded, and not unfrequently the two are mixed together. One of these, for which M. Pasteur preserves the name of *quinidine*, is hydrated, efflorescent, isomeric with quinine, deviates to the right the plane of polarization, and like quinine gives a green colour with chlorine and ammonia. The other, which he calls *cinchonidine*, is anhydrous, isomeric with cinchonine, exercises to the left its rotatory power, and does not exhibit the green colour with the two tests referred to. The latter is the most common in commercial specimens; and it is easy to ascertain whether it contains quinidine. If recently crystallized cinchonidine be exposed to hot air, all the crystals of quinidine will effloresce, and separate from the others, from which they are distinguished by their opaque whiteness. Now, if these two alkaloids, quinidine and cinchonidine, be exposed to heat in the same manner as quinine and cinchonine above referred to, they will offer the same results; that is, they will severally be transformed into isomeric bases; and, what is remarkable, these bases are identical, the one with quinicine and the other with cinchonicine; so that, of the four original alkaloids, quinine and quinidine are changed into quinicine, and cinchonine and cinchonidine into cinchonicine.

The relation of these six alkaloids to one another in reference to polarized light is remarkable. Of the three isomeric alkaloids, quinine, quinidine, and quinicine, the quinine deviates to the right, the quinidine to the left, and both considerably, while the quinicine deviates to the right, but very feebly; and the same thing exactly is true of cinchonine, cinchonidine, and cinchonicine, which are also isomeric.

Commercial *quinoïdine*, or the substance left after the crystallization of sulphate of quinia, purified by solution and precipitation, consists of the alkaloids mixed with a large proportion of resinous and colouring matters, into which the salts of the alkaloids have been transformed. This change takes place either by artificial heat or in the sun, and therefore results both in the process of preparing sulphate of quinia, and during the drying of the fresh barks by sunlight, or their subsequent exposure to the same influence. (*Journ. de Pharm.*, 3*e sér.*, xxiv. 161)—*Note to the tenth edition.*

bitter, resembling exactly that of yellow bark. It crystallizes in crusts of a mammillated form, and opaque or semitransparent. The salt is with difficulty obtained free from colour, and only by employing the ingredients in a state of extreme purity. (*Ann. de Chim. et de Phys.*, Juillet, 1829.)*

Kinovic Acid. This is white, uncrystallizable, almost insoluble in water, but readily dissolved by alcohol and ether. It is very bitter, and, as it is asserted to have no febrifuge virtues, may on this account mislead the judgment in relation to the activity of the bark in which it may be found. It consists of carbon, hydrogen, and oxygen; its formula being $C_{12}H_9O_3$. It forms salts with the acids; and a solution of kinovate of magnesia precipitates solutions of acetate of lead, bichloride of mercury, and the salts of cinchonia. Winckler gives as a certain test of its presence in any bark the sulphate of copper, which is indifferent to infusions of bark containing none of this principle, but discovers the smallest proportion of it by producing a dirty-green colour, soon followed by the deposition of a fine similarly coloured powder. This is kinovate of copper, and has a very bitter and metallic taste. (See *Am. Journ. of Pharm.*, xxv. 343.)

Of the relations of bark to the several solvents employed in pharmacy we shall speak hereafter, under the head of its infusion, decoction, and tincture; where we shall also have an opportunity of mentioning some of the more prominent substances which afford precipitates with its liquid preparations. It is sufficient at present to state, that all the substances which precipitate the infusion of bark do not by any means necessarily affect its virtues; as it contains several inert ingredients which form insoluble compounds with bodies that do not disturb its active principles. As tannic acid forms with the alkaloids compounds insoluble in water, it is desirable that substances containing this acid, in a free state, should not be prescribed in connexion with the infusion or decoction of bark; for, though these insoluble tannates might be found efficacious if administered, yet, being precipitated from the liquid, they would be apt to be thrown away as dregs, or at any rate would communicate, if agitated, an unpleasant turbidness.

It is evident, from what has been said, that an infusion of bark, on account of the tannin-like principle which it contains, may precipitate gelatin, tartar emetic, and the salts of iron, without having a particle of cinchonia, quinia, or other alkaloid in its composition; and that consequently any inference as to its value, drawn from these chemical properties, would be fallacious; but, as the active principles are thrown down by the tannic acid of galls, no bark can be considered good which does not afford a precipitate with the infusion of this substance.

It is impossible to determine, with accuracy, the relative proportion of the active ingredients in the different varieties of cinchona; as the quantity is by no means uniform in different specimens of the same variety. The results of the most recent experiments have been already stated under the head of the several varieties of bark described. But it is highly important, in relation to any particular sample of bark, to be able to ascertain its medicinal efficiency,

* When kinic acid is mixed with sulphuric acid and deutoxide of manganese, and distilled, a neutral substance called *kinoïle* or *kinone* is obtained, in crystalline needles, of a beautiful golden yellow colour and high lustre, fusible and volatilizable without change, and having a peculiar odour. The production of this substance, when a concentrated decoction of a bark is distilled with half its weight of sulphuric acid and deutoxide of manganese, has been proposed as a test of the presence of kinic acid in the bark, and consequently of its belonging to the cinchona barks. If there is the least quantity of that acid, the first portion of liquid distilled will have a yellow colour and the odour of kinone, and will become bright green on the addition of chlorine water. (*Philos. Mag.*, xxvi. 198.)

which is measured by the quantity of the peculiar cinchona alkaloids it may contain. The following is Winckler's process, which he prefers to all others. In determining the value of a large quantity of bark, it is necessary first to ascertain whether it may not consist of more than one variety, and if it do, to assort it, and act on each kind separately. The pieces are to be reduced to a fine powder, of which 1000 grains are to be digested with 6 ounces of alcohol of 80 per cent., by means of a water-bath, until completely exhausted. The tincture, when cold, is to be strained through thin but close linen; and the residue to be again digested with 3 ounces of alcohol and strained as before. The residue now obtained is to be once more treated in like manner with alcohol. The tinctures are then to be united, filtered, and treated, at common temperatures, with a mixture of equal parts of fresh slaked lime and crude well-burnt animal charcoal, of which about 500 grains will be required. The mixture is to be frequently shaken, and the maceration to be continued until the supernatant liquid is rendered colourless. In most of the genuine barks the decolorization is soon effected; but in those containing kinovic acid it is imperfect. The decolorized liquid is to be separated, and the residue to be repeatedly shaken with small quantities of alcohol, washed on a filter with the same liquor, and dried. The alcoholic liquids are to be mixed, and the alcohol distilled off. The whole of the alkaloids is contained in the residue, with a peculiar fatty matter, cinchonic red, and any kinovic acid which may have existed in the bark. To remove these, the matter is to be transferred to a small evaporating basin from the distilling vessel, which is to be washed with a little water acidulated with sulphuric acid, and the liquid thus obtained to be added to the rest. A slight excess of sulphuric acid is now to be dropped into the mixture, which is to be heated, allowed to cool, and then filtered, so as to remove the precipitated kinovic acid and other impurities. From the filtered acidulated solution, the alkaloids are to be precipitated by a slight excess of ammonia, and the mixture evaporated by a gentle heat to dryness. The sulphate of ammonia is to be removed from the residue by a small quantity of very cold water, and the residual alkaloid matter dried and weighed. Though not absolutely pure, it is sufficiently so for the purposes of the investigation.* (*Am. Journ. of Pharm.*, xxv. 343.) Winckler states

* M. Rabourdin has proposed chloroform as an agent for testing the alkaloid richness of barks. The following is his method, applied to the Calisaya. Five drachms of the powder, previously passed through a fine hair sieve, are to be exhausted by water, acidulated with hydrochloric acid (2 drachms of acid to a pound of water), in a percolation apparatus, the liquid being added until it passes colourless and tasteless. Five or six ounces of liquid are thus obtained, to which a drachm and a half of caustic potassa and five drachms of chloroform are to be added. These are to be agitated for a short time, and then allowed to stand. A dense whitish deposit forms, consisting of the alkaloids and chloroform. Sometimes the separation is complete and effected in an instant, leaving a red transparent liquid floating on the surface, which is to be immediately poured off. The chloroformic solution is then washed with water, put into a capsule, and allowed to evaporate. The alkaloids remain behind in a pure state.

Red bark is to be treated as the Calisaya; but for the pale or cinchonia barks the process is to be carried further. The matter left after the evaporation of the chloroform contains cinchonic red as well as cinchonia. It is to be treated with water acidulated with hydrochloric acid, which dissolves all the alkaloid, and a portion of the cinchonic red. The liquid is to be filtered, and solution of ammonia diluted with 15 or 20 parts of water, added drop by drop, with constant stirring, until a white cloud appears which is not removed by the agitation. The cinchonic red is thus precipitated without the alkaloid. It is easy to know when to stop this part of the process; as the cinchonic red is precipitated in reddish-brown flakes, the cinchonia in white curdled flakes. The liquid is now to be filtered, the filter washed with a little distilled water, and the united liquors precipitated by an excess of ammonia. The precipitate is the pure alkaloid. (See *Am. Journ. of Pharm.*, xxiii. 249.)

that the barks will yield to the manufacturer quite as much as is obtained in this way, and generally from one-eighth to one-quarter of one per cent. more, in consequence of the loss in working being less on a large scale.

The quantity of alkaloid matter obtained by the above process will measure the efficacy of the bark; for all the organic alkaline principles contained in it are efficient as medicines, and in all probability in a nearly equal degree. But for manufacturing purposes, it is necessary to push the investigation further, and ascertain the proportion of the several alkaloids in the mixture. This is most conveniently done by means of ether. Cinchonia is scarcely soluble in ether, quinidia is soluble in small proportion, quinia is freely soluble. When, therefore, a mixture of these alkaloids is treated with that menstruum, quinia and quinidia are dissolved, and cinchonia left. The two former may be separated by allowing the ethereal solution to evaporate. Quinidia crystallizes from the solution, and quinia is obtained uncrystallized as the last product of the evaporation of the ether.*

The Edinburgh Pharmacopœia gives the following mode of testing the value of yellow bark. "A filtered decoction of 100 grains in two fluidounces of distilled water gives, with a fluidounce of concentrated solution of carbonate of soda, a precipitate, which, when heated in the fluid, becomes a fused mass, weighing when cold two grains or more, and easily soluble in solution of oxalic acid."

From the most recent and carefully conducted experiments, it appears that the best officinal yellow Calisaya bark, the finest red bark, and the finest fibrous Carthagena bark from Pitaya, are about equal in their amount of alkaloids, each containing from 3 to 4 per cent.; while between these and the barks of lowest value there is every grade of productiveness, down to a mere trace of alkaline matter.

Medical Properties and Uses.

This valuable remedy was unknown to the civilized world till about the middle of the seventeenth century; though the natives of Peru are generally supposed to have been long previously acquainted with its febrifuge powers. Humboldt, however, is of a different opinion. In his Memoir on the Cin-

* Mr. Robert Howard employs the following method of ascertaining the presence or absence of these alkaloids severally in any mixture of their sulphates, founded on the fact that ten grains of sulphate of quinia dissolve in sixty drops of ether, but only one grain of sulphate of quinidia. Ten grains of the salt are put into a strong test tube, ten drops of dilute sulphuric acid (one of acid and five of water) with fifteen drops of water are added, and a moderate heat applied till the salt is dissolved. When the solution has quite cooled, sixty drops of officinal ether with twenty of spirit of ammonia are added, and the mixture is well shaken, the tube being closed by the thumb. After this the tube is closely stopped with a well-fitting cork, and gently shaken from time to time. If the salt contain only quinia, or not more than 10 per cent. of quinidia, it will be completely dissolved, while, at the surface of contact of the two clear liquids, only mechanical impurities will be seen. After some time the layer of ether becomes gelatinous, and then no further observation can be made. Ten grains of the salt examined may contain one grain of quinidia, and yet be completely dissolved by the ether and ammonia; but in this case the quinidia will soon begin to crystallize in the layer of ether. The last trace of quinidia may be detected by employing, instead of ordinary ether, the same fluid previously saturated with quinidia, in which case all the quinidia must remain undissolved. It is necessary, in the last experiment, to observe, after the shaking, whether or not all has dissolved; for, owing to the great tendency of quinidia to crystallize, it may again separate, and thus become a source of error. If more than a tenth of quinidia, or if cinchonia be present in the salt, an insoluble precipitate will be seen between the layers of the two fluids. If it be quinidia, it will be dissolved on the addition of proportionately more ether; while, if cinchonia, it will remain unaffected. (*Pharm. Journ. and Trans.*, xi. 394.)

chona forests, he states that it is unknown as a remedy to the Indians inhabiting the country where it grows; and, as these people adhere pertinaciously to the habits of their ancestors, he concludes that it never was employed by them. They have generally the most violent prejudices against it, considering it poisonous, and in the treatment of fever prefer the milder indigenous remedies. Humboldt is disposed to ascribe the discovery of the febrifuge powers of the bark to the Jesuits, who were sent to Peru as missionaries. As bitters had been chiefly relied on in the treatment of intermittent fevers, and as bitterness was observed to be a predominant property in the bark of certain trees which were felled in clearing the forests, the missionaries were naturally led to give it a trial in the same complaint. They accordingly administered an infusion of the bark in the tertian ague, then prevalent in Peru, and soon ascertained its extraordinary powers. A tradition to this effect is said by Humboldt to be current at Loxa. Ruiz and Pavon, however, ascribe the discovery to the Indians; and Tschudi states, in his Travels in Peru (*Am. ed.*, ii. 280), that the inhabitants of the Peruvian forests drink an infusion of the green bark as a remedy in intermittent fever.* The Countess of Cinchon, wife of the Viceroy of Peru, having in her own person experienced the beneficial effects of the bark, is said, on her return to Spain in the year 1640, to have first introduced the remedy into Europe. Hence the name of *pulvis Commitissæ*, by which it was first known. After its introduction, it was distributed and sold by the Jesuits, who are said to have obtained for it the price of its weight in silver. From this circumstance it was called *Jesuits' powder*, a title which it long retained. It had acquired some reputation in England so early as the year 1658, but, from its high price, and from the prejudice excited against it, was at first little used. At this early period, however, its origin and nature do not seem to have been generally known; for we are told that Sir John Talbot (Sir Robert Talbor, *Pereira*), an Englishman, having employed it with great success in France, in the treatment of intermittents, under the name of the English powder, at length, in the year 1679, sold the secret of its origin and preparation to Louis XIV., by whom it was divulged.

When taken into the stomach, bark usually excites in a short time a sense of warmth in the epigastrium, which often diffuses itself over the abdomen and even the breast, and is sometimes attended with considerable gastric and intestinal irritation. Nausea and vomiting are sometimes produced, especially if the stomach was previously in an inflamed or irritated state. Purging, moreover, is not an unfrequent attendant upon its action. After some time has elapsed, the circulation often experiences its influence, as exhibited in the somewhat increased frequency of pulse; and, if the dose be repeated, the whole system becomes more or less affected, and all the functions undergo a moderate degree of excitement. Its action upon the nervous system is often evinced by a sense of tension or fulness or slight pain in the head, singing in the ears, and partial deafness, which are always experienced by many individuals when brought completely under its influence. The effects above mentioned entitle bark to a place among the tonics, and it is usually ranked at the very head of this class of medicines. But, besides the mere excitation of the ordinary functions of health, it produces other effects upon the system, which must be considered peculiar, and independent of its mere tonic operation. The power by which, when administered in the intervals between the paroxysms of intermittent disorders, it interrupts the

* Tschudi also observes that he has found the fresh bark more efficacious than the dried; as, in less than half the usual dose, it not only effects cures in a short time, but insures the patient against the return of the disease.

progress of the disease, is something more than what is usually understood by the tonic property; for no other substance belonging to the class, however powerful or permanent may be the excitement which it produces, exercises a control over intermittents at all comparable to that of the medicine under consideration. As it is probable that, in the intervals of these complaints, a train of morbid actions is going on out of our sight, within the recesses of the nervous system; so it is also probable that bark produces, in the same system, an action equally mysterious, which supersedes that of the malady, and thus accomplishes the restoration of the patient. From the possession both of the tonic, and of the *anti-intermittent* property, if we may be allowed so to designate it, bark is capable of being usefully applied in the treatment of numerous diseases.

It may usually be employed with benefit in all morbid conditions of the system, whatever may be the peculiar modifications, in which a permanent corroborant effect is desirable, provided the stomach be in a proper state for its reception. In low or typhoid forms of disease, in which either no inflammation exists, or that which does exist has been moderated by proper measures, or has passed into the suppurative or the gangrenous stage, this remedy is often of the greatest advantage in supporting the system till the morbid action ceases. Hence its use in the latter stages of typhus gravior; in malignant scarlatina, measles, and small-pox; in carbuncle and gangrenous erysipelas; and in all cases in which the system is exhausted under large purulent discharges, and the tendency of the affection is towards recovery. As a tonic, bark is also advantageously employed in chronic diseases connected with debility; as, for example, in scrofula, dropsy, passive hemorrhages, certain forms of dyspepsia, obstinate cutaneous affections, amenorrhœa, chorea, hysteria; in fact, whenever a corroborant influence is desired, and no contra-indicating symptoms exist. But in all these cases it greatly behooves the physician to examine well the condition of the system, and, before resorting to the tonic, to ascertain the real existence of an enfeebled condition of the functions, and the absence of such local irritations or inflammations, especially of the stomach or bowels, as would be likely to be aggravated by its use. In doubtful cases, we have been in the habit of considering the occurrence of profuse sweating during sleep as affording an indication for its use, and under these circumstances, have prescribed it very advantageously, in the form of sulphate of quinia, in acute rheumatism, and in the advanced stages of protracted fevers.

But it is in the cure of intermittent diseases that bark displays its most extraordinary powers. It was originally introduced into notice as a remedy in fever and ague, and the reputation which it acquired at an early period it has ever since retained. Very few cases of this disease will be found to resist the judicious use of bark, or some one of its preparations. This is not the place to speak of the precise circumstances under which it is best administered. It will be sufficient to say that physicians generally concur in recommending its early employment, in divided doses, to the extent of one or two ounces, during the intermission, and the repetition of this plan till the disease is subdued, or the remedy is found insufficient for its cure. Other intermittent diseases have been found to yield with almost equal certainty to the remedy, particularly those of a neuralgic character. Hemicrania and violent pains in the eyes, face, and other parts of the body, occurring periodically, are often almost immediately relieved by the use of bark. Some cases of epilepsy, in which the convulsions recurred at regular intervals, have also been cured by it; and even the hectic intermittent is frequently arrested, though, as the cause still generally continues to operate, the relief is too often only tempo-

rary. Diarrhœa and dysentery sometimes put on the intermittent form, especially in miasmatic districts; and under these circumstances may often be cured by bark. Nor is it necessary that, in the various diseases which have been mentioned, the intermission should always be complete, in order to justify a resort to the remedy. Remittent fevers, in which the remission is very decided, not unfrequently yield to the use of bark, if preceded by proper depleting measures. But, as a general rule, the less of the diseased action there is in the interval, the better is the chance of success.

Some observations are requisite as to the choice of the bark, and the forms of administration. In the treatment of intermittents, either the best red or the yellow (Calisaya) bark is decidedly preferable to the pale. The pale bark may, in its finest forms, be superior for the purposes of a general tonic; as it is less liable to offend the stomach, and perhaps to irritate the bowels.

Where the object is to obtain the full influence of bark, it may in some instances be advisable to administer it in substance. We are not absolutely certain that the alkaloids are the only active ingredients; and, even supposing them to be so, we are equally uncertain whether they may not be somewhat modified in their properties, even by the therapeutically inert principles with which they are associated. In fact, bark in substance has been repeatedly known to cure intermittents when sulphate of quinia has failed. It is best administered diffused in water or some aromatic infusion. Experience has proved that its efficacy in intermittents is often greatly promoted by admixture with other substances. A mixture of powdered bark, Virginia snake-root, and carbonate of soda, was at one time highly esteemed in this city; and another, consisting of bark, confection of opium, lemon-juice, and port wine, has in our own experience, and that of some of our friends, proved highly efficacious in some obstinate cases of fever and ague.*

But, notwithstanding the supposed superior efficacy of the bark in substance, in the same relative dose, it is in the great majority of instances sufficient to resort to some one of its preparations; and in many cases we are compelled to this resort by the inability of the stomach to support the powder, or the unwillingness of the patient to encounter its disagreeable taste. The best substitutes, in intermittent diseases, are the sulphates of its alkaloids. Sulphate of quinia has until recently been used almost to the exclusion of the others; but sulphate of cinchonia is now considerably employed, and with nearly equal effect; and there is every reason to believe that sulphate of quinidia will be found scarcely less efficient than either. The advantage of these preparations is their facility of administration, and the possibility, by their employment, of introducing a large quantity of the active matter, with less risk of offending the stomach. (See *Quiniæ Sulphas.*)

Though the alkaloids possess the anti-intermittent power of bark, they have not been certainly ascertained to exert all the peculiar influence of that medicine as a tonic; but, as bark in powder can seldom be supported, by a delicate stomach, for a sufficient period to insure the necessary influence of the medicine in chronic disease, it is customary to resort, in this case, to some one of its preparations in which the alkaloids are extracted in connexion with the other principles; as the infusion, decoction, tincture, and extract. Each of these will be particularly treated of among the preparations. It is here only necessary to say that their use is mostly confined to chronic cases,

* The following are the formulæ for these mixtures: 1. ℞. Cinchon. Pulv. ℥ss; Serpentariæ pulv. ʒj; Sodæ Carbonat. ʒss. Misce et in pulveres quatuor divide, una tertiâ vel quartâ quâque horâ sumenda. 2. ℞. Cinchon. Rub. pulv. ℥ss; Confect. Opii ʒj; Suc. Limon. recentis fʒij; Vin. Rub. f℥iv. Misce. Tertia pars tertiâ quâque horâ sumenda.

or to those of a malignant character, as typhus gravior, &c., in which the whole virtues of the bark are desired, but the stomach is unable to bear the powder. Should bark or its preparations produce purging, as they occasionally do, they ought to be combined with a small portion of laudanum.*

It is sometimes desirable to introduce bark into the system by other avenues than the stomach; as it exercises its peculiar influence to whatever part it is applied. Injected into the rectum, in connexion with opium to prevent purging, it has been employed successfully in the cure of intermittents; and the use of bark jackets, made by quilting the powder between two pieces of flannel or muslin, and worn next the skin, and of bark baths made by infusing the medicine in water, has proved serviceable in cases of children. But the best preparation of bark for injection, or external use, is sulphate of quinia, which, thrown with a little laudanum into the rectum, or applied to a blistered surface denuded of the cuticle, produces on the system effects scarcely less decided than those which result from it when swallowed.

The medium dose of bark, as administered in intermittents, is a drachm, to be repeated more or less frequently according to circumstances. When given as a tonic in chronic complaints, the dose is usually smaller; from ten to thirty grains being sufficient to commence with.

Off. Prep. of Yellow Bark. Decoctum Cinchonæ Flavæ; Extractum Cinchonæ Flavæ; Infusum Cinchonæ Flavæ; Infus. Cinch. Flav. Spissatum; Quiniæ Sulphas; Tinctura Cinchonæ; Vinum Gentianæ.

Off. Prep. of Pale Bark. Decoct. Cinchonæ Pallidæ; Extract. Cinchonæ Pallidæ; Infusum Cinchonæ Pallidæ; Infus. Cinch. Pallid. Spissatum; Mistura Ferri Aromatica; Tinct. Cinchonæ Pallidæ; Tinct. Cinchonæ Comp.

Off. Prep. of Red Bark. Decoct. Cinchon. Rubræ; Extract. Cinchon. Rub.; Infus. Cinchon. Rub.; Infus. Cinchon. Comp.; Tinct. Cinchon. Comp. W.

CINNAMOMUM. *U. S., Lond., Dub.*

Cinnamon.

The bark of Cinnamomum Zeylanicum and of Cinnamomum aromaticum. *U. S.* Bark of Cinnamomum Zeylanicum. *Lond., Dub.*

Off. Syn. CINNAMOMUM. Bark of Cinnamomum Zeylanicum. *Cinnamon.*—CASSIÆ CORTEX. Bark of Cinnamomum Cassia. *Cassia Bark. Ed.*

Cinnamon.—Canelle, *Fr.;* Brauner Canel, Zimmt, *Germ.;* Canella, *Ital.;* Canela, *Span.;* Kurundu, *Cingalese;* Karua puttay, *Tamul.*

Cassia.—Cassia lignea; Casse, *Fr.;* Cassienzimmt, *Germ.;* Cannellina, *Ital.;* Casia, *Span.*

The U. S. Pharmacopœia embraces, under the title of cinnamon, not only the bark of that name obtained from the island of Ceylon, but also the commercial cassia, which is imported from China; and as the two products, though very different in price, and somewhat in flavour, possess identical medical properties, and are used for the same purposes, there seems to be no necessity for giving them distinct officinal designations. Indeed, the barks of all the species of the genus Cinnamomum, possessing analogous properties, are as much entitled to the common name of cinnamon as those of the Cinchonas have to the name of cinchona, and the juice of different species of Aloe to

* Mr. Alfred B. Taylor, of Philadelphia, prepares a fluid extract of bark, by first forming a tincture with diluted alcohol by means of percolation, evaporating the tincture sufficiently, and incorporating the residual liquid with sugar. From 8 ounces of Calisaya bark he prepares 4 pints of tincture, which he evaporates to 9 fluidounces, and then adds 14 ounces of sugar. A fluidrachm represents about half a drachm of the bark. (*Am. Journ. of Pharm.*, xxiii. 219.)

that of aloes. Varieties may be sufficiently distinguished by an appropriate epithet. Both *cinnamomum* and *cassia* were terms employed by the ancients, but whether exactly as now understood, it is impossible to determine. The term *cassia*, or *cassia lignea*, has been generally used in modern times to designate the coarser barks analogous to cinnamon. It was probably first applied to the barks from Malabar, and afterwards extended to those of China and other parts of Eastern Asia. It has been customary to ascribe *cassia lignea* to the *Laurus Cassia* of Linnæus; but the specific character given by that botanist was so indefinite, and based on such imperfect information, that the species has been almost unanimously abandoned by botanists. The fact appears to be, that the barks sold as cinnamon and cassia in different parts of the world are derived from various species of Cinnamomum. Dr. Wight, who was commissioned by the British Indian Government to inquire into the botanical source of "the common cassia bark of the markets of the world," expresses his belief, that the list of plants yielding this product extends to nearly every species of the genus, including not less than six plants on the Malabar coast and in Ceylon, and nearly twice as many more in the Eastern part of Asia, and the islands of the Eastern Archipelago. (*Madras Journ. of Literat. and Sci.*, 1839, No. 22.) We shall describe only the two species recognised in the U. S. Pharmacopœia.

Cinnamomum. *Sex. Syst.* Enneandria Monogynia. — *Nat. Ord.* Lauraceæ. *Gen. Ch. Flowers* hermaphrodite or polygamous, panicled or fascicled, naked. *Calyx* six-cleft, with the limb deciduous. *Fertile stamens* nine, in three rows; the inner three with two sessile glands at the base; *anthers* four-celled, the three inner turned outwards. Three capitate *abortive stamens* next the centre. *Fruit* seated in a cup-like calyx. *Leaves* ribbed. *Leaf buds* not scaly. (*Lindley.*)

1. *Cinnamomum Zeylanicum.* Nees, *Laurineæ*, 52; Lindley, *Med. Flor.* 329; Hayne, *Darstel. und Beschreib.* &c. xii. 263.—*Laurus Cinnamomum.* Linn. This is a tree about twenty or thirty feet high, with a trunk from twelve to eighteen inches in diameter, and covered with a thick, scabrous bark. The branches are numerous, strong, horizontal and declining; and the young shoots are beautifully speckled with dark green and light orange colours. The leaves are opposite for the most part, coriaceous, entire, ovate or ovate-oblong, obtusely pointed, and three-nerved, with the lateral nerves vanishing as they approach the point. There are also two less obvious nerves, one on each side, arising from the base, proceeding towards the border of the leaf, and then quickly vanishing. The footstalks are short and slightly channeled, and, together with the extreme twigs, are smooth and without the least appearance of down. In one variety, the leaves are very broad, and somewhat cordate. When mature, they are of a shining green upon their upper surface, and lighter-coloured beneath. The flowers are small, white, and arranged in axillary and terminal panicles. The fruit is an oval berry, which adheres like the acorn to the receptacle, is larger than the black currant, and when ripe has a bluish-brown surface diversified with numerous white spots.

The tree emits no smell perceptible at any distance. The bark of the root has the odour of cinnamon with the pungency of camphor, and yields this principle upon distillation. The leaves have a spicy odour when rubbed, and a hot taste. The petiole has the flavour of cinnamon. It is a singular fact, that the odour of the flowers is to people in general disagreeable, being compared by some to the scent exhaled from newly sawn bones. The fruit has a terebinthinate odour when opened, and a taste in some degree like that of juniper berries. A fatty substance, called cinnamon-suet, is obtained from it when ripe, by bruising and then boiling it in water, and removing the

oleaginous matter which rises to the surface, and concretes upon cooling. It is the prepared bark that constitutes the genuine cinnamon.

This species is a native of Ceylon, where it has long been cultivated for the sake of its bark. It is said also to be a native of the Malabar Coast, and has at various periods been introduced into Java, the Isle of France, Bourbon, the Cape de Verds, Brazil, Cayenne, several of the West India Islands, and Egypt; and in some of these places is at this time highly productive. This is particularly the case in Cayenne, where the plant was flourishing so early as 1755. It is exceedingly influenced, as regards the aromatic character of its bark, by the circumstances of soil, climate, and mode of culture. Thus, we are told by Marshall that in Ceylon, beyond the limits of Negombo and Matura, in the western and southern aspect of the island, the bark is never of good quality, being greatly deficient in the aromatic flavour of the cinnamon; and that even within these limits it is of unequal value, from the various influence of exposure, soil, shade, and other circumstances.

2. *C. aromaticum.* Nees, *Laurineæ*, 52; Lindley, *Flor. Med.* 330.—*C. Cassia.* Blume, Ed. Ph.; Hayne, *Darstel. und Beschreib. &c.* xii. 23.—*Laurus Cassia.* Aiton, *Hort. Kew.* ii. 427.—Not *Laurus Cassia* of Linn. This is of about the same magnitude as the former species, and like it has nearly opposite, shortly petiolate, coriaceous, entire leaves, of a shining green upon the upper surface, lighter coloured beneath, and furnished with three nerves, of which the two lateral vanish towards the point. The leaves, however, differ in being oblong-lanceolate and pointed, and in exhibiting, under the microscope, a very fine down upon the under surface. The footstalks and extreme twigs are also downy. The flowers are in narrow, silky panicles. The plant grows in China, Sumatra, and other parts of Eastern Asia, and is said to be cultivated in Java. It is believed to be the species which furnishes, wholly or in part, the Chinese cinnamon or cassia brought from Canton, and is supposed to be the source of the *cassia buds.*

Besides the two species above described, others have been thought to contribute to the cinnamon and cassia found in commerce. The opinion of Dr. Wight has been already stated. *C. Loureirii* of Nees, growing in the mountains of Cochin-china towards Laos, and in Japan, affords, according to Loureiro, a cinnamon of which the finest kind is superior to that of Ceylon. *C. nitidum*, growing in Ceylon, Java, and upon the continent of India, is said to have been the chief source of the drug, known formerly by the name of *Folia Malabathri*, and consisting of the leaves of different species of Cinnamomum mixed together. The leaves of *C. Tamala* of Hindostan have been sold under the same name. *C. Culilawan* of the Moluccas yields the aromatic bark called culilawan, noticed in the *Appendix;* and similar barks are obtained from another species of the same region, denominated *C. rubrum*, and from *C. Sintoc* of Java.

Culture, Collection, Commerce, &c. Our remarks under this head will first be directed to the cinnamon of Ceylon, in relation to which we have more precise information than concerning the aromatic obtained from other sources. The bark was originally collected exclusively from the tree in a wild state; but the Dutch introduced the practice of cultivating it, which has been continued since the British came into possession of the Island. The principal cinnamon gardens are in the vicinity of Columbo. The seeds are planted in a prepared soil at certain distances; and, as four or five are placed in a spot, the plants usually grow in clusters like the hazel bush. In favourable situations they attain the height of five or six feet in six or seven years, and a healthy bush will then afford two or three shoots fit for peeling; and every second year afterwards will afford from four to seven shoots in a good soil.

The cinnamon harvest commences in May, and continues till late in October. The first object is to select shoots proper for decortication, and those are seldom cut which are less than half an inch, or more than two or three inches in diameter. The bark is divided by longitudinal incisions, of which two are made in the smaller shoots, several in the larger, and is then removed in strips by means of a suitable instrument. The pieces are next collected in bundles, and allowed to remain in this state for a short time, so as to undergo a degree of fermentation, which facilitates the separation of the epidermis. This, with the green matter beneath it, is removed by placing the strip of bark upon a convex piece of wood, and scraping its external surface with a curved knife. The bark now dries and contracts, assuming the appearance of a quill. The peeler introduces the smaller tubes into the larger, thus forming a congeries of quills which is about forty inches long. When sufficiently dry, these cylinders are collected into bundles weighing about thirty pounds, and bound together by pieces of split bamboo. The commerce in Ceylon cinnamon was formerly monopolized by the East India Company; but the cultivation is now unrestricted, and the bark may be freely exported upon the payment of a fixed duty. It is assorted in the island into three qualities, distinguished by the designations of *first*, *second*, and *third*. The inferior kinds, which are of insufficient value to pay the duty, are used for the preparation of oil of cinnamon.

Immense quantities of cinnamon are exported from China, the finest of which is little inferior to that of Ceylon, though the mass of it is much coarser. It passes in commerce under the name of *cassia*, and is said by Mr. Reeves to be brought to Canton from the province of Kwangse, where the tree producing it grows very abundantly. (*Trans. Medico-Bot. Soc.*, 1828, p. 26.) It has already been stated that this tree is supposed to be the *Cinnamomum aromaticum;* but we have no positive proof of the fact. Travellers inform us that cinnamon is also collected in Cochin-china; but that the best of it is monopolized by the sovereign of the country. It is supposed to be obtained from the *Cinnamomum Loureirii* of Nees, the *Laurus Cinnamomum* of Loureiro. According to Siebold, the bark of the large branches is of inferior quality and is rejected; that from the smallest branches resembles the Ceylon cinnamon in thickness, but has a very pungent taste and smell, and is little esteemed; while the intermediate branches yield an excellent bark, about a line in thickness, which is even more highly valued than the cinnamon of Ceylon, and yields a sweeter and less pungent oil. (*Annal. der Pharm.*, xx. 280.) Cinnamon of good quality is said to be collected in Java, and considerable quantities of inferior quality have been thrown into commerce, as *cassia lignea*, from the Malabar coast. Manilla and the Isle of France are also mentioned as sources whence this drug is supplied. Little, however, reaches the United States from these places.

Cayenne, and several of the West India Islands, yield to commerce considerable quantities of cinnamon of various qualities. That of Cayenne is of two kinds, one of which closely resembles, though it does not quite equal, the aromatic of Ceylon; the other resembles the Chinese. The former is supposed to be derived from plants propagated from a Ceylonese stock, the latter from those which have sprung from a tree introduced from Sumatra.

By far the greater proportion of cinnamon brought to this country is imported from China. It is entered as *cassia* at the custom house, while the same article brought from other sources is almost uniformly entered as cinnamon. Much of it is afterwards exported.

From what source the ancients derived their cinnamon and cassia is not certainly known. Neither the plants nor their localities, as described by Dioscorides, Pliny, and Theophrastus, correspond precisely with our present

knowledge; but in this respect much allowance must be made for the inaccurate geography of the ancients. It is not improbable that the Arabian navigators, at a very early period, conveyed this spice within the limits of Phœnician and Grecian, and subsequently of Roman commerce.

Properties. *Ceylon cinnamon* is in long cylindrical fasciculi, composed of numerous quills, the larger enclosing the smaller. In the original sticks, which are somewhat more than three feet in length, two or three fasciculi are neatly joined at the end, so as to appear as if the whole were one continuous piece. The finest is of a light brownish-yellow colour, almost as thin as paper, smooth, often somewhat shining, pliable to a considerable extent, with a splintery fracture when broken. It has a pleasant fragrant odour, and a warm, aromatic, pungent, sweetish, slightly astringent, and highly agreeable taste. When distilled it affords but a small quantity of essential oil, which, however, has an exceedingly grateful flavour. It is brought to this country from England; but is very costly, and is not generally kept in the shops. The inferior sorts are browner, thicker, less splintery, and of a less agreeable flavour, and are little if at all superior to the best Chinese. The finer variety of *Cayenne cinnamon* approaches in character to that above described, but is paler and in thicker pieces, being usually collected from older branches. That which is gathered very young is scarcely distinguishable from the cinnamon of Ceylon. It is not recognised in our markets as a distinct variety.

Chinese cinnamon, or *cassia*, is in tubes from the eighth of an inch to an inch in diameter, usually single, sometimes double, but very rarely more than double. In some instances the bark is rolled very much upon itself, in others is not even completely quilled, forming segments more or less extensive of a hollow cylinder. It is of a redder or darker colour than the finest Ceylon cinnamon, thicker, rougher, denser, and breaks with a shorter fracture. It has a stronger, more pungent and astringent, but less sweet and grateful taste; and, though of a similar odour, is less agreeably fragrant. It is the kind almost universally kept in our shops. Of a similar character is the cinnamon imported directly from various parts of the East Indies. But under the name of cassia have also been brought to us very inferior kinds of cinnamon, collected from the trunks or large branches of the trees, or injured by want of care in keeping, or perhaps derived from inferior species. It is said that cinnamon from which the oil has been distilled, is sometimes fraudulently mingled with the genuine. These inferior kinds are detected, independently of their greater thickness, and coarseness of fracture, by their deficiency in the peculiar sensible properties of the spice.

From an analysis made by Vauquelin, it appears that cinnamon contains a peculiar essential oil, tannin, mucilage, a colouring matter, an acid, and lignin. The tannin is of the variety which yields a greenish-black precipitate with the salts of iron. The oil obtained from the Cayenne cinnamon, he found to be more biting than that from the Ceylonese, and at the same time to be somewhat peppery. Bucholz found in 100 parts of *cassia lignea*, 0·8 of volatile oil, 4·0 of resin, 14·6 of gummy extractive (probably including tannin), 64·3 of lignin and bassorin, and 16·3 of water including loss. This aromatic yields its virtues wholly to alcohol, and less readily to water. At the temperature of boiling alcohol very little of the oil rises, and an extract prepared from the tincture retains, therefore, the aromatic properties. For an account of the essential oil, see *Oleum Cinnamomi.*

Medical Properties and Uses. Cinnamon is among the most grateful and efficient of the aromatics. It is warm and cordial to the stomach, carminative, astringent, and, like most other substances of this class, more powerful as a local than general stimulant. It is seldom prescribed alone, though,

when given in powder or infusion, it will sometimes allay nausea, check vomiting, and relieve flatulence. It is chiefly used as an adjuvant to other less pleasant medicines, and enters into a great number of officinal preparations. It is often employed in diarrhœa, in connexion with chalk and astringents. The dose of the powder is from ten grains to a scruple.

Cassia Buds. This spice consists of the calyx of one or more species of Cinnamomum, surrounding the young germ, and, as stated by Dr. Martius on the authority of the elder Nees, about one quarter of the normal size. It is produced in China; and Mr. Reeves states that great quantities of it are brought to Canton from the province which affords cassia. The species which yields it is in all probability the same with that which yields the bark, though it has been ascribed by Nees to *Cinnamomum Loureirii*. In favour of the former opinion is the statement of Dr. Christison, that *C. aromaticum*, cultivated in the hot-houses of Europe, bears a flower-bud which closely resembles the cassia-bud when at the same period of advancement. Cassia-buds have some resemblance to cloves, and are compared to small nails with round heads. The enclosed germen is sometimes removed, and they are then cup-shaped at top. They have a brown colour, with the flavour of cinnamon, and yield an essential oil upon distillation. Though little known in this country, they may be used for the same purposes as the bark.

Off. Prep. Acidum Sulphuricum Aromaticum; Aqua Cassiæ; Aqua Cinnamomi; Confectio Aromatica; Decoctum Hæmatoxyli; Electuarium Catechu; Infusum Catechu Comp.; Pulvis Aromaticus; Pulvis Catechu Compositus; Pulvis Cinnamomi Comp.; Pulvis Cretæ Comp.; Pulvis Kino Comp.; Spiritus Ammoniæ Aromaticus; Spiritus Cassiæ; Spiritus Cinnamomi; Spiritus Lavandulæ Comp.; Syrupus Rhei Aromaticus; Tinctura Cardamomi Comp.; Tinctura Cassiæ; Tinctura Catechu; Tinctura Cinnamomi; Tinctura Cinnamomi Comp.; Tinctura Quassiæ Comp.; Vinum Opii. W.

COCCULUS. *Ed.*

Cocculus Indicus.

Fruit of Anamirta Cocculus. *Ed.*

Coque du Levant, *Fr.;* Kokkelskörner, Fischkörner, *Germ.;* Galla di Levante, *Ital.*

The plant which produces cocculus Indicus was embraced by Linnæus, with several others, under the title of *Menispermum Cocculus*. These were referred by De Candolle to a new genus, denominated *Cocculus*. From this the particular species under consideration has been separated by Wight and Arnott, and erected into a distinct genus with the name of *Anamirta*.

ANAMIRTA. *Sex. Syst.* Dicœcia Dodecandria.—*Nat. Ord.* Menispermaceæ.

Gen. Ch. Flowers dicœcious. *Calyx* of six sepals in a double series, with two close-pressed bracteoles. *Corolla* none. MALE. Stamens united into a central column dilated at the apex. *Anthers* numerous, covering the whole globose apex of the column. FEMALE. *Flowers* unknown. *Drupes* one to three, one-celled, one-seeded. *Seed* globose, deeply excavated at the hilum. *Albumen* fleshy. *Cotyledons* very thin, diverging. (*Wight and Arnott.*)

Anamirta Cocculus. Wight and Arnott, *Flor. Penins. Ind. Orient.* i. 446; Lindley, *Flor. Med.* 371.—*Menispermum Cocculus*, Linn.—*Cocculus suberosus.* De Cand. *Prodrom.* i. 97. This is the only species. It is a climbing shrub, with a suberose or corky bark; thick, coriaceous, smooth, shining, roundish or cordate leaves, sometimes truncate at the base; and the female flowers in lateral compound racemes. It is a native of the Malabar coast, and of Eastern Insular and Continental India. The fruit is the officinal portion.

This plant was proved to be the source of cocculus Indicus by Roxburgh, who raised it from genuine seeds which he had received from Malabar. It is believed that other allied plants, bearing similar fruit, contribute to furnish the drug; and the *Cocculus Plukenetii* of Malabar, and *C. lacunosus* of Celebes and the Moluccas, are particularly designated by authors. It was known to the Arabian physicians, and for a long time was imported into Europe from the Levant, from which circumstance it was called *cocculus Levanticus*. It is now brought exclusively from the East Indies.

Properties, &c. Cocculus Indicus, as found in the shops, is roundish, somewhat kidney-shaped, about as large as a pea; having a thin, dry, blackish, wrinkled exterior coat, within which is a ligneous bivalvular shell, enclosing a whitish, oily, very bitter kernel. It is without smell, but has an intensely and permanently bitter taste. It bears some resemblance to the bay berry, but is not quite so large, and may be distinguished by the fact that in the cocculus Indicus the kernel never wholly fills the shell. When the fruit is kept long, the shell is sometimes almost empty. The Edinburgh College directs that "the kernels should fill at least two-thirds of the fruit." M. Boullay discovered in the seeds a peculiar bitter principle which he denominated *picrotoxin*. This is white, crystallizable in quadrangular prisms, soluble in 25 parts of boiling and 150 of cold water (*Glover*), and very soluble in alcohol and ether, but insoluble in the oils. Its composition is $C_{12}H_7O_5$. It is poisonous, and, given to strong dogs in the quantity of from five to ten grains, produces death, preceded by convulsions, which, according to Dr. R. M. Glover, are very similar in character to those produced by Flourens by section of the corpora quadrigemina and cerebellum; being attended with backward and rotatory movements, and tetanic spasms. It also greatly increases the animal heat. (*Ed. Monthly Journ. of Med. Sci.*, N. S., iii. 303.) To procure it, the watery extract of the seeds is triturated with pure magnesia, and then treated with hot alcohol, which dissolves the picrotoxin, and yields it upon evaporation. In this state, however, it is impure. To obtain it colourless it must be again dissolved in alcohol, and treated with animal charcoal. After filtration and due evaporation, it is deposited in the crystalline form. Besides picrotoxin, cocculus Indicus contains a large proportion of fixed oil, and other substances of less interest. The active principle above described is said to reside exclusively in the kernel. In the shell MM. Pelletier and Couerbe discovered two distinct principles, one alkaline and named *menispermin* (menispermia), the other identical with it in composition, but distinguishable by its want of alkalinity, its volatility, and its solubility and crystalline form, and denominated *paramenispermin*. They also found, in the same part, a new acid, which they called *hypopicrotoxic*. The picrotoxin of M. Boullay they believed to possess acid properties, and proposed for it the name of *picrotoxic acid*. (*Journ. de Pharm.*, xx. 122.)

Medical Properties, &c. Cocculus Indicus acts in the manner of the acrid narcotic poisons, but is never given internally. In India it is used to stupefy fishes in order that they may be caught; and it has been applied to the same purpose in Europe and this country. It is asserted that the fish thus taken are not poisonous. In Europe, it is added to malt liquors in order to give them bitterness and intoxicating properties; although the practice is forbidden by the law, in England, under heavy penalties. The powdered fruit, mixed with oil, is employed in the East Indies as a local application in obstinate cutaneous affections. An ointment made with the powder has been used in tinea capitis, and to destroy vermin in the hair. Picrotoxin has been successfully substituted by Dr. Jeager for the drug itself. Rubbed up with lard in the proportion of ten grains to the ounce, it usually effected cures of tinea

capitis in less than a month. A case is recorded by W. B. Thompson, of New York, in which death in a child six years old, preceded by tetanic spasms, and extremely contracted pupil, resulted from the application of a strong tincture of the fruit to the scalp. (*Med. Exam., N. S.*, viii. 227.)

Off. Prep. Unguentum Cocculi. W.

COCCUS. *U. S., Lond.*

Cochineal.

Coccus Cacti. *U. S., Lond.*

Off. Syn. COCCI. Coccus Cacti. *Ed.;* COCCUS CACTI. *Dub.*
Cochenille, *Fr., Germ.;* Cocciniglia, *Ital.;* Cochinilla, *Span.*

The Coccus is a genus of hemipterous insects, having the snout or rostrum in the breast, the antennæ filiform, and the posterior part of the abdomen furnished with bristles. The male has two erect wings, the female is wingless. The *C. Cacti* is characterized by its depressed, downy, transversely wrinkled body, its purplish abdomen, its short and black legs, and its subulate antennæ, which are about one-third of the length of the body. (*Rees's Cyclopædia.*) Another species, *C. Ilicis*, which inhabits a species of oak, is collected in the mountainous parts of the Morea, in Greece, and used as a dye-stuff in the East. (Landerer, *Pharm. Journ. and Trans.*, xi. 564.)

The Coccus Cacti is found wild in Mexico and the adjoining countries, inhabiting different species of Cactus and allied genera of plants; and is said to have been discovered also in some of the West India islands, and the southern parts of the United States. In Mexico, particularly in the provinces of Oaxaca and Guaxaca, it is an important object of culture. The Indians form plantations of the *nopal* (*Opuntia cochinillefera*), upon which the insect feeds and propagates. During the rainy season, a number of the females are preserved under cover upon the branches of the plant, and, after the cessation of the rains, are distributed upon the plants without. They perish quickly after having deposited their eggs. These, hatched by the heat of the sun, give origin to innumerable minute insects, which spread themselves over the plant. The males, of which, according to Mr. Ellis, the proportion is not greater than one to one hundred or two hundred females, being provided with wings and very active, approach and fecundate the latter. After this period, the females, which before moved about, attach themselves to the leaves, and increase rapidly in size; so that, in the end, their legs, antennæ, and proboscis are scarcely discoverable, and they appear more like excrescences on the plant than distinct animated beings. They are now gathered for use, by detaching them by means of a blunt knife, a quill, or a feather, a few being left to continue the race. They are destroyed either by dipping them enclosed in a bag into boiling water, or by the heat of a stove. In the former case they are subsequently dried in the sun. The males, which are much smaller than the full grown females, are not collected. It is said that of the wild insect there are six generations every year, furnishing an equal number of crops; but the domestic is collected only three times annually, the propagation being suspended during the rainy season, in consequence of its inability to support the inclemency of the weather. The insect has been taken from Mexico to the Canary Islands; and considerable quantities of cochineal have been delivered to commerce from the island of Teneriffe. The culture has also been successfully introduced into Java by the Dutch; and attempts have been made to introduce it into Spain, Corsica, and Algiers.

As kept in the shops, the finer cochineal, *grana fina* of Spanish commerce,

is in irregularly circular or oval, somewhat angular grains, about one-eighth of an inch in diameter, convex on one side, concave or flat on the other, and marked with several transverse wrinkles. Two varieties of this kind of cochineal are known to the druggist, distinguished by their external appearance. One is of a reddish-gray colour, formed by an intermixture of the dark colour of the insect with the whiteness of a powder by which it is almost covered, and with patches of a rosy tinge irregularly interspersed. From its diversified appearance, it is called by the Spaniards *cochinilla jaspeada*. It is the variety commonly kept in our shops. The other, *cochinilla renegrida*, or *grana nigra*, is dark coloured, almost black, with only a minute quantity of the whitish powder between the wrinkles. The two are distinguished in our markets by the names of *silver grains* and *black grains*. Some suppose the difference to arise from the mode of preparation; the gray cochineal consisting of the insects destroyed by a dry heat; the black, of those destroyed by hot water, which removes the external whitish powder. According to Mr. Faber, who derived his information from a merchant resident in the neighbourhood where the cochineal is collected, the silver grains consist of the impregnated female just before she has laid her eggs, the black of the female after the eggs have been laid and hatched. (*Am. Journ. of Pharm.*, xviii. 47.) There is little or no difference in their quality.

Another and much inferior variety is the *grana sylvestra* or wild cochineal, consisting partly of very small separate insects, partly of roundish or oval masses, which exhibit, under the microscope, minute and apparently new born insects, enclosed in a white or reddish cotton-like substance. It is scarcely known in our drug market.

Cochineal has a faint heavy odour, and a bitter slightly acidulous taste. Its powder is of a purplish carmine colour, tinging the saliva intensely red. According to Pelletier and Caventou, it consists of a peculiar colouring principle, a peculiar animal matter constituting the skeleton of the insect, stearin, olëin, an odorous fatty acid, and various salts. It was also analyzed by John, who called the colouring principle *cochinilin*. This is of a brilliant purple-red colour, unalterable in dry air, fusible at 122° F., very soluble in water, soluble in cold, and more so in boiling alcohol, insoluble in ether, and without nitrogen among its constituents. It is obtained by macerating cochineal in ether, and treating the residue with successive portions of boiling alcohol, which on cooling deposits a part of the cochinilin, and yields the remainder by spontaneous evaporation. It may be freed from a small proportion of adhering fatty matter, by dissolving it in alcohol of 40° Baumé, and then adding an equal quantity of sulphuric ether. The pure cochinilin is deposited in the course of a few days. The watery infusion of cochineal is of a violet-crimson colour, which is brightened by the acids, and deepened by the alkalies. The colouring matter is readily precipitated. The salts of zinc, bismuth, and nickel produce a lilac precipitate, and those of iron a dark purple approaching to black. The salts of tin, especially the nitrate and chloride, precipitate the colouring matter of a brilliant scarlet, and form the basis of those splendid scarlet and crimson dyes, which have rendered cochineal so valuable in the arts. With alumina the colouring matter forms the pigment called *lake*. The finest *lakes* are obtained by mixing the decoction of cochineal with freshly prepared gelatinous alumina. The pigment called *carmine* is the colouring matter of cochineal precipitated from the decoction by acids, the salts of tin, &c., or animal gelatin, and when properly made is of the most intense and brilliant scarlet.

Cochineal has been adulterated by causing certain heavy substances, such as powdered talc and carbonate of lead, by shaking in a bag or otherwise, to

adhere to the surface of the insects, and thus increase their weight. The fraud may be detected by the absence, under the microscope, of a woolly appearance which characterizes the white powder upon the surface of the unadulterated insect. Metallic lead, which is said frequently to exist in fine particles in the artificial coating, may be discovered by powdering the cochineal, and suspending it in water, when the metal remains behind. Grains of a substance artificially prepared to imitate the dried insect have been mixed with the genuine in France. A close inspection will serve to detect the difference. (*Journ. de Pharm.*, 3e *sér.*, ix. 110.)

Medical Properties, &c. Cochineal is supposed by some to possess anodyne properties, and has been highly recommended in hooping-cough and neuralgic affections. It is frequently associated, in prescription, with carbonate of potassa, especially in the treatment of hooping-cough. In pharmacy it is employed to colour tinctures and ointments. To infants with hooping-cough, cochineal in substance is given in the dose of about one-third of a grain three times a day. The dose of a tincture, prepared by macerating one part of the medicine in eight parts of diluted alcohol, is for an adult from twenty to thirty drops twice a day. In neuralgic paroxysms, Sauter gave half a tablespoonful, with the asserted effect of curing the disease.

Off. Prep. Syrupus Cocci; Tinctura Cardamomi Composita; Tinct. Cinchonæ Comp.; Tinct. Cocci Cacti; Tinct. Gentianæ Comp.; Tinct. Lavandulæ Comp.; Tinct. Quassiæ Comp.; Tinct. Serpentariæ. W.

COLCHICI RADIX. *U. S.*

Colchicum Root.

The Cormus of Colchicum autumnale. *U. S.*

Off. Syn. COLCHICI CORMUS. Colchicum autumnale. The recent and dried cormus of the wild herb. *Lond.;* COLCHICI CORMUS. The cormus of Colchicum autumnale. *Ed.;* COLCHICUM AUTUMNALE. The *cormus. Dub.*

COLCHICI SEMEN. *U. S., Lond.*

Colchicum Seed.

The seeds of Colchicum autumnale. *U. S., Lond.*

Off. Syn. COLCHICI SEMINA. *Seeds* of Colchicum autumnale. *Ed.;* COLCHICUM AUTUMNALE. The *seeds. Dub.*

Colchique, *Fr.;* Zeitlose, Herbst-Zeitlose, *Germ.;* Colchico, *Ital., Span.*

COLCHICUM. *Sex. Syst.* Hexandria Trigynia.—*Nat. Ord.* Melanthaceæ.

Gen. Ch. A *spathe. Corolla* six-parted, with a tube proceeding directly from the root. *Capsules* three, connected, inflated. *Willd.*

Colchicum autumnale. Willd. *Sp. Plant.* ii. 272; Woodv. *Med. Bot.* p. 759, t. 258. This species of Colchicum, often called *meadow-saffron*, is a perennial bulbous plant, the leaves of which appear in spring, and the flowers in autumn. Its manner of growth is peculiar, and deserves notice as connected in some measure with its medicinal efficacy. In the latter part of summer, a new bulb, or *cormus* as the part is now called, begins to form at the lateral inferior portion of the old one, which receives the young offshoot in its bosom, and embraces it half round. The new plant sends out fibres from its base, and is furnished with a radical spathe, which is cylindrical, tubular, cloven at top on one side, and half under ground. In September, from two to six flowers, of a lilac or pale purple colour, emerge from the

spathe, unaccompanied with leaves. The corolla consists of a tube five inches long, concealed for two-thirds of its length in the ground, and of a limb divided into six segments. The flowers perish by the end of October, and the rudiments of the fruit remain under ground till the following spring, when they rise upon a stem above the surface, in the form of a three-lobed, three-celled capsule. The leaves of the new plant appear at the same time; so that in fact they follow the flower instead of preceding it, as might be inferred from the order of the seasons in which they respectively show themselves. The leaves are radical, spear-shaped, erect, numerous, about five inches long, and one inch broad at the base. In the mean time, the new bulb has been increasing at the expense of the old one, which having performed its appointed office perishes; while the former, after attaining its full growth, sends forth shoots, and in its turn decays. The old bulb, in its second spring, and a little before it perishes, sometimes puts forth one or more small bulbs, which separate from the parent, and are supposed to be sources of new plants.

C. autumnale is a native of the temperate parts of Europe, where it grows wild in moist meadows. Attempts have been made to introduce its culture into this country, but with no great success; though small quantities of the bulb, of apparently good quality, have been brought into the market. The officinal portions are the bulb or cormus, and the seeds. The root, botanically speaking, consists of the fibres attached to the base of the bulb. The flowers possess similar virtues with the bulb and seeds.

1. Colchici Radix.

The medicinal virtue of the bulb depends much upon the season at which it is collected. Early in the spring, it is too young to have fully developed its peculiar properties; and late in the fall, it has become exhausted by the nourishment afforded to the new plant. The proper period for its collection is from the early part of June, when it has usually attained perfection, to the middle of August, when the offset appears.* It may be owing, in part, to this inequality at different seasons, that entirely opposite reports have been given of its powers. Krapf ate whole bulbs without inconvenience; Haller found the bulbs entirely void of taste and acrimony; and we are told that in Carniola the peasants use it as food with impunity in the autumn. On the other hand, there can be no doubt of its highly irritating and poisonous nature, when fully developed, under ordinary circumstances. Perhaps soil and climate may have some influence in modifying its character.

The bulb is often used in the fresh state in the countries where it grows; as it is apt to be injured in drying unless the process is carefully conducted. The usual plan is to cut the bulb, as soon after it has been dug up as possible, into thin transverse slices, which are spread out separately upon paper or perforated trays, and dried with a moderate heat. The reason for drying it quickly after removal from the ground, is that it otherwise begins to vegetate, and a change in its chemical nature takes place; and such is its retentiveness of life, that, if not cut in slices, it is liable to undergo a partial vegetation even during the drying process. Dr. Houlton recommends that the bulb should be stripped of its dry coating, carefully deprived of the bud or young bulb, and then dried whole. It is owing to the high vitality of the bud that the bulb is so apt to vegetate. Much loss of weight is sustained by exsiccation. Mr. Bainbridge

* Dr. Christison, however, has found the roots collected in April, though shrivelled and less abundant in starch than those gathered in July, to be even more bitter; and conjectures, therefore, that the common opinion of their superior efficacy at the latter season may not be well founded.

obtained only two pounds fifteen ounces of dried bulb from eight pounds of the fresh.

Properties. The recent bulb or cormus of *C. autumnale* resembles that of the tulip in shape and size, and is covered with a brown membranous coat. Internally it is solid, white, and fleshy; and, when cut transversely, yields, if mature, an acrid milky juice. There is often a small lateral projection from its base, particularly noticed by Dr. J. R. Coxe, which appears to be merely a connecting process between it and the new plant, and is not always present. When dried, and deprived of its external membranous covering, the bulb is of an ash-brown colour, convex on one side, and somewhat flattened on the other, where it is marked by a deep groove extending from the base to the summit. As found in our shops it is always in the dried state, sometimes in segments made by vertical sections of the bulb, but generally in transverse circular slices, about the eighth or tenth of an inch in thickness, with a notch at one part of their circumference. The cut surface is white, and of an amylaceous aspect. The odour of the recent bulb is said to be *hircine*. It is diminished but not lost by drying. The taste is bitter, hot, and acrid. Its constituents, according to Pelletier and Caventou, are a vegetable alkali combined with an excess of gallic acid; a fatty matter composed of olëin, stearin, and a peculiar volatile acid analogous to the cevadic; a yellow colouring matter; gum; starch; inulin in large quantity; and lignin. The active properties are ascribed to the alkaline principle, which was believed by its discoverers to be identical with *veratria*, but has been subsequently found to be peculiar, and has received the appropriate name of *colchicia*.* Wine and vinegar extract all the virtues of the bulb. Dr. A. T. Thomson states that the milky juice of fresh colchicum produces a fine blue colour, if rubbed with the tincture of guaiac; and that the same effect is obtained from an acetic solution of the dried bulb. He considers the appearance of this colour, when the slices are rubbed with a little distilled vinegar and tincture of guaiac, as a proof that the drug is good and has been well dried. Dr. J. M. Maclagan has shown that this change of colour is produced with the albumen, which is not affected if previously coagulated; so that the value of the test consists simply in proving that the drying has not been effected at a heat above 180°, or the temperature at which albumen coagulates. (*Ed. Monthly Journ. of Med. Sci.*, N. S., iv. 507.) A very deep or large notch in the circumference of the slices was considered by Dr. Thomson an unfavourable sign; as it indicates that the bulb has been somewhat exhausted in the nourishment of the offset. The decoction yields a deep blue precipitate with solution of iodine, white precipitates with acetate and subacetate of lead, nitrate of protoxide of mercury, and nitrate of silver, and a slight

* To Geiger and Hesse belongs the credit of determining the precise nature of this alkaline principle. *Colchicia* is crystallizable, and has a very bitter and sharp taste, but is destitute of the extreme acrimony of veratria, and does not, like that principle, excite violent sneezing, when applied to the nostrils. It differs also in being more soluble in water, and less poisonous. To a kitten eight weeks old, one-tenth of a grain was given dissolved in a little dilute alcohol. Violent purging and vomiting were produced, with apparently severe pain and convulsions, and the animal died at the end of twelve hours. The stomach and bowels were found violently inflamed, with effusion of blood throughout their whole extent. A kitten somewhat younger was destroyed in ten minutes by only the twentieth of a grain of veratria; and, on examination after death, marks of inflammation were found only in the upper part of the œsophagus. The process for obtaining colchicia is similar to that employed in the preparation of hyoscyamia from hyoscyamus. (*See the article Hyoscyamus.*) A simpler process is to digest the seeds of meadow-saffron in boiling alcohol, precipitate the tincture with magnesia, treat the precipitated matter with boiling alcohol, and finally filter and evaporate.

precipitate with tincture of galls. The value of colchicum is best tested by its bitterness.

Medical Properties and Uses. Colchicum root is believed to act upon the nervous system, allaying pain and producing other sedative effects, even when it exerts no obvious influence over the secretions. Generally speaking, when taken in doses sufficiently large to affect the system, it gives rise to more or less disorder of the stomach or bowels, and sometimes occasions active vomiting and purging, with the most distressing nausea. When not carried off by the bowels, it often produces copious diaphoresis, and occasionally acts as a diuretic and expectorant; and a case is on record of a violent salivation supposed to have resulted from its use. (*N. Am. Med. and Surg. Journ.*, x. 204.) It appears in fact to have the property of stimulating all the secretions, while it somewhat diminishes the action of the heart. In an overdose, it may produce dangerous and even fatal effects. Excessive nausea and vomiting, abdominal pains, purging and tenesmus, great thirst, sinking of the pulse, coldness of the extremities, and general prostration, with occasional symptoms of nervous derangement, such as headache, delirium, and stupor, are among the results of its poisonous action. It was well known to the ancients as a poison, and is said to have been employed by them as a remedy in gout and other diseases. Störck revived its use among the moderns. He gave it as a diuretic and expectorant in dropsy and humoral asthma; and on the continent of Europe it acquired considerable reputation in these complaints; but the uncertainty of its operation led to its general abandonment, and it had fallen into almost entire neglect, when Dr. Want, of London, again brought it into notice by attempting to prove its identity with the active ingredient of the *eau medicinale d'Husson*, so highly celebrated as a cure for gout. In James's Dispensatory, printed in 1747, it is said to be used in gout as an external application. The chief employment of the meadow-saffron is at present in the treatment of gout and rheumatism, in which experience has abundantly proved it to be a highly valuable remedy. We have, within our own observation, found it especially useful in these affections, when of a shifting or neuralgic character. It sometimes produces relief without obviously affecting the system; but is more efficient when it evinces its influence upon the skin or alimentary canal. Professor Chelius states that it changes the chemical constitution of the urine in arthritic patients, producing an evident increase of the uric acid. (*N. Am. Med. and Surg. Journ.*, xi. 234.) Dr. Maclagan had found it greatly to increase the proportion both of urea and uric acid in the urine, and, where these previously existed in the blood, to separate them from it. (*Ed. Monthly Journ. of Med. Sci.*, N. S., v. 23.) Dr. Elliotson successfully treated a case of prurigo with the wine of colchicum, given in the dose of half a drachm three times a day, and continued for three weeks (*Med.-Chir. Rev.*, Oct. 1827); and it has been found useful in urticaria and other cutaneous affections. Dr. Smith, of Port au Prince, employed it advantageously in tetanus both traumatic and idiopathic. He gave it in full doses, repeated every half hour till it produced an emetic or cathartic effect. (*Am. Journ. of the Med. Sci.*, xvii. 66.) Mr. Ritton found the powdered bulb an effectual remedy in numerous cases of leucorrhœa. (*Ibid.*, vi. 527.) Colchicum has also been recommended in inflammatory and febrile diseases as an adjuvant to the lancet, in diseases of the heart with excessive action, in various nervous complaints, as chorea, hysteria, and hypochondriasis, and in chronic bronchial affections. It is generally given in the state of vinous tincture. (See *Vinum Colchici Radicis.*) In this form it has been used externally in rheumatism. The dose of the dried bulb is from two to eight grains, which may be repeated every four or six hours till the effects of the medicine are obtained.

2. Colchici Semen.

The seeds of the meadow-saffron ripen in summer, and should be collected about the end of July or beginning of August. They never arrive at maturity in plants cultivated in a dry soil, or in confined gardens. (*Williams.*) They are nearly spherical, about the eighth of an inch in diameter, of a reddish-brown colour externally, white within, and of a bitter acrid taste. Their active properties are thought to reside in the testa or husk, and they should not, therefore, be bruised in the preparation of the wine or tincture. Dr. Williams, of Ipswich, in England, who first brought them into notice, recommends them in the warmest terms in chronic rheumatism, and considers them superior to the bulb, both in the certainty of their effects and the mildness of their operation. There is no doubt that they possess virtues analogous to those of the bulb, and have this advantage, that they are not liable to become injured by drying; an advantage of peculiar value in a country where the plant is not cultivated, and the fresh bulb cannot be readily procured. A wine of the seeds is directed in the United States Pharmacopœia. Their dose is about the same with that of the bulb.*

Off. Prep. of the Root. Acetum Colchici; Extractum Colchici; Extractum Colchici Aceticum; Vinum Colchici Radicis.

Off. Prep. of the Seed. Tinctura Colchici Composita; Tinct. Colchici Seminis; Vinum Colchici Seminis. W.

COLOCYNTHIS. *U. S., Lond., Ed., Dub.*

Colocynth.

The fruit of Citrullus Colocynthis, deprived of its rind. *U. S., Lond.* Pulp of the fruit of Cucumis Colocynthis. *Ed., Dub.*

Coloquintida; Coloquinte, *Fr.;* Coloquinte, Coloquintenapfel, *Germ.;* Coloquintida, *Ital., Span.*

Cucumis. *Sex. Syst.* Monœcia Monadelphia.—*Nat. Ord.* Cucurbitaceæ.

Gen. Ch. Male. *Calyx* five-toothed. *Corolla* five-parted. *Filaments* three. Female. *Calyx* five-toothed. *Corolla* five-parted. *Pistil* three-cleft. *Seeds* of the *gourd* with a sharp edge. *Willd.*

Cucumis Colocynthis. Willd. *Sp. Plant.* iv. 611; Woodv. *Med. Bot.* p. 189, t. 71.—*Citrullus Colocynthis,* Royle's Mat. Med. The *bitter cucumber* is an annual plant, bearing considerable resemblance to the common watermelon. The stems, which are herbaceous and beset with rough hairs, trail upon the ground, or rise upon neighbouring bodies, to which they attach themselves by their numerous tendrils. The leaves, which stand alternately on long petioles, are triangular, many-cleft, variously sinuated, obtuse, hairy, of a fine green colour on the upper surface, rough and pale on the under. The flowers are yellow, and appear singly at the axils of the leaves. The fruit is a globular pepo, of the size of a small orange, yellow, and smooth when

* The following description of the seeds is given by Mr. Gray in the *Lond. Med. Repository* for April, 1821. "*Seeds*, ovate, globose, about one-eighth of an inch in diameter. *Integuments*, simple, soft, spongy, membranaceous, thin, reddish-brown, closely adherent to the perisperm. *Perisperm* or *albumen*, hard, rather cartilaginous, pellucid, pale, not in the least divided, of the same shape as the seed. *Corculum* or *embryo*, very small, ovate-globose, not in the least divided, whitish, placed nearly opposite to the *hylum*, or that part where the seed is affixed to the parent plant, but out of the axis of the seed. Base pointing to the hylum, slender. Apex very obtuse." An acquaintance with the characters of the seeds is the more necessary, as the seeds of other plants have been sold for them.

ripe; and contains, within a hard, coriaceous rind, a white spongy medullary matter, enclosing numerous ovate, compressed, white or brownish seeds.

The plant is a native of Turkey, and abounds in the islands of the Archipelago. It grows also in various parts of Africa and Asia. Burkhardt, in his travels across Nubia, found the country covered with it; Thunberg met with it at the Cape of Good Hope; and Ainslie says that it grows in many parts of Lower India, particularly in sandy places near the sea. It is said to be cultivated in Spain. The fruit is gathered in autumn, when it begins to become yellow, and, having been peeled, is dried quickly, in a stove or by the sun. Thus prepared, it is imported from the Levant. Small quantities are said to be imported into England from Mogador unpeeled.*

Properties. As kept in the shops, colocynth is in the shape of whitish balls about the size of an orange, very light and spongy, and abounding in seeds which constitute three-fourths of their weight. The seeds are somewhat bitter; but possess little activity, and, according to Captain Lyon, are even used as food in Northern Africa. When the medicine is prepared for use, they are separated and rejected, the pulpy or medullary matter only being employed. This has a very feeble odour, but a nauseous and intensely bitter taste. Water and alcohol extract its virtues. Vauquelin obtained the bitter principle in a separate state, and called it *colocynthin.* According to Meissner, 100 parts of the dry pulp of colocynth contain 14·4 parts of colocynthin, 10·0 of extractive, 4·2 of fixed oil, 13·2 of a resinous substance insoluble in ether, 9·5 of gum, 3·0 of pectic acid (pectin), 17·6 of gummy extract derived from the lignin by means of potassa, 2·7 of phosphate of lime, 3·0 of phosphate of magnesia, and 19·0 of lignin, besides water. Colocynthin is obtained by boiling the pulp in water, evaporating the decoction, treating the extract thus procured with alcohol, evaporating the alcoholic solution, and submitting the residue, which consists of the bitter principle and acetate of potassa, to the action of a little cold water, which dissolves the latter, and leaves the greater part of the former untouched. Mr. Bastick obtains it by exhausting the pulp with cold water, heating the solution to ebullition, adding subacetate of lead so long as a precipitate is produced, filtering the liquor when cold, adding dilute sulphuric acid gradually until it no longer occasions a precipitate, boiling to expel free acetic acid, filtering to separate sulphate of lead, evaporating cautiously nearly to dryness, extracting the colocynthin from the residuum by strong alcohol which leaves the salts, and finally evaporating the alcoholic solution. Colocynthin is yellowish-brown, somewhat translucent, brittle and friable, fusible by a heat below 212°, inflammable, more soluble in alcohol than in water, but capable of rendering the latter intensely bitter. It is neither acid nor alkaline; but its aqueous solution gives with infusion of galls a copious white precipitate. An infusion of colocynth, made with boiling water, gelatinizes upon cooling. Neumann obtained from 768 parts of the pulp, treated first with alcohol and then with water, 168 parts of alcoholic and 216 of aqueous extract.

* In a letter from Mr. R. W. Pelham, of the Shakers' Village, near New Lebanon, Ohio, the author was informed that a hybrid plant between the colocynth and watermelon had been successfully cultivated in that place, and yielded a bitter fruit having the medicinal virtues of colocynth. With the letter came also some seeds of the plant, and a portion of extract prepared from the pulp of the fruit. This was found, upon trial, to be actively cathartic. The seeds, planted in the garden of the author, produced vigorous plants, which perfected their fruit. The plant appeared intermediate between the colocynth and watermelon. The fruit was globular, about four inches in diameter, green like the watermelon externally, having the same odour when cut, but of an extremely bitter taste. A portion of the pulp was dried; and an extract prepared from it was found to have the properties of the extract of colocynth.

Medical Properties and Uses. The pulp of colocynth is a powerful drastic, hydragogue cathartic, producing, when given in large doses, violent griping, and sometimes bloody discharges, with dangerous inflammation of the bowels. Death has resulted from a teaspoonful and a half of the powder. (*Christison.*) Even in moderate doses it sometimes acts with much harshness, and is, therefore, seldom prescribed alone. By some writers it is said to be diuretic. It was frequently employed by the ancient Greeks and the Arabians, though its drastic nature was not unknown to them. Among the moderns it is occasionally used, especially by the German practitioners, in obstinate cases of dropsy, and in various affections depending on disordered action of the brain. In combination with other cathartics it loses much of its violence, but retains its purgative energy; and in this state is very extensively employed. The compound extract of colocynth is a favourite preparation with many practitioners; and, combined with calomel, extract of jalap, and gamboge, it forms a highly efficient and safe cathartic, especially applicable in congestion of the portal circle and torpidity of the liver. (See *Pilulæ Catharticæ Compositæ.*) The dose of colocynth is from five to ten grains. It is best administered in minute division, effected by trituration with gum or farinaceous matter.

Thunberg states that the fruit of C. Colocynthis, at the Cape of Good Hope, is rendered so mild by being properly pickled, that it is eaten both by the natives and colonists; but, as it is thus employed before attaining perfect maturity, it is possible that the drastic principle may not have been developed.

Off. Prep. Extractum Colocynthidis; Extractum Colocynthidis Compositum; Pilulæ Colocynthidis Compositæ. W.

COLOMBA. *U. S.*

Columbo.

The root of Cocculus palmatus. *U. S.*

Off. Syn. CALUMBA. Root of Cocculus palmatus. *Ed.*, *Lond.*, *Dub.* Colombo, *Fr.;* Columbowurzel, *Germ.;* Columba, *Ital.;* Raiz de Columbo, *Span.;* Kalumbo, *Port.;* Calumb, *Mozambique.*

The columbo plant was imperfectly known till within a recent period. Flowering specimens of a plant gathered by Commerson, about the year 1770, in the garden of M. Poivre in the Isle of France, and sent to Europe with that botanist's collection, were examined by Lamarck, and described under the name of *Menispermum palmatum.* But its original locality was unknown, and it was only conjectured to be the source of columbo. In the year 1805, M. Fortin, while engaged in purchasing the drug in Mozambique, obtained possession of a living offset of the root, which, being taken to Madras, and planted in the garden of Dr. Anderson, produced a male plant, which was figured and described by Dr. Berry. From the drawing thus made, the plant was referred to the natural family of the Menispermeæ; but, as the female flowers were wanting, some difficulty was experienced in fixing its precise botanical position. De Candolle, who probably had the opportunity of examining Commerson's specimens, gave its generic and specific character; but confessed that he was not acquainted with the structure of the female flower and fruit. The desideratum, however, has been supplied by ample drawings sent to England by Mr. Telfair, of Mauritius, made from plants which were propagated from roots obtained by Captain Owen in 1825, while prosecuting his survey of the Eastern coast of Africa. (*Curtis's Bot. Mag.*, *vol.* 4, *pl.* 2970.) The genus *Cocculus*, in which the plant is now placed, was separated by De Candolle from *Menispermum*, and includes those species which have six stamens, while the Menispermum is limited to those with twelve or more.

Cocculus. *Sex. Syst.* Dicœcia Hexandria. — *Nat. Ord.* Menispermaceæ. *Gen. Ch. Sepals and Petals* ternate, usually in two, rarely in three rows. *Stamens* six, distinct, opposite the petals. *Drupes* berried, 1–6, generally oblique, reniform, somewhat compressed, one-seeded. *Cotyledons* distant. *De Cand.*

Cocculus palmatus. De Cand. *Syst. Veg.* i. 523; Woodv. *Med. Bot.* 3*d ed. vol.* 5, *p.* 21. This is a climbing plant, with a perennial root, consisting of several fasciculated, fusiform, somewhat curved, and descending tubers, of the thickness of an infant's arm. The stems, of which one or two proceed from the same root, are twining, simple in the male plant, branched in the female, round, hairy, and about as thick as the little finger. The leaves, which stand on rounded, glandular-hairy footstalks, are alternate, distant, cordate, with three, five, or seven entire, acuminate, wavy, somewhat hairy lobes, and as many nerves, each of which runs into one of the lobes. The flowers are small and inconspicuous, and are arranged in solitary axillary racemes, which, in the male plant, are compound, in the female, simple, and in both, shorter than the leaves.

This species of Cocculus is a native of Mozambique, on the south-eastern coast of Africa, where it grows wild in great abundance in the thick forests extending from the sea many miles into the interior. It is not cultivated. The root is dug up in March, when dry weather prevails. From the base of the root numerous fusiform offsets proceed, less fibrous and woody than the parent stock. These offsets are separated and cut into transverse slices, which are dried in the shade. The old root is rejected.

Columbo is a staple export of the Portuguese from their dominions in the south-east of Africa. It is taken to India, and thence distributed. It was formerly supposed to be a product of Ceylon, and to have derived its name from Colombo, a city of that Island, from which it was thought to be exported. It is possible that, when the Portuguese were in possession of Ceylon, Colombo may have been the entrepot for the drug brought from Africa, and thus have given origin to its name. Some, however, consider a more probable derivation to be from the word *calumb*, which is said to be the Mozambique name for the root. Dr. Christison has been misinformed in relation to the cultivation of the true columbo plant in this country. (See *Christison's Dispensatory, Am. ed., p.* 304.)

Properties. The root, as it reaches us, is in flat circular or oval pieces, from the eighth of an inch to near an inch in thickness, and from one to two inches in diameter. Along with these are sometimes a few cylindrical pieces an inch or two in length. The cortical portion is thick, of a bright yellow, slightly greenish colour internally, but covered with a brownish, wrinkled epidermis. The interior or medullary portion, which is readily distinguishable from the cortical, is light, spongy, yellowish, usually more or less shrunk, so that the pieces are thinnest in the centre; and is frequently marked with concentric circles and radiating lines. Those pieces are to be preferred which have the brightest colour, are most compact and uniform in their texture, and least worm-eaten. The odour of columbo is slightly aromatic. The taste is very bitter, that of the cortical much more so than that of the central portion, which is somewhat mucilaginous. The root is easily pulverized. The powder has a greenish tinge, which becomes browner with age, and deepens when it is moistened. As it attracts moisture from the air, and is apt to undergo decomposition, it should be prepared in small quantities at a time.

M. Planche analyzed columbo in 1811, and found it to contain an azotized substance, probably albumen, in large quantity, a bitter yellow substance not

precipitated by metallic salts, and one-third of its weight of starch. He obtained also a small proportion of essential oil, salts of lime and potassa, oxide of iron, and silica. Wittstock, of Berlin, afterwards isolated a peculiar crystallizable principle, which he called colombin, and which appears to be the bitter yellow substance of Planche, deprived of a portion of colouring matter. *Colombin* crystallizes in beautiful transparent quadrilateral prisms, is without smell, and is extremely bitter. It is but very slightly soluble in water, alcohol, or ether, at ordinary temperatures, and yet imparts to these fluids a strongly bitter taste. It is more soluble in boiling alcohol, which deposits it upon cooling. The best solvent is diluted acetic acid. It is taken up by alkaline solutions, from which it is precipitated by acids. It has neither acid nor alkaline properties, and its alcoholic and acetic solutions are not affected by the metallic salts, or the infusion of galls. It is obtained by exhausting columbo by means of alcohol of the sp. gr. 0·835, distilling off three-quarters of the alcohol, allowing the residue to stand for some days till crystals are deposited, and lastly treating these crystals with alcohol and animal charcoal. The mother waters still contain a considerable quantity of colombin, which may be separated by evaporating with coarsely powdered glass to dryness, exhausting the residue with ether, distilling off the ether, treating the residue with boiling acetic acid, and evaporating the solution so that crystals may form.

From the researches of Dr. Bödeker, it appears that another bitter principle exists in columbo, which corresponds in composition and chemical relations with *berberin*, the active principle of *Berberis vulgaris*, and is assumed to be identical with that substance. It was obtained by exhausting columbo with alcohol of 0·889, distilling off the alcohol, allowing the residual liquor to stand for three days so as to deposit its columbin, evaporating the supernatant liquid together with the aqueous washings of the columbin to dryness, exhausting the residue with boiling alcohol of 0·863, treating the solution thus obtained as the former one, submitting the residue to the action of boiling water, filtering and adding muriatic acid, collecting the precipitate thus formed on a filter, drying it with bibulous paper, and finally, in order to separate adhering acid, dissolving it in alcohol, and precipitating with ether. The result was an imperfectly crystalline, bright yellow powder, of a disagreeable bitter taste, supposed to be a *muriate of berberin*. It is stated that berberin is present in columbo in much larger proportion than colombin, and, being abundantly soluble in hot water and alcohol, while colombin is but slightly so, is probably more largely extracted in the ordinary liquid preparations of the root. (See *Am. Journ. of Pharm.*, xx. 322.) It is thought that berberin exists in columbo combined with a peculiar acid denominated *columbic acid;* and that, while the colombin occurs in the cells of the root in a crystalline state, the columbate of berberin is deposited in the thickening layers of the cell-membranes. (*Chem. Gaz.*, vii. 150.)

It is probable that both colombin and berberin contribute to the remedial effects of columbo. The virtues of the root are extracted by boiling water and by alcohol. Precipitates are produced with the infusion and tincture by the infusion of galls, acetate and subacetate of lead, corrosive chloride of mercury, and lime-water; but the bitterness is not affected.

Adulterations. It is said that the root of *white bryony*, tinged yellow with the tincture of columbo, has sometimes been fraudulently substituted for the genuine root; but the adulteration is too gross to deceive those acquainted with the characters of either of these drugs. American columbo, which is the root of *Frasera Walteri*, is said to be sold in some parts of Europe for the genuine. Independently of the sensible differences between the two roots (see *Frasera*), M. Stolze of Halle states that, while the tincture

of columbo remains unaffected by the sulphate or sesquichloride of iron, and gives a dirty gray precipitate with tincture of galls, the tincture of frasera acquires a dark-green colour with the former reagent, and is not affected by the latter. (*Duncan.*) Under the name of *columbo wood*, or *false columbo*, the wood of *Coscinium fenestratum*, a plant of the family of Menispermaceæ, growing in Ceylon, has been imported into England, and offered for sale in the drug market. (*Pharm. Journ. and Trans.*, x. 321, and xii. 185.)

Medical Properties and Uses. Columbo is among the most useful of the mild tonics. Without astringency, with very little stimulating power, and generally acceptable to the stomach, it answers admirably as a remedy in simple dyspepsia, and in those states of debility which are apt to attend convalescence, especially when the alimentary canal is left enfeebled. Hence, it is often prescribed in the declining stages of remittent fever, dysentery, diarrhœa, cholera morbus, and cholera infantum. The absence of irritating properties renders it also an appropriate tonic in the hectic fever of phthisis, and its kindred affections. It has been highly recommended in vomiting, unconnected with inflammation of the stomach, as in the sickness of pregnant women. It is frequently administered in combination with other tonics, aromatics, mild cathartics, and antacids. The remedy which we have found most effectual in the permanent cure of a disposition to the accumulation of flatus in the bowels, is an infusion made with half an ounce of columbo, half an ounce of ginger, a drachm of senna, and a pint of boiling water, and given in the dose of a wineglassful three times a day. Columbo is much used by the natives of Mozambique in dysentery and other diseases. (*Berry.*) It was first introduced to the notice of the profession in Europe by François Redi, in the year 1685.

It is most commonly prescribed in the state of infusion. (See *Infusum Colombæ.*) The dose of the powder is from ten to thirty grains, and may be repeated three or four times a day. It is frequently combined with powdered ginger, subcarbonate of iron, and rhubarb.

Off. Prep. Infusum Colombæ; Mistura Ferri Aromatica; Tinctura Colombæ.

W.

CONII FOLIA. *U. S.*

Hemlock Leaves.

The leaves of Conium maculatum. *U. S.*

Off. Syn. CONIUM. Conium maculatum. The fresh and dried leaf of the wild herb. *Lond.* The leaves. *Ed. Dub.*

CONII SEMEN. *U. S.*

Hemlock Seed.

The fruit of Conium maculatum. *U. S.*

Ciguë ordinaire, Grande ciguë, *Fr.;* Gefleckter Schierling, *Germ.;* Cicuta, *Ital., Span.*

Conium. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Apiaceæ or Umbelliferæ.

Gen. Ch. Partial Involucre halved, usually three-leaved. *Fruit* nearly globular, five-streaked, notched on both sides. *Willd.*

Conium maculatum. Willd. *Sp. Plant.* i. 1395; Bigelow, *Am. Med. Bot.* i. 113; Woodv. *Med. Bot.* p. 104, t. 42. This is an umbelliferous plant, having a biennial spindle-shaped whitish root, and an herbaceous branching stem, from three to six feet high, round, hollow, smooth, shining, slightly striated, and marked with brownish-purple spots. The lower leaves are tri-

pinnate, more than a foot in length, shining, and attached to the joints of the stem by sheathing petioles; the upper are smaller, bipinnate, and inserted at the division of the branches; both have channeled foot-stalks, and incised leaflets, which are deep green on their upper surface and paler beneath. The flowers are very small, white, and disposed in compound terminal umbels. The general involucre consists of from three to seven lanceolate, reflected leaflets, whitish at their edges; the partial involucre, of three or four, oval, pointed, spreading, and on one side only. The petals are cordate, with their points inflected, five in number, and nearly equal. The stamens are spreading, and about as long as the corolla; the styles diverging. The fruit, commonly called seeds, is roundish-ovate, a line and a half or rather less in length by a line in breadth, striated, and composed of two plano-convex, easily separable parts, which have on their outer surface five crenated ribs.

The hemlock is a native of Europe, and has become naturalized in the United States. It grows usually in clusters along the road sides, or in waste grounds, and is found most abundantly in the neighbourhood of old settlements. It flowers in June and July. The whole plant, especially at this period, exhales a fetid odour, compared by some to that of mice, by others to that of the urine of cats; and narcotic effects result from breathing for a long time air impregnated with the effluvia. The plant varies in narcotic power according to the weather and the climate, being most active in hot and dry seasons, and in warm countries. The hemlock of Greece, Italy, and Spain is said to be much more energetic than that of the North of Europe. As a general rule, those plants are most active which grow in a sunny exposure. The term *cicuta*, which has often been applied to this plant, belongs to a different genus. Both the leaves and fruit are officinal.

The proper season for gathering the leaves is when the plant is in flower; and Dr. Fothergill asserts, from experiment, that they are most active about the time when the flowers begin to fade. The footstalks should be rejected, and the leaflets quickly dried, either in the hot sun, on tin plates before a fire, or by a stove heat not exceeding 120° F. They should be kept in boxes or tin cases, excluded from the air and light, by exposure to which they lose their fine green colour, and become deteriorated in medical virtues. The same end is answered by pulverizing them, and preserving the powder in opaque and well stopped bottles. But little reliance can be placed on the dried leaves; as, even when possessed of a strong odour and a fine green colour, they are sometimes destitute of the narcotic principle. When rubbed with caustic potassa they should exhale the odour of conia. The fruit retains its activity much longer than the leaves. Dr. Christison found it to have sustained no diminution of power, after having been kept eight years.

Properties. The dried leaves of the hemlock have a strong, heavy, narcotic odour, less disagreeable than that of the recent plant. Their taste is bitterish and nauseous; their colour a dark green, which is retained in the powder. A slight degree of acrimony possessed by the fresh leaves is said to be dissipated by drying. The seeds have a yellowish-gray colour, a feeble odour, and a bitterish taste. Their form has already been described. Water distilled from the fresh leaves has the odour of hemlock, and a nauseous taste, but does not produce narcotic effects. The decoction has little taste, and the extract resulting from its evaporation is nearly inert. From these facts it is inferrible that the active principle, as it exists in the plant, is not volatile at 212°, and, if soluble in water, is injured by a boiling heat. Alcohol and ether take up the narcotic properties of the leaves; and the ethereal extract, which is of a rich dark green colour, is stated by Dr. A. T. Thomson to have the smell and taste of the plant in perfection, and in the dose of half a grain

to produce headache and vertigo. Upon destructive distillation, the leaves yield a very poisonous empyreumatic oil. We have no satisfactory analysis of hemlock. Schrader found in the juice of the leaves, resin, extractive, gum, albumen, a green fecula, and various saline substances. Brandes obtained from the plant a very odorous oil, albumen, resin, colouring matter, and salts.

So long ago as 1827, Giseke obtained an alkaline liquid by distilling hemlock leaves with water and caustic lime; but he did not succeed in isolating the substance in which this alkalinity resided. Geiger was the first who obtained the active principle in a separate state, and proved it to be alkaline. It appears that there are two volatile substances in hemlock, one of them an *oil*, which comes over by simple distillation, and upon which the odour of the plant depends, and the other an *alkaline principle*, which, as it exists in the plant, is so combined as not to be volatilizable, but which, when separated by one of the mineral alkalies from its native combination, rises readily in distillation, and may thus be procured separate. The latter substance is the active principle, and has received the name of *conia*. It probably exists in the plant united with an acid, as it is separated by the alkalies. This acid Peschier believed to be peculiar, and named *coniic acid*. Geiger obtained conia by the following process. He distilled fresh hemlock with caustic potassa and water, neutralized with sulphuric acid the alkaline liquid which came over, evaporated this liquid to the consistence of syrup, added anhydrous alcohol so long as a precipitate of sulphate of ammonia was afforded, separated this salt by filtration, distilled off the alcohol, mixed the residue with a strong solution of caustic potassa, and distilled anew. The conia passed over with the water, from which it separated, floating on the surface in the form of a yellowish oil. According to Dr. Christison, an easier process is to distil cautiously a mixture of a strong solution of potassa and the alcoholic extract of the unripe fruit. As obtained by the above processes, conia is in the state of a hydrate, containing one-fourth of its weight of water and a little ammonia. From the former, it may be freed by chloride of calcium; from the latter, by exposing it under an exhausted receiver till it ceases to emit bubbles of gas.

The fresh leaves or seeds should be employed in the preparation of conia; as the alkali undergoes decomposition by time and exposure. The seeds contain most of this principle; but even in these it exists in very small proportion. From 6 pounds of the fresh and 9 of the dried seeds, Geiger obtained about an ounce of conia; while from 100 pounds of the fresh herb he got only a drachm, and from the dried leaves none. Christison recommends the full grown fruit while yet green, and states that 8 pounds will yield half an ounce of hydrate of conia, and contains much more.

Conia is in the form of a yellowish, oily liquid, lighter than water, of a very acrid taste, and a strong penetrating odour, compared to that of the urine of mice, and recalling the smell of fresh hemlock, though not identical with it. In volatility it resembles the essential oils, readily rising with the vapour of boiling water, but, when unmixed, requiring for ebullition, according to Christison, a temperature of 370°. It is freely soluble in alcohol, ether, the fixed and volatile oils, and slightly so in water. It unites with about one-fourth its weight of water to form a hydrate. It reddens turmeric, and neutralizes the acids, forming with them soluble salts, some of which are crystallizable. With tannic acid it forms an insoluble compound. Like ammonia it occasions a white cloud, when approached by a rod moistened with muriatic acid. It coagulates albumen, and precipitates the salts of aluminium, copper, zinc, manganese, and iron. It also precipitates nitrate of silver, but in excess

redissolves the precipitate. Most of its salts are decomposed by evaporation. When exposed to the air, it speedily assumes a deep-brown colour, and is ultimately converted into a resinous matter, and into ammonia which escapes. Under the influence of heat this change takes place with much greater rapidity. The presence of conia may be detected in an extract or other preparation of hemlock by rubbing it with potassa, which instantly developes its peculiar odour. It consists of nitrogen, carbon, and hydrogen; its formula being variously given, $NC_{16}H_{15}$ (*Gerhardt*), $NC_{16}H_{16}$ (*Ortigosa*), and $NC_{17}H_{17}$ (*Blythe*). (*Am. Journ. of Pharm.*, xxiii. 73.)* In its effects on the system it closely resembles hemlock itself. Dr. Christison found it, contrary to the experience of Geiger, more active in the saline state, than when uncombined. It is a most energetic poison; one drop of it injected into the eye of a rabbit killing the animal in nine minutes, and three drops killing a stout cat in a minute and a half when similarly applied. Dr. Christison, from whose paper these facts are derived (*Trans. Roy. Soc. Ed.*, 1836), thinks that it acts upon the spinal marrow, directly prostrating the nervous power, producing paralysis of the voluntary muscles, and destroying life by arresting respiration. The brain does not seem to be especially attacked; as the animal, when it dies slowly, preserves its senses unimpaired so long as it breathes. In cases of sudden death from the poison, the heart does not cease to act till after apparent death; and its action may be sustained, after the animal has ceased to breathe, by keeping up artificial respiration. A recently prepared extract of hemlock acted precisely as conia. Locally the alkali appears to act as an irritant.

Medical Properties and Uses. Hemlock is narcotic, and rather sedative than otherwise to the circulation. Mr. Judd inferred from his experiments that it directly diminishes the action of the heart, and when it produces death, contrary to the results obtained by Christison, exhausts the contractility of that organ. (*Medico-Bot. Trans.*, vol. i. pt. 4.) When given so as fully to affect the system, it produces more or less vertigo, dimness of vision, nausea, faintness, sensations of numbness, and general muscular debility. In larger doses it occasions dilated pupils, difficulty of speech, delirium or stupor, tremors and paralysis, and ultimately convulsions and death. Sometimes it produces fatal effects, through paralysis alone, without coma or convulsions. Its operation usually commences in less than half an hour, and, if moderate, seldom continues longer than twenty-four hours. It is supposed to be the narcotic used by the Athenians to destroy the life of condemned individuals, and by which Socrates and Phocion died. It was also used by the ancients as a medicine, but fell into entire neglect, and was not again brought into notice till the time of Störck, by whom it was much employed and extravagantly praised. Since that time it has been submitted to ample trial, and, though its original reputation has not been fully sustained, it still retains a place in the catalogue of useful medicines. Anodyne, soporific, antispasmodic, antaphrodisiac, deobstruent, and diuretic properties have been ascribed to it. It was highly recommended by Störck as a remedy in scirrhus and cancerous ulcers, but at present is only considered a useful palliative in

* Orfila gives the following additional chemical characters of conia. Heated in a capsule, it forms white vapours, *having a strong smell of celery and of the urine of mice.* Weak tincture of iodine gives a white precipitate, becoming olive with excess of the tincture. *Pure concentrated sulphuric acid does not alter it;* but, when the mixture is heated, it becomes first brown, then blood-red, and finally black. *Nitric acid imparts a topaz colour*, not changed by heat. The chlorides of platinum and of gold give yellow precipitates, and corrosive sublimate a white one. Red permanganate of potassa is immediately decolorized. *Neutral acetate of lead gives no precipitate;* nor does the subacetate. The parts of this paragraph in italics indicate the methods of distinguishing this alkaloid from nicotia. (See *Pharm. Journ. and Trans.*, xi. 89.)

those affections. In mammary tumours and chronic enlargements of the liver and other abdominal viscera; in painful scrofulous tumours and ulcers; in various diseases of the skin, as leprosy and elephantiasis; in the complicated derangements of health attendant upon secondary syphilis; in chronic rheumatism and neuralgic affections; in excessive secretion of milk; in pertussis, asthma, chronic catarrh, and consumption; and in various other disorders connected with nervous derangement, or a general depraved state of the health, it is occasionally employed with the effect of relieving or palliating the symptoms, or favourably modifying the action of remedies with which it is combined. Dr. Gibson, of the University of Pennsylvania, considers it efficacious in the cure of goitre.

The powdered leaves, and the inspissated juice (the extract of the Pharmacopœias), are the forms in which it is usually administered. Either of these may be given in the dose of three or four grains twice a day, gradually increased till the occurrence of slight vertigo or nausea indicates that it has taken effect. To maintain a given impression, it is necessary to increase the dose even more rapidly than is customary with most other narcotics; as the system becomes very speedily habituated to its influence. In some instances, the quantity administered in one day has been augmented to more than two ounces. The strength of the preparations of hemlock is exceedingly unequal; and caution is therefore necessary, when the medicine is given in very large quantities, to employ the same parcel, or, if a change be made, to commence with the new parcel in small doses, so as to obviate any danger which might result from its greater power. Unpleasant consequences have followed a neglect of this precaution. There is also an officinal tincture and an alcoholic extract, both of which, when properly made, are efficient preparations. The fresh juice of the plant has been recommended by Hufeland in the dose of from twelve to forty drops. The powdered seeds should be given in a dose considerably smaller than that of the leaves.* The fresh leaves are sometimes used externally as an anodyne cataplasm; and the extract, and an ointment prepared from the leaves, are applied to the same purpose.

Conia has been occasionally employed both internally and externally, with asserted advantage, as an anodyne and resolvent. It has been particularly recommended in hooping-cough. Dr. Spengler, of Herborn, gave it to an infant a year old in the dose of one-sixteenth of a grain every six hours, with the effect of curing the disease in ten days. (*Ann. de Thérap.*, 1853, p. 73.) According to the formula of Müller, two drops are dissolved in twenty-four drops of alcohol, and three drops of the solution are given, each on a piece of sugar. (*Arch. Gén.*, 4*e sér.*, xxiii. 226.) A solution of one part in 100 of very dilute alcohol has been used with advantage in certain cases of scrofulous ophthalmia with photophobia, applied several times daily by friction about the eyelids. (*Journ. de Pharm.*, 3*e sér.*, xix. 219.)

Though fatal to some animals, hemlock is eaten with impunity by others, as horses, goats, and sheep. The best method of relieving its poisonous effects is the speedy evacuation of the stomach.

Off. Prep. of the Leaves. Extractum Conii; Extract. Conii Alcoholicum; Tinctura Conii; Unguentum Conii. W.

* From their greater strength, permanency, and uniformity, the seeds might well supersede the leaves for internal use. They should be pulverized and made into pills with syrup, and given in the commencing dose of half a grain, to be gradually increased till their effects are experienced. MM. Devay and Guilliermond prepare a *syrup* from the seeds, made by exhausting 10 parts of them with 60 parts of alcohol of 28°, and adding the tincture to 3,000 parts of syrup "aromatised *ad libitum*." One or two fluidrachms may be taken at first. (*Ann. de Thérap.*, pour 1853, p. 54.)—*Note to the tenth edition.*

CONTRAYERVA. *U. S. Secondary.*

Contrayerva.

The root of Dorstenia Contrayerva. *U. S.*

Contrayerva, *Fr.;* Giftwurzel, *Germ.;* Contrajerva, *Ital.;* Contrayerba, *Span.*

DORSTENIA. *Sex. Syst.* Tetrandria Monogynia.—*Nat. Ord.* Urticaceæ.

Gen. Ch. Receptacle common, one-leafed, fleshy, in which solitary *seeds* are nestled. *Willd.*

The root known by the name of *contrayerva* is believed to be derived from several species of Dorstenia, among which, besides *D. Contrayerva*, two others are mentioned by Dr. Houston, *D. Houstonia*, and *D. Drakena*, the former growing near Campeachy, the latter near Vera Cruz. It is referred by Dr. Martius also to *D. Brasiliensis*, growing in Jamaica, Trinidad, and Brazil. D. Contrayerva is the only one recognised in the Pharmacopœias.

Dorstenia Contrayerva. Willd. *Sp. Plant.* i. 682; Woodv. *Med. Bot.* p. 705, t. 240. This plant has a perennial, fusiform, branching, rough, compact root or rhizoma, which sends up several leaves of an irregular shape, about four inches in length, lobed, serrated, pointed, and placed upon long radical footstalks, which are winged towards the leaves. The scapes or flower-stems are also radical, rise several inches in height, and support irregular quadrangular receptacles, which contain male and female flowers, the former having two stamens, the latter a single style. The capsule, when ripe, possesses an elastic power, by which the seeds are thrown out with considerable force.

The plant grows in Mexico, the West Indies, and Peru. The root (rhizoma) is the officinal portion. According to Pereira, however, the contrayerva of the shops is the product of D. Brasiliensis, and is brought from Brazil. The term contrayerba, in the language of the Spanish Americans, signifies *counterpoison* or *antidote*, and was applied to this root under the impression that it had the property of counteracting all kinds of poison.

Properties. The root, as found in our shops, is oblong, an inch or two in length, of varying thickness, very hard, rough, and solid, of a reddish-brown colour externally, and pale within; and has numerous long, slender, yellowish fibres attached to its inferior part. The odour is aromatic; the taste warm, slightly bitterish, and pungent. The fibres have less taste and smell than the tuberous portion. The sensible properties are extracted by alcohol and boiling water. The decoction is highly mucilaginous. The tincture reddens infusion of litmus, and lets fall a precipitate on the addition of water. The root has not yet been analyzed, but contains starch and a volatile oil.

Medical Properties and Uses. Contrayerva is a stimulant tonic and diaphoretic, and has been given in low states of fever, malignant eruptive diseases, some forms of dysentery and diarrhœa, and other diseases requiring gentle stimulation. It is very seldom used in this country. The dose of the powdered root is about half a drachm. W.

CONVOLVULUS PANDURATUS. *U. S. Secondary.*

Wild Potato.

The root of Convolvulus panduratus. *U. S.*

CONVOLVULUS. See SCAMMONIUM.

Convolvulus panduratus. Willd. *Sp. Plant.* i. 850; Barton, *Med. Bot.* i. 249. The wild potato has a perennial root, and a round, purplish, procumbent or climbing stem, which twines around neighbouring objects, and grows

sometimes twelve feet in length. The leaves, which stand alternately on long petioles, are broad, heart-shaped at the base, entire, or lobed on the sides like a guitar or violin, somewhat acuminate, deep green on the upper surface and paler beneath. The flowers are in fascicles, upon long axillary peduncles. The calyx is smooth and awnless; the corolla, tubular campanulate, very large, white at the border, but purplish-red at the base.

The plant is indigenous, growing throughout the United States in sandy fields and along fences, and flowering from June to August. A variety with double flowers is cultivated in the gardens for the sake of ornament.

The root, which is the officinal part, is very large, two or three feet in length, about three inches thick, branched at the bottom, externally of a brownish-yellow colour, and full of longitudinal fissures, internally whitish and milky, and of a somewhat acrid taste. Pursh says that he has seen a root as thick as a man's thigh.

Medical Properties. The wild potato is feebly cathartic, and has been proposed as a substitute for jalap, but is scarcely used. It is thought also to be diuretic, and has been employed, with supposed advantage, in strangury and calculous complaints. Dr. G. M. Maclean considers it one of the best diuretics he has used, when given in infusion. (*N. Y. Journ. of Med.*, x. 375.) Forty grains of the dried root are said to purge gently. W.

COPAIBA. *U. S., Lond., Ed.*

Copaiba.

The juice of Copaifera officinalis and other species of Copaifera. *U. S.* Copaifera multijuga and other species. The oleo-resin from incisions in the trunk. *Lond.* Fluid resinous exudation of various species of Copaifera. *Ed.*

Off. Syn. COPAIVA BALSAM. The balsam of Copaifera officinalis and other species. *Dub.*

Balsam of Copaiva; Baume de copahu, *Fr.;* Copaiva-Balsam, *Germ.;* Balsamo di copaiba, *Ital.;* Balsamo de copayva, *Span.*

COPAIFERA. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Leguminosæ, *Jussieu.* Amyridaceæ. *Lindley.*

Gen. Ch. Calyx none. *Petals* four. *Legume* ovate. *Seed* one, with an ovate arillus. *Willd.*

The first notice to be found of the copaiba plant is that by Marcgrav and Piso in the year 1648. Jacquin in 1763 described a species of Copaifera, growing in the Island of Martinique, which he named *C. officinalis.* As this was believed to be the same plant with the one observed by Marcgrav in Brazil, it was adopted in the Pharmacopœias; but their identity is now denied; and Desfontaines has proposed for Jacquin's species the title of *C. Jacquini*, in honour of that botanist. It is now known that many species of Copaifera exist in Brazil and other parts of South America; and all of them, according to Martius, yield copaiba. Besides C. officinalis or C. Jacquini, the following are described by Hayne;—*C. Guianensis, C. Langsdorffii, C. coriacea, C. Beyrichii, C. Martii, C. bijuga, C. nitida, C. laxa, C. cordifolia, C. Jussieui, C. Sellowii, C. oblongifolia*, and *C. multijuga.* Hayne believed that C. bijuga was the plant seen by Marcgrav and Piso.

Copaifera officinalis. Willd. *Sp. Plant.* ii. 630; Woodv. *Med. Bot.* p. 609, t. 216. *C. Jacquini.* Desfont. *Mem. du Mus.* vii. 376; Hayne, *Darstel. und Beschreib. &c.* x. 14. This is an elegant tree, with a lofty stem, much branched at the top, and crowned by a thick canopy of foliage. The leaves are alternate, large, and pinnate, composed of from two to five pairs of ovate, entire, obtusely acuminate leaflets, two or three inches in length, rather narrower

on one side than the other, smooth, pellucidly punctate, somewhat shining, and on short footstalks. The flowers are whitish, and in terminal branched spikes. The fruit is an oval, two-valved pod, containing a single seed.

This species of Copaifera is a native of Venezuela, and grows in the province of Carthagena, mingled with the trees which afford the balsam of Tolu. It grows also in some of the West India islands, particularly Trinidad and Martinique, where it is said to be naturalized. Though recognised in the United States Pharmacopœia as one of the sources of officinal copaiba, it probably yields little of that now in use. According to Hayne, the species from which most of the copaiba of commerce is derived, is *C. multijuga*, growing in the province of Para. It is probable that *C. Guianensis*, which inhabits the neighbouring province of Guiana, especially in the vicinity of the Rio Negro, affords also considerable quantities; and *C. Langsdorffii* and *C. coriacea*, which are natives of Santo Paulo, are thought to yield most of the juice collected in the last-mentioned province.

The juice is obtained by making deep incisions into the stems of the trees; and the operation is said to be repeated several times in the same season. As it flows from the wound, it is clear, colourless, and very thin, but soon acquires a thicker consistence, and a yellowish tinge. It is most largely collected in the provinces of Para and Maranham, in Brazil, and until recently was brought to this country chiefly from the port of Para, in small casks or barrels. But large quantities of it are now brought from Maracaibo, in Venezuela, and from other ports on the Caribbean sea, whence it comes in casks, demijohns, cans, jugs, &c. Copaiba is also exported from Angustura on the Orinoco, from the French South American province of Cayenne, from Rio Janeiro, and from some of the West India islands.

Properties. Copaiba is a clear, transparent liquid, usually of the consistence of olive oil, of a pale-yellow colour, a peculiar not unpleasant odour, and a bitterish, hot, nauseous taste. Its specific gravity varies ordinarily from 0·950 to 1·000; but has been known to be as low as 0·916. (Procter, *Am. Journ. of Pharm.*, xxii. 292.)* It is insoluble in water, but entirely soluble in absolute alcohol, ether, and the fixed and volatile oils. Strong alkaline solutions dissolve it perfectly; but the resulting solution becomes turbid when largely diluted with water. With the alkalies and alkaline earths it forms saponaceous compounds, in which the resin of the copaiba acts the part of an acid. It dissolves magnesia, especially with the aid of heat, and even disengages carbonic acid from the carbonate of that earth. If triturated with a sixteenth of its weight of magnesia and set aside, it gradually assumes a solid consistence; and a similar change is produced with hydrate of lime. (See *Pilulæ Copaibæ.*) Its essential constituents are volatile oil and resin, with a minute proportion of an acid which appears to be the acetic. (Durand, *Journ. of the Phil. Col. of Pharm.*, i. 3.) As it contains no benzoic acid, it cannot with propriety retain its old title of *balsam of copaiva*. The substances which it most closely resembles, both in composition and properties, are the turpentines. The *volatile oil* will be treated of among the preparations. (See *Oleum Copaibæ.*)

* The variety of copaiba found by Prof. Procter to have this low sp. gr. was of uncertain origin, but supposed to be from Para. It was of a light straw-colour, very fluid, and possessed of the pure copaiba odour. It contained 80 per cent. of volatile oil and 20 of resin, and was not affected by recently calcined magnesia. It appears to be the same with a variety described by Dr. L. Posselt, of which an account is contained in the Chemical Gazette for May 1st, 1849. The view of Prof. Procter, that it is the product of young trees in which the juice has not become fully elaborated is highly probable. As the virtues of copaiba depend mainly on the oil, this variety should be more efficacious than the copaiba in common use.—*Note to ninth edition.*

The *resinous* mass which remains after the distillation of the oil is hard, brittle, translucent, of a greenish-brown colour, and nearly destitute of smell and taste. By mixing it with the oil in proper proportion, we may obtain a liquid identical or nearly so with the original juice. When treated with the oil of petroleum, it is separated into two distinct resins, one of which is dissolved, and may be obtained separate by evaporation, the other is left behind. The first is yellowish, hard, and brittle, and constitutes by far the largest proportion of the residuum of the distillation. It appears to possess acid properties; as its alcoholic solution reddens litmus, and it forms definite compounds with the alkalies. It has therefore received the name of *copaivic acid.* The second resin is yellowish-brown, soft, unctuous, and without acid reaction; and is supposed by Berzelius to result from the resinification of the volatile oil, as it is more abundant in the old than in the recent juice. Recent copaiba examined by Gerber yielded 41 per cent. of volatile oil, 51·38 of the hard and brittle resin, 2·18 of the soft resin, and 5·44 of water; while an older specimen gave 31·07 per cent. of oil, 53·68 of hard resin, 11·15 of soft resin, and 4·10 of water.

Copaiba, upon exposure to the air, acquires a deeper colour, a thicker consistence, and greater density, and, if spread out upon an extended surface, ultimately becomes dry and brittle. This change is owing partly to the volatilization, partly to the oxidation of the essential oil. As it is the soft resin that results from the oxidation of the oil, it follows that the proportion of this resin must increase with age. Considerable diversities must, therefore, exist in the drug, both in physical properties and the proportion of its ingredients, according to its age and degree of exposure. Similar differences also exist in the copaiba procured from different sources. Thus, that of the *West Indies*, when compared with the *Brazilian*, which is the variety above described, and in common use, is of a thicker consistence, of a deeper or darker yellow colour, less transparent, and of a less agreeable, more terebinthinate odour; and specimens obtained from the ports of Venezuela or New Grenada were found, upon examination by M. Vigne, to differ from each other not only in physical properties, but also in their chemical relations. (*Journ. de Pharm.*, N. S., i. 52.) It is not impossible that differences may exist in the juice according to the circumstances of its collection. The age of the tree, its position, and the season of collection may also have some influence over the product. It is highly probable that the resinous matter results from oxidation of the oil in the cells of the plant, and that the less elaborated the juice may be, the larger proportion it will contain of the oil. It is said that a volatile oil flows abundantly from a tree near Bogota, which is employed to adulterate the copaiba collected in that neighbourhood, and shipped from Maracaibo and other neighbouring ports. (*Am. Journ. of Pharm.*, xviii. 240.)

Adulterations. Copaiba is said to be frequently adulterated; but the remark is applicable rather to the markets of Europe than to those of the United States.* The fixed oils are the most frequent addition, especially castor oil, which, in consequence of its solubility in alcohol, cannot, like the others, be detected by the agency of that fluid. Various plans have been proposed for ascertaining the presence of castor oil. The simplest is to boil a drachm of the copaiba in a pint of water, till the liquid is wholly evapo-

* We have a specimen of a substance imported into New York, under the name of *red copaiba*, which has not a single character of the genuine drug. It is of a thick semi-fluid consistence, not unlike that of balsam of Tolu as it often reaches us, a brown colour similar to that of the same balsam, though darker, and an unpleasant yet somewhat aromatic odour, recalling that of liquidamber, but less agreeable. Its origin is unknown.—*Note to the ninth edition.*

rated. If the copaiba contain a fixed oil, the residue will be more or less soft, according to the quantity present; otherwise it will be hard. Another mode, proposed by M. Planche, consists in shaking together in a bottle one part of solution of ammonia of the sp. gr. 0·9212 (22° Baumé) with two and a half parts of copaiba, at a temperature of from 50° to 60° F. The mixture, at first cloudy, quickly becomes transparent if the copaiba is pure, but remains more or less opaque if it is adulterated with castor oil. According to J. E. Simon, however, a variety of genuine copaiba sometimes occurs in commerce, in which this test fails (*Am. Journ. of Pharm.*, xvi. 236); and it does not apply to the variety containing 80 per cent. of volatile oil described by Professor Procter. (See note, p. 287.) Carbonate of magnesia, caustic potassa, and sulphuric acid have also been proposed as tests. In the Edinburgh Pharmacopœia, it is stated that copaiba "dissolves a fourth part of its weight of carbonate of magnesia, with the aid of a gentle heat, and continues translucent." The presence of a small proportion of any fixed oil renders the mixture opaque. One part of potassa dissolved in two of water forms a clear solution with nine parts of pure copaiba, and the liquid continues clear when moderately diluted with water or alcohol; but the presence of one-sixth of fixed oil in the copaiba occasions more or less opacity in the liquid, and half the quantity causes the precipitation of white flakes in a few hours. (Stolze.) Turpentine, which is said to be sometimes added to copaiba, may be detected by its smell, especially if the copaiba be heated. According to Mr. Redwood, most of the proposed tests of the purity of copaiba are liable to fallacy; and the best measure of its activity is the quantity of volatile oil it affords by distillation.

Medical Properties and Uses. Copaiba is gently stimulant, diuretic, laxative, and in very large doses often actively purgative. It produces, when swallowed, a sense of heat in the throat and stomach, and extends an irritant action, not only throughout the alimentary canal, but also to the urinary passages, and in fact, in a greater or less degree, to all the mucous membranes, for which it appears to have a strong affinity. The urine acquires a peculiar odour during its use, and its smell may be detected in the breath. It sometimes occasions an eruption upon the skin, resembling that of measles, and attended with a disagreeable itching and tingling sensation. Nausea and vomiting, painful purgation, strangury and bloody urine, and a general state of fever are among the morbid results of its excessive action. As a remedy it has been found most efficient in diseases of the mucous membranes, particularly those of a chronic character. Thus, it is given with occasional advantage in leucorrhœa, gleet, chronic dysentery and diarrhœa, painful hemorrhoidal affections, and chronic bronchitis. By Dr. La Roche, of Philadelphia, it is highly recommended in catarrh of the bladder, and in chronic irritation of the same organ. (*Am. Journ. of Med. Sci.*, xiv. 13.) It has been given in dropsy, and is said to be used as a vermifuge in Brazil. The complaint, however, in which it is most employed is gonorrhœa. It is given in all stages of the disorder; but caution is requisite when the inflammatory symptoms are high. Even in health, if taken largely, it sometimes produces very unpleasant irritation of the urinary passages, and, by sympathy, of the testicles. It was formerly much esteemed as a vulnerary, and as an application to ulcers; but is now seldom used externally. Dr. Ruschenberger recommends it as a local application in chilblains. (*Med. Examiner*, i. 77.)

The dose of copaiba is from twenty drops to a fluidrachm three times a day, or a smaller quantity repeated more frequently. It may be given dropped on sugar; but in this form is often so exceedingly offensive, as to render some concealment of its nauseous qualities necessary. It is sometimes given floating on the surface of an aromatic water, or mixed with an equal measure of

spirit of nitric ether. A less disagreeable form is that of emulsion, prepared by rubbing the copaiba first with mucilage or the yolk of an egg, and sugar, and afterwards with some aromatic water, as that of mint or cinnamon. The *volatile oil*, which is the active ingredient of copaiba, may be given in the dose of ten or fifteen drops, either upon sugar, or in the form of emulsion. The resin, which has been proposed as a substitute, is nearly inert. The pills made with magnesia may sometimes be resorted to with advantage; and it is customary to administer copaiba enclosed in capsules of gelatin, which cover the taste, while they readily dissolve in the stomach. (See *Glue, in the Appendix.*) Velpeau has found the best effects from copaiba in the form of enema. He gives two drachms made into an emulsion with the yolk of an egg, twenty or thirty drops of laudanum, and eight fluidounces of water.

Off. Prep. Oleum Copaibæ; Pilulæ Copaibæ. W.

COPTIS. *U. S. Secondary.*

Goldthread.

The root of Coptis trifolia. *U. S.*

Coptis. *Sex. Syst.* Polyandria Polygynia.—*Nat. Ord.* Ranunculaceæ.

Gen. Ch. Calyx none. *Petals* five or six, caducous. *Nectaries* five or six, cucullate. *Capsules* five to eight, stipitate, stellately diverging, and rostrate, many-seeded. *Nuttall.*

Coptis trifolia. Bigelow, *Am. Med. Bot.* i. 60; Barton, *Med. Bot.* ii. 97. This little evergreen has a perennial creeping root, the slenderness and bright yellow colour of which have given rise to the name of *goldthread*, by which the plant is commonly known. The caudex from which the petioles and flower-stems proceed, is invested with ovate, acuminate, yellowish, imbricated scales. The leaves, which stand on long slender footstalks, are ternate, with firm, rounded or obovate, sessile leaflets, having an acute base, a lobed and acuminately crenate margin, and a smooth veined surface. The scape or flower-stem is slender, round, rather longer than the leaves, and surmounted by one small white flower, with a minute mucronate bracte beneath it. The petals are oblong, concave, and of a white colour; the nectaries inversely conical, hollow, and yellow at the top. The stamens have capillary filaments and globose anthers. The germs are from five to eight, stipitate, oblong, compressed, and surmounted by short recurved styles, with acute stigmas. The capsules, which diverge in a star-like form, are pedicelled, compressed, beaked, and contain numerous black seeds attached to the inner side.

The goldthread inhabits the northern regions of this continent and of Asia, and is found in Greenland and Iceland. It delights in the dark shady swamps and cold morasses of northern latitudes and Alpine regions, and abounds in Canada, and in the hilly districts of New England. Its blossoms appear in May. All parts of the plant possess more or less bitterness; but this property is most intense in the root, which is the only officinal portion.

Dried goldthread, as brought into the market, is in loosely matted masses, consisting of the long, thread-like, orange-yellow roots, frequently interlaced, and mingled with the leaves and stems of the plant. It is without smell, and has a purely bitter taste, unattended with aroma or astringency. It imparts its bitterness and yellow colour to water and alcohol, but most perfectly to the latter, with which it forms a bright yellow tincture. The infusion is precipitated by nitrate of silver and acetate of lead. (*Bigelow.*) It affords no evidence of containing either resin, gum, or tannin.

Medical Properties and Uses. Goldthread is a simple tonic bitter, bearing a close resemblance to quassia in its mode of action, and applicable to all

cases in which that medicine is prescribed; though, from its higher price, not likely to come into general use as a substitute. In New England it is much employed as a local application in aphthous ulcerations of the mouth; but it probably has no other virtues in this complaint than such as are common to the simple bitters. It may be given in substance, infusion, or tincture. The dose of the powder is from ten to thirty grains, of a tincture made with an ounce of the root to a pint of diluted alcohol, one fluidrachm.

Another species of Coptis has been described by Dr. Wallich, under the name of *Coptis Teeta*, which grows in the mountainous regions bordering on Assam, and is much used as a tonic by the people of that country and by the Chinese. It appears to be closely analogous in properties to C. trifolia. (*Am. Journ. of Pharm.*, ix. 196.) W.

CORIANDRUM. *U. S., Lond., Ed.*

Coriander.

The fruit of Coriandrum sativum. *U. S., Lond., Ed.*

Off. Syn. CORIANDER. The seeds of Coriandrum Sativum. *Dub.*

Coriandre, *Fr.;* Koriander, *Germ.;* Coriandro, *Ital.;* Cilantro, *Span.*

CORIANDRUM. *Sex. Syst.* Pentandria Digynia. — *Nat. Ord.* Apiaceæ or Umbelliferæ.

Gen. Ch. Corolla radiate. *Petals* inflex-emarginate. *Universal involucre* one-leafed. *Partial involucres* halved. *Fruit* spherical. *Willd.*

Coriandrum sativum. Willd. *Sp. Plant.* i. 1448; Woodv. *Med. Bot.* p. 137, t. 53. This is an annual plant, with an erect, round, smooth, branching stem, which rises about two feet in height, and is furnished with compound leaves, of which the upper are thrice ternate, with linear pointed leaflets, the lower pinnate, with the pinnæ cut into irregular serrated lobes, resembling those of common parsley. The flowers are white or rose-coloured, and disposed in compound terminal umbels. The fruit is globular, and consists of two concave hemispherical portions.

C. sativum is a native of Italy, but at present grows wild in most parts of Europe, having become naturalized in consequence of its extended cultivation. The flowers appear in June, and the fruit ripens in August. It is a singular fact, that all parts of the fresh plant are extremely fetid when bruised, while the fruit becomes fragrant by drying. This is the officinal portion. It is brought to us from Europe.

The fruit of the coriander, as found in the shops, is globular, about the eighth of an inch in diameter, obscurely ribbed, of a grayish or brownish-yellow colour, and separable into the two portions (half-fruits) of which it consists. It has the persistent calyx at its base, and is sometimes surmounted by the adhering style. The smell and taste are gratefully aromatic, and depend on a volatile oil, which may be obtained separate by distillation, and is said to belong to the camphene family. (*Am. Journ. of Pharm.*, xxv. 131.) They are imparted to alcohol by maceration, and less readily to water.

Medical Properties and Uses. Coriander has, in a moderate degree, the ordinary medicinal virtues of the aromatics. It is almost exclusively employed in combination with other medicines, either to cover their taste, to render them acceptable to the stomach, or to correct their griping qualities. It was well known to the ancients. The dose is from a scruple to a drachm.

Off. Prep. Confectio Sennæ; Infusum Gentianæ Compositum; Infusum Sennæ; Infusum Sennæ Compositum; Tinctura Rhei et Sennæ; Tinctura Sennæ et Jalapæ. W.

CORNU. *Lond., Ed.*

Hartshorn.

Horn of Cervus Elaphus. *Ed., Lond.*

Corne de cerf, *Fr.;* Hirschhorn, *Germ.;* Corno di cervo, *Ital.;* Cuerno de ciervo, *Span.*

The stag or hart—*Cervus Elaphus*—the horns of which are directed by the British Colleges, inhabits Europe, Asia, and the north of Africa. Those of our own common deer—*Cervus Virginianus*—though employed in the arts, are not officinal. Hartshorn is usually imported into this country from Germany, in the state of shavings, but is very little employed.

Hartshorn shavings are without smell and taste, pliable, and of an ivory yellow colour. According to M. Merat-Guillot, they contain in 100 parts, 27 of gelatin, 57·5 of phosphate of lime, 1 of carbonate of lime, and 14·5 of water including the loss. Boiling water extracts their gelatin, forming a transparent, colourless jelly, which may be rendered palatable by the addition of sugar, lemon or orange juice, and a little wine. To prepare it, two pints of water are boiled with four ounces of the shavings to a pint, and the residue strained while hot. The liquid gelatinizes upon cooling. By destructive distillation, the shavings yield an impure solution of carbonate of ammonia, which was formerly called *spirit of hartshorn;* and the same name has been applied to similar ammoniacal solutions from other sources.

Cornu Ustum. *Lond. Burnt Hartshorn.* The directions formerly given by the London College for the preparation of this substance were, to "burn pieces of Hartshorn in an open vessel until they are thoroughly white; then powder them, and prepare them in the manner directed for Chalk." The horn must not only be heated, but also burnt, in order that the animal matter may be entirely consumed. The operation may be performed in a common furnace or stove, the air being freely admitted. Care should be taken that the heat be not too great; as otherwise the external surface of the horn may become vitrified, and prevent the complete combustion of the interior portion, while it is itself rendered less fit for use. Burnt hartshorn consists of bone-phosphate of lime, with about one per cent. of free lime derived from the carbonate contained in the horns. Calcined bone is usually sold in the shops for burnt hartshorn. For the chemical characters of bone-phosphate of lime, see *Calcis Phosphas Præcipitatum.*

Medical Properties and Uses. The opinion formerly entertained that burnt hartshorn was antacid, has been abandoned since the discovery of its chemical nature. Its composition suggested its application to the cure of rachitis and mollities ossium, of which the prominent character is a deficiency of phosphate of lime in the bones; and it is said to have been employed in some cases, in connexion with phosphate of soda, with apparent success. Experience, however, has not confirmed the first report in its favour. It is probably altogether inert. The dose is twenty grains or more. The jelly prepared from the shavings of hartshorn has been thought to possess medical virtues; but it is only nutritive and demulcent, and is probably not superior to calfsfoot jelly. The shavings themselves are used in the preparation of the Pulvis Antimonialis.

Off. Prep. Pulvis Antimonialis. W.

CORNUS CIRCINATA. *U. S. Secondary.*

Round-leaved Dogwood.

The bark of Cornus circinata. *U. S.*

Cornus. *Sex. Syst.* Tetrandria Monogynia.—*Nat. Ord.* Cornaceæ.

Gen. Ch. Involucre usually four-leaved. *Petals* superior, four. *Drupe* with a two-celled nut. *Willd.*

We have ten indigenous species of Cornus, all of which are supposed to possess similar medical properties; and three—*C. Florida, C. circinata,* and *C. sericea*—are noticed in the Pharmacopœia of the United States. The last two are placed in the secondary list, not because they are esteemed less efficient than the first, but because they have hitherto less attracted the attention of the profession.

Cornus circinata. Willd. *Sp. Plant.* i. 663. This is a shrub from six to ten feet high, with warty branches, large, roundish, pointed leaves, waved on their edges and downy beneath, and white flowers disposed in depressed cymes. The fruit is blue. The plant is a native of the United States, extending from Canada to Virginia, and growing on hill-sides and the banks of rivers. It flowers in June and July.

The bark, when dried, is in quills of a whitish or ash colour, and affords a powder resembling that of ipecacuanha. Its taste is bitter, astringent, and aromatic. In chemical composition, so far as this has been ascertained, it is analogous to Cornus Florida. It possesses also similar medical virtues, and may be employed in the same doses. It has been much used as a tonic and astringent in Connecticut, and was highly extolled by the late Dr. Ives, of New York, who recommended, as the most eligible preparation, an infusion made by pouring a pint of boiling water on an ounce of the coarsely powdered bark. The dose of this is from one to two fluidounces. W.

CORNUS FLORIDA. *U. S.*

Dogwood.

The bark of Cornus Florida. *U. S.*

Cornus. See CORNUS CIRCINATA.

Cornus Florida. Willd. *Sp. Plant.* i. 661; Bigelow, *Am. Med. Bot.* ii. 73; Barton, *Med. Bot.* i. 44. This is a small indigenous tree, usually about fifteen or twenty feet in height, though sometimes not less than thirty or thirty-five feet. It is of slow growth; and the stem, which generally attains a diameter of four or five inches, is compact, and covered with a brownish bark, the epidermis of which is minutely divided by numerous superficial cracks or fissures. The branches are spreading, and regularly disposed, sometimes opposite, sometimes in fours nearly in the form of crosses. The leaves are opposite, oval, about three inches long, pointed, dark-green and sulcated on the upper surface, glaucous or whitish beneath, and marked with strong parallel veins. Towards the close of summer they are speckled with black spots, and on the approach of cold weather become red. The proper flowers are small, yellowish, and collected in heads, which are surrounded by a large conspicuous involucre, consisting of four white obcordate leaves, having the notch at their summit tinged with red or purple. This involucre constitutes the chief beauty of the tree when in flower. The calyx is four-toothed, and the corolla composed of four obtuse reflexed petals. The fruit is an oval drupe of a vivid glossy redness, containing a two-celled and two-seeded nucleus. The drupes are usually associated together to the number of three or four, and remain on the tree till after the early frosts. They ripen in September.

The dogwood is found in all parts of the United States, from Massachusetts to the Mississippi and the Gulf of Mexico; but is most abundant in the Middle States. In the month of May, it is clothed with a profusion of large white blossoms, which render it one of the most conspicuous ornaments of the American forests. The bark is the officinal portion, and is derived for use both

from the stem and branches, and from the root. The bark of the root is preferred. It is brought into market in pieces of various sizes, usually more or less rolled, sometimes invested with a fawn-coloured epidermis, sometimes partially or wholly deprived of it, of a reddish-gray colour, very brittle, and affording, when pulverized, a grayish powder tinged with red. The odour of dogwood is feeble, its taste bitter, astringent, and slightly aromatic. Water and alcohol extract its virtues. It has not been accurately analyzed; but, from the experiments of Dr. Walker and others, appears to contain extractive matter, gum, resin, tannin, and gallic acid. A peculiar bitter principle, for which the name of *cornine* was proposed, was announced as an ingredient by Mr. Carpenter; but we need more definite information on the subject. The flowers of *C. Florida* have the same bitter taste as the bark, and, though not officinal, are sometimes employed for the same purposes.

Medical Properties and Uses. Cornus Florida is tonic and astringent. By Dr. Walker it was found, when taken internally, to augment the force and frequency of the pulse, and increase the heat of the body. It is thought to possess remedial properties analogous to those of Peruvian bark, for which it has occasionally been successfully substituted in the treatment of intermittent fevers; but the introduction of sulphate of quinia into use has nearly banished this, as well as many other substitutes for cinchona, from regular practice. The dogwood has also been employed in low fevers, and other complaints for which Peruvian bark is usually prescribed.

It may be given in powder, decoction, or extract. The dose of the powder is from a scruple to a drachm, repeated, in cases of intermittent fever, so that from one to two ounces may be taken in the interval between the paroxysms. The decoction is officinal. (See *Decoctum Cornûs Floridæ.*) The dried bark is said to be preferable to the fresh; as it possesses all the activity of the latter, without being equally liable to offend the stomach and bowels. An extract might probably be used with advantage in intermittents in large doses.

Off. Prep. Decoctum Cornûs Floridæ. W.

CORNUS SERICEA. *U. S. Secondary.*

Swamp Dogwood.

The bark of Cornus sericea. *U. S.*

Cornus. See CORNUS CIRCINATA.

Cornus sericea. Willd. *Sp. Plant.* i. 663; Barton, *Med. Bot.* i. 115. This species of Cornus is usually six or eight feet in height, with numerous erect stems, which are covered with a shining reddish bark, and send out opposite spreading branches. The young shoots are more or less pubescent. The leaves are opposite, petiolate, ovate, pointed, entire, and on the under surface covered with soft brownish hairs. The flowers are small, white, and disposed in terminal cymes, which are depressed and woolly. The fruit consists of globular, berry-formed drupes, of a cerulean blue colour, and collected in bunches.

The swamp dogwood inhabits the United States from Canada to Carolina, and is found in moist woods, in swamps, and on the borders of streams. It flowers in June and July. The bark was ascertained by Dr. Walker to have the same medical properties as that of Cornus Florida. It may be given in the same doses, and administered in a similar manner. W.

COTULA. *U. S. Secondary.*

Mayweed.

The herb of Anthemis Cotula. *U. S.*

Camomille puante, Maroute, *Fr.;* Hunds-Kamille, Stinkende-Kamille, *Germ.;* Camomilla fetida, Cotula, *Ital.;* Manzanilla loca, *Span.*

ANTHEMIS. See ANTHEMIS.

Anthemis Cotula. Willd. *Sp. Plant.* iii. 2181; Barton, *Med. Bot.* i. 161. The mayweed is an annual plant, with a fibrous root, and an erect striated stem, very much branched even to the bottom, from one to two feet in height, and supporting alternate, sessile, flat, doubly pinnated, somewhat hairy leaves, with pointed linear leaflets. The flowers stand singly upon the summits of the branches, and consist of a central, convex, golden yellow disk, with white radial florets, which spread horizontally during the day, but are reflexed or bent towards the stem at night. The calyx, which is common to all the florets, is hemispherical, and composed of imbricated hairy scales. The receptacle is conical or nearly cylindrical, and surmounted by rigid, bristle-shaped paleæ, shorter than the florets. The seeds are naked.

This plant grows abundantly both in the United States and in Europe. In this country it is found in the vicinity of inhabited places, growing among rubbish, along the sides of roads, and in waste grounds. Notwithstanding its extensive diffusion, it is generally believed to be a naturalized, not an indigenous plant. It is frequently called *wild chamomile.* It flowers from the middle of summer till late in autumn.

The whole plant has a strong, disagreeable smell, and a warm, bitter taste, and imparts these properties to water.

The medical properties of this species of Anthemis are essentially the same as those of chamomile, for which it may be employed as a substitute; but its disagreeable odour is an obstacle to its general use. On the continent of Europe it has been given in nervous diseases, especially hysteria, under the impression, probably derived from its peculiar smell, that it possesses antispasmodic powers. It has also been thought to be emmenagogue. It is said to have the property of vesicating, if applied to the surface fresh and bruised. In this country it is scarcely employed, except as a domestic remedy. The whole plant is active; but the flowers, being less disagreeable than the leaves, are preferred for internal use. The remedy is best administered in the state of infusion. W.

CREASOTUM. *U. S., Lond., Ed., Dub.*

Creasote.

A peculiar substance obtained from tar. *U. S.* An oxy-hydro-carburet, prepared from pyroxylic oil. *Lond.*

This is a substance of the nature of the volatile oils, discovered in 1830 by Dr. Reichenbach in the products of the distillation of wood. M. Deville conceives that it is a volatile oil, derived by heat from the resin of wood, and isomeric with the original volatile oil, from which the resin is supposed to have been formed by a slow alteration occurring in the vegetable. It may, therefore, be classed with the volatile oils which are regenerated by distillation.

In the products of the distillation of organic substances generally, whether vegetable or animal, Reichenbach also discovered five other principles, called paraffine, eupione, picamar, capnomor, and pittacal, which, as being associated with creasote, will be here briefly described. *Paraffine* is a white, crystalline, soft solid, devoid of taste and smell, and characterized by its feeble affinity for other bodies, as is indicated by its name, from *parum affinis. Eupione* is an inodorous, insipid, limpid, and colourless liquid, of the sp. gr. 0·740, obtained most abundantly from animal tar and Dippel's animal oil. Both these substances are composed exclusively of carbon and hydrogen. *Picamar*

is a colourless, oily liquid, heavier than water, of a peculiar odour and very bitter taste. It is present in the heaviest portion of the rectified oil of tar, and constitutes the bitter principle of that substance. *Capnomor*, so called from its being one of the ingredients of smoke, is a colourless liquid, lighter than water, having a pleasant odour and a pungent taste, and occurring in the heavy oil of tar. It has the property of dissolving caoutchouc, and is an ingredient in coal naphtha, which owes to its presence the property of dissolving that substance. *Pittacal*, also obtained from the heavy oil of tar, is a solid of a beautiful blue colour, differing from the other substances above noticed in containing nitrogen as one of its elements.

Preparation. Creasote is obtained either from wood tar or from crude pyroligneous acid. When wood tar is used, it is distilled until it has attained the consistence of pitch. The distilled liquid divides itself into three layers, an aqueous between two oily layers. The inferior oily layer, which alone contains the creasote, is separated, and saturated with carbonate of potassa to remove acetic acid. The liquid is allowed to rest, and the new oil which separates is decanted from it. This oil is distilled, and yields products lighter than water, and a liquid heavier. The latter alone is preserved, and, having been agitated repeatedly with weak phosphoric acid to neutralize ammonia, is allowed to remain at rest for some time. It is next washed as long as acidity is removed, and then distilled with a fresh portion of weak phosphoric acid, care being taken to cohobate from time to time. The oily liquid thus rectified is colourless, and contains much creasote, but also a portion of eupione. To separate the latter, the liquid is mixed with a solution of caustic potassa of the density of 1·12, which dissolves the creasote, but not the eupione. The eupione, which swims above from its levity, being separated, the alkaline solution of the creasote is exposed to the air, until it becomes brown in consequence of the decomposition of a foreign matter, and is then saturated with sulphuric acid. This sets free the creasote, which is decanted and again distilled. The treatment by solution of potassa, sulphuric acid, &c., is to be repeated until the creasote no longer becomes brown by exposure to the air, but only slightly reddish. It is then dissolved in a stronger solution of potassa and distilled again, and finally redistilled for the last time, rejecting the first portion which comes over on account of its containing much water, collecting the next portion, and avoiding to push the distillation too far. The product collected in this distillation is pure creasote.

When creasote is extracted from pyroligneous acid, the first step is to dissolve sulphate of soda in it to saturation. The oil which separates and swims above is decanted, and, having been allowed to remain at rest for a few days, is saturated by carbonate of potassa with the assistance of heat, and distilled with water. The oleaginous liquid obtained is of a pale-yellow colour, and is to be treated with phosphoric acid, &c. &c., as above detailed with respect to the treatment of the corresponding oil obtained from tar.

According to M. Koene, the tar of the pine furnishes but little pure creasote; while coal tar yields nearly five drachms to the pint. Some object to the use of coal tar, as affording a product, mentioned further on, called phenylic acid, which closely resembles creasote, or, at least, as furnishing a creasote, contaminated with this acid.

Properties. Creasote, when pure, is a colourless oleaginous liquid, of the consistence of oil of almonds, slightly greasy to the touch, volatilizable by heat, and having a caustic, burning taste, and a penetrating, disagreeable odour, like that of smoked meat. As met with in the shops, it has frequently a brownish tinge. It burns with a sooty flame. Applied to the skin in a concentrated state, it corrugates and then destroys the cuticle. On

paper it leaves a greasy stain, which disappears in a few hours, or in ten minutes when exposed to a heat of about 212°. Its sp. gr. is 1·037 (1·046 *Lond.*, 1·066 *Ed.*, *Dub.*). It boils at 397°, and retains its fluidity at 17° below zero. It is a non-conductor of electricity, and a powerful refractor of light. It is devoid of acid or alkaline reaction. Mixed with water, it forms two solutions — one consisting of 1 part of creasote in about 80 of water, the other, of 1 part of water in 10 of creasote. (*Berzelius.*) It unites in all proportions with alcohol, ether, naphtha, and bisulphuret of carbon. It is capable of dissolving a large proportion of iodine and phosphorus, and a considerable amount of sulphur, especially when assisted by heat.

Creasote forms two combinations with potassa; one anhydrous, of an oleaginous consistence, the other, hydrated, and in the form of small, white, pearly scales. It forms similar compounds with soda. From these combinations and its elementary analysis, its formula is deduced to be $C_{28}H_{16}O_4$. Creasote instantly dissolves ammonia, and retains it with great force. Strong nitric and sulphuric acids decompose it; the former giving rise to reddish vapours, the latter to a red colour, which becomes black on the addition of more of the acid. Dilute nitric acid converts it into a brown resin, which, treated with ammonia, and then dissolved in boiling alcohol, gives, by evaporation, certain salts of ammonia, two of which contain new acids, discovered by Laurent. Muriatic acid produces no change on it. Acetic acid dissolves it in all proportions without decomposing it. Creasote dissolves a large number of metallic salts, and reduces a few to the metallic state; as, for example, nitrate and acetate of silver. It acts powerfully in coagulating albumen.

Of all the properties of creasote, the most remarkable is its power of preserving meat. It is this property which has suggested its name, derived from κρεὰς *flesh*, and σώζω *I save*.

Impurities and Adulterations. Creasote is apt to contain eupione, picamar, and capnomor, and is sometimes adulterated with rectified oil of tar, and the fixed and volatile oils. All these substances are detected by strong acetic acid, which dissolves the creasote, and leaves them behind, floating above the creasote solution. Fixed oils are also discovered by a stain on paper, not discharged by heat. Any trace of the matter which produces the brownish tinge (see *page* 296), is detected by the liquid becoming discoloured by exposure to sunshine.

Creasote, when obtained from coal tar, is apt to be contaminated with *phenylic acid* (*carbolic acid*, hydrated oxide of phenyle, $C_{12}H_5,O+HO$), one of the products of the distillation of the oil of coal tar. Indeed, it is said that phenylic acid has been sold for creasote, which it closely resembles in properties. This substitution may be discovered by the lower boiling point of phenylic acid (368° F.). The presence of phenylic acid in creasote is detected by the addition of sesquichloride of iron, which causes a violet-blue colour, if this impurity be present. According to Mr. Edward N. Kent, of New York, phenylic acid from coal tar, and creasote from wood tar are essentially the same; the former being a purer state of the latter. (*New York Journal of Pharmacy*, Oct. 1853.) This view is contradicted by the results of Gorup-Besanez, who obtained creasote which did not respond to the tests of phenylic acid.

Medical Properties, &c. Creasote is irritant, narcotic, styptic, antiseptic, and moderately escharotic. Internally it has been employed in a number of diseases; externally, for the most part, as an application to eruptions, wounds, and ulcers, and as an injection and gargle. Dr. R. Dick, of Glasgow, recommends it as an internal remedy in chronic gonorrhœa and gleet. Dr. Elliotson, of London, considers it an important remedy in arresting nausea and vomit-

ing, when not dependent on inflammation or structural disease of the stomach, as in hysteria and pregnancy. Both he and Mr. A. B. Maddock, of London, recommend it as a preventive of sea-sickness. Mr. Kesteven, of England, found it a very useful remedy in diarrhœa; and Dr. T. M. Woodson, of Tenn., and Mr. B. W. Richardson, of Glasgow, confirm this statement. Dr. D. J. Cain used it with advantage in cholera morbus and cholera infantum, either alone, or conjoined with charcoal, chalk, or bicarbonate of soda.

The eruptions, to the treatment of which creasote has been supposed to be best suited, are those of a scaly character. In burns its efficacy has been insisted on, especially in those attended with excessive suppuration and fungous granulations. In chilblains also it is stated to be a useful application. When applied to wounds it acts as a styptic, stopping the capillary hemorrhage, but possesses no power to arrest the bleeding from large vessels. Accordingly, creasote water has been applied locally to arrest uterine hemorrhage, and the bleeding from leech-bites. The ulcers, in the treatment of which it has been found most useful, are those of an indolent and gangrenous character, in which its several properties of escharotic, stimulant, and antiseptic are usefully brought into play. It is also praised as an application to syphilitic, scrofulous, and cancerous ulcers. In all these cases, the remedy should be applied with judgment; and, in case it should irritate, its use must be suspended, or alternated with that of emollient and soothing applications. Injected into fistulous ulcers, it proves a useful resource, by exciting the callous surfaces and disposing them to unite. Dr. Hildreth, of Zanesville, Ohio, found it efficacious, mixed with mercurial ointment, in the proportion of ten to thirty drops to the ounce, in scrofulous ophthalmia, and scrofulous ulceration of the cornea. A small portion of the ointment is introduced under the upper eyelid, morning and evening, and rubbed over the whole globe. The application should be strong enough to produce a smarting pain for about five minutes. The local must of course be combined with constitutional treatment. (*Am. Journ. of Med. Sci.*, Oct. 1842, p. 362.) In cases of putrid sorethroat, in which the use of a stimulant and antiseptic is required, a gargle of creasote acts beneficially; and in chronic suppuration of the external meatus of the ear, the same properties make it valuable as an injection. In deafness arising from deficient cerumen, Mr. Curtis has found it useful. The meatus is first well cleansed, and afterwards brushed over, night and morning, with a mixture of a drachm of creasote to four drachms of oil of almonds, by means of a camel's hair brush. Dr. Partridge, of this city, has found the same treatment advantageous in several cases of deafness. The meatus may be cleansed by dropping into the ear at night a few drops of olive oil, and syringing it out the next morning with a weak and warm solution of castile soap, to which a sixth of Cologne water has been added. This may be repeated five or six days, until the ear is thoroughly cleansed. (*Med. Exam.*, iii. 347.) In toothache, depending on destruction of the tooth and exposure of the nerve, creasote often acts promptly and radically in the removal of the pain. One or two drops of the pure substance must be carefully introduced into the hollow of the tooth, on a little cotton, avoiding contact with the tongue or cheek. To render the remedy effectual, the hollow of the tooth must be well cleaned out before it is applied.

Creasote is employed in the pure state, in mixture or solution, and in the form of ointment. (See *Mistura Creasoti* and *Unguentum Creasoti*.) In the pure state, it may be brushed over indolent or ill conditioned ulcers, or applied to them by means of lint, to arouse their sensibility, or to create a new action. Internally it is given in the dose of from one to two drops or more, repeated several times a day, diluted with weak mucilage, in the proportion of

half a fluidounce to the drop. When used as a lotion for eruptions, ulcers, or burns, or as a gargle or injection, it is employed in solution, containing two, four, or six drops to the fluidounce of distilled water; the strength being determined by the circumstances of each particular case. In some cases the solution of creasote is used externally, mixed with poultices.

Creasote, in an overdose, acts as a poison. It produces giddiness, obscurity of vision, depressed action of the heart, convulsions, and coma. No antidote is known. The medical treatment consists in the evacuation of the poison, and the administration of ammonia and other stimulants.

The addition of three or four drops of creasote to a pint of ink is said effectually to prevent its becoming mouldy. Dr. Christison finds that creasote water is as good a preservative of some anatomical preparations as spirit, with the advantage of not hardening the parts. It is to creasote that the antiseptic properties of wood-smoke and of pyroligneous acid are probably due.

Off. Prep. Mistura Creasoti; Unguentum Creasoti. B.

CRETA. *U. S., Ed., Dub.*

Chalk.

Native friable carbonate of lime. *U. S., Ed.*

Craie, *Fr.;* Kreide, *Germ.;* Creta, *Ital.;* Greda, *Span., Port.*

Carbonate of lime, in the extended meaning of the term, is the most abundant of simple minerals, constituting, according to its state of aggregation and other peculiarities, the different varieties of calcareous spar, common and shell limestone, marble, marl, and chalk. It occurs also in the animal kingdom, forming the principal part of shells, and a small proportion of the bones of the higher orders of animals. It is present in small quantity in most natural waters, being held in solution by the carbonic acid which they contain. In the waters of limestone districts, it is a very common impregnation, and causes purging in those not accustomed to their use. In all such cases, boiling the water, by expelling the carbonic acid, causes the carbonate to be deposited. (See *page* 109.) Besides being officinal in the state of chalk, carbonate of lime is also ordered as it exists in marble and oyster-shell, and as obtained by precipitation. (See *Marmor*, *Testa*, and *Calcis Carbonas Præcipitatum.*) In the present article we shall confine our observations to chalk.

Localities. Chalk occurs abundantly in the South of England and North of France. It has not been found in the United States. It occurs massive in beds, and very frequently contains nodules of flint, and fossil remains of land and marine animals.

Properties. Chalk is an insipid, inodorous, insoluble, opaque, soft solid, generally white, but grayish-white when impure. It is rough to the touch, easily pulverized, and breaks with an earthy fracture. It soils the fingers, yields a white trace when drawn across an unyielding surface, and when applied to the tongue adheres slightly. Its sp. gr. varies from 2·3 to 2·6. It is never a perfectly pure carbonate of lime; but contains, besides gritty siliceous particles, small portions of alumina and of oxidized iron. If pure it is entirely soluble in muriatic acid; but usually a little silica is left. If the muriatic solution is not precipitated by ammonia, it is free from alumina and iron. Like all carbonates it effervesces with acids. Though insoluble in water, it dissolves in an excess of carbonic acid. It consists, like the other varieties of carbonate of lime, of one eq. of carbonic acid 22, and one of lime 28·5=50·5.

Pharm. Uses. Chalk, on account of the gritty particles which it contains, is unfit for medicinal use, until it has undergone levigation, when it is called

prepared chalk. (See *Creta Præparata.*) It is used in the preparation of the alkaline bicarbonates, to furnish a stream of carbonic acid, when decomposed by a dilute acid; as in the Dublin processes for bicarbonate of potassa and bicarbonate of soda.

Off. Prep. Ammoniæ Carbonas; Calcii Chloridum; Creta Præparata; Potassæ Bicarbonas; Sodæ Bicarbonas. B.

CROCUS. *U. S., Lond., Ed., Dub.*

Saffron.

The stigmas of Crocus sativus. *U. S., Lond., Ed., Dub.*

Safran, *Fr., Germ.;* Zafferano, *Ital.;* Azafran, *Span.*

Crocus. *Sex. Syst.* Triandria Monogynia.—*Nat. Ord.* Iridaceæ.

Gen. Ch. Corolla six parted, equal. *Stigmas* convoluted. *Willd.*

Crocus sativus. Willd. *Sp. Plant.* i. 194; Woodv. *Med. Bot.* p. 763, t. 259. The common cultivated saffron is a perennial plant, with a rounded and depressed bulb or cormus, from which the flower rises a little above the ground upon a long, slender, white, and succulent tube. The flower is large, of a beautiful lilac or bluish-purple colour, and makes its appearance in September or October. The leaves are radical, linear, slightly revolute, dark-green upon their upper surface with a white longitudinal furrow in the centre, paler underneath with a prominent flattened midrib, and enclosed at their base, together with the tube of the corolla, in a membranous sheath, from which they emerge soon after the appearance of the flower. The style hangs out on one side between two segments of the corolla, and terminates in three long convoluted stigmas, which are of a rich orange colour, highly odorous, rolled in at the edges, and notched at the summit. These stigmas are the officinal part of the plant.

C. sativus, or *autumnal crocus*, is a native of Greece and Asia Minor, where it has been cultivated from the earliest ages. It is also cultivated for medicinal use in Sicily, Spain, France, England, and other temperate countries of Europe. Large quantities of saffron are raised in Egypt, Persia, and Cashmere, whence it is sent to India. We cultivate the plant in this country chiefly, if not solely, as a garden flower. It is liable to two diseases, which sometimes interfere with the success of its culture; one dependent on a parasitic fungus which attaches itself to the bulb, the other called by the cultivators in France *tacon*, by which the bulb is converted into a blackish powder. (*Journ. de Pharm. et de Chim.*, xviii. 41.)

In England the flowers appear in October, and the leaves continue green through the winter; but the plant does not ripen its seed, and is propagated by offsets from the bulb. These are planted in grounds prepared for the purpose, and are arranged either in rows, or in small patches at certain distances. The flowers are gathered soon after they show themselves, as the period of flowering is very short. The stigmas, or summits of the pistils, together with a portion of the style, are separated from the remainder of the flower, and carefully dried by artificial heat, or in the sun. During this process, they are sometimes made to assume the form of a cake by pressure; but the finest saffron is that which has been dried loosely. The two forms are distinguished by the names of *hay-saffron* and *cake-saffron*. Five pounds of the fresh stigmas yield one pound of the dried. (*Duncan.*)

The English saffron, formerly most highly esteemed in this country, has disappeared from our market. What may be sold under that name is probably derived from other sources. Much of the drug is imported from Gibral-

tar, packed in canisters. Parcels of it are also brought from Trieste and other ports of the Mediterranean. The Spanish saffron is generally considered the best. Genuine *cake-saffron* is at present seldom found in commerce. According to Landerer, the stigmas of several other species besides those of C. sativus are gathered and sold as saffron in Greece and Turkey.

Properties. Saffron has a peculiar, sweetish, aromatic odour, a warm, pungent, bitter taste, and a rich deep orange colour, which it imparts to the saliva when chewed. The stigmas of which it consists are an inch or more in length, expanded and notched at the upper extremity, and narrowing towards the lower, where they terminate in a slender, capillary, yellowish portion, forming a part of the style. Analyzed by Vogel and Bouillon-Lagrange, it afforded 65·0 per cent. of a peculiar extractive matter, and 7·5 of an odorous volatile oil, together with wax, gum, albumen, saline matter, water, and lignin. The extractive was named *polychroïte*, from the changes of colour which it undergoes by the action of reagents. They prepared it by evaporating the watery infusion to the consistence of honey, digesting the residue in alcohol, filtering the tincture, and evaporating it to dryness. Thus obtained, it is in the form of a reddish-yellow mass, of an agreeable smell, slightly bitter, soluble in water and alcohol, and somewhat deliquescent. Its solution becomes grass-green by the action of nitric acid, blue and then violet by that of sulphuric acid, and loses its colour altogether on exposure to light, and by chlorine. M. Henry, sen., found it to contain about 20 per cent. of volatile oil, which could be separated only by an alkali. M. Quadrat obtained it pure by exhausting saffron with ether, then treating it with boiling water, precipitating with subacetate of lead, decomposing the compound of oxide of lead and colouring matter thus obtained with sulphuretted hydrogen, treating the precipitate with boiling alcohol, evaporating the solution, dissolving the residue in water, and lastly evaporating by means of a water-bath. Thus procured, it is of a brilliant red colour, inodorous, slightly soluble in water which it renders yellow, much more soluble by the least addition of an alkali, readily soluble in alcohol, but sparingly in ether. Its formula is $C_{20}H_{13}O_{11}$. M. Quadrat found also in saffron, a fatty matter, glucose, and a peculiar acid. (*Ann. der Chem. und Pharm.*, lxxx. 340.) According to M. Henry, the colouring principle constitutes 42 per cent. of saffron, and the essential oil 10 per cent. It is to the latter that the medicine owes its activity. It may be partially separated by distillation. It is yellow, of a hot, acrid, bitterish taste, and heavier than water, in which it is slightly soluble.

Adulterations. The high price of this medicine gives rise to frequent adulterations. Water is said to be very often added in order to increase its weight. Oil is also added for the same purpose, or to improve the appearance. Sometimes the flowers of other plants, particularly of *Carthamus tinctorius* or safflower, and of *Calendula officinalis* or officinal marygold, are fraudulently mixed with the genuine stigmas. They may be known by their shape, which is rendered obvious by throwing a portion of the suspected mass into hot water, which causes them to expand. (See *Carthamus.*) Other adulterations are the fibres of dried beef, the stamens of the Crocus distinguishable by their yellow colour, the stigmas previously exhausted in the preparation of the infusion or tincture, and various mineral substances easily detected upon close examination. J. Müller recommends concentrated sulphuric acid as the most certain test of saffron. It instantly changes the colour of pure saffron to indigo blue. (*Chem. Gaz.*, May, 1845, p. 197.)

Choice of Saffron. Saffron should not be very moist, nor very dry, nor easily pulverized, nor should it emit an offensive smell when thrown upon live coals. The freshest is the best, and that which is less than a year old

should, if possible, be selected. It should possess in a high degree the characteristic properties of colour, taste, and smell. If it does not colour the fingers when rubbed between them, or has an oily feel, or a musty flavour, or a black, yellow, or whitish colour, it should be rejected. In the purchase of this medicine in cakes, those should be selected which are close, tough, and firm in tearing; and care should be taken to avoid *cakes of safflower*.

As its activity depends, partly at least, on a volatile ingredient, saffron should be kept in well stopped vessels. Some recommended that it should be enclosed in a bladder, and introduced into a tin case.

Medical Properties and Uses. Saffron was formerly considered highly stimulant and antispasmodic. It has been alleged that, in small doses, it moderately excites the different functions, exhilarates the spirits, relieves pain, and produces sleep; in large doses, gives rise to headache, intoxication, delirium, stupor, and other alarming symptoms; and Shröder asserts that, in the quantity of two or three drachms, it proves fatal. It was thought also to act powerfully on the uterine system, promoting menstruation. The ancients employed it extensively, both as a medicine and condiment, under the name of *crocus*. It was also highly esteemed by the Arabians, and enjoyed considerable reputation among the physicians of modern Europe till within a comparatively recent period. On the continent it is still much used as a stimulant and emmenagogue. But the experiments of Dr. Alexander have proved it to possess little activity; and in Great Britain and the United States it is seldom prescribed. By old women and nurses saffron tea is frequently used in exanthematous diseases, to promote the eruption; a practice introduced by the humoral pathologists, but afterwards abandoned by the profession. The chief use of saffron at present is to impart colour and flavour to officinal tinctures. From ten to thirty grains may be given for a dose.

Off. Prep. Acetum Opii; Confectio Aromatica; Decoctum Aloës Compositum; Pilulæ Aloës et Myrrhæ; Pilula Styracis Composita; Syrupus Croci; Tinctura Aloës et Myrrhæ; Tinct. Cinchonæ Comp.; Tinct. Croci; Tinct. Opii Ammoniata; Tinct. Rhei Comp.; Tinct. Rhei et Sennæ. W.

CUBEBA. *U. S., Lond., Dub.*

Cubebs.

The berries of Piper Cubeba. *U. S.* The unripe fruit. *Lond.* The berries of Cubeba officinalis. *Dub.*

Off. Syn. CUBEBÆ. Fruit of Piper Cubeba. *Ed.*

Cubebe, *Fr.;* Kubeben, *Germ.;* Cubebe, *Ital.;* Cubebas, *Span.;* Kebabeh, *Arab.*

PIPER. *Sex. Syst.* Diandria Trigynia.—*Nat. Ord.* Piperaceæ.

Gen. Ch. Calyx none. *Corolla* none. *Berry* one-seeded. *Willd.*

Piper Cubeba. Willd. *Sp. Plant.* i. 159; Woodv. *Med. Bot.* 3d ed. v. 95. This is a climbing perennial plant, with a smooth, flexuous, jointed stem, and entire, petiolate, oblong or ovate-oblong, acuminate leaves, rounded or obliquely cordate at the base, strongly nerved, coriaceous, and very smooth. The flowers are diœcious and in spikes, with peduncles about as long as the petiole. The fruit is a globose, pedicelled berry.

This species of Piper is a native of Java, Penang, and probably other parts of the East Indies. It grows wild in the woods, and does not appear to be cultivated. The dried unripe fruit is the officinal portion. Dr. Blume thinks it probable that the drug is derived chiefly from another species, the *P. caninum*, inhabiting the same countries; but Dr. Lindley could discover no difference between the fruit of *P. Cubeba* and ordinary cubebs.

Properties. Cubebs are round, about the size of a small pea, of a blackish or grayish-brown colour, and furnished with a short stalk, which is continuous with raised veins that run over the surface of the berry, and embrace it like a network. The shell is hard, almost ligneous, and contains within it a single loose seed, covered with a blackish coat, and internally white and oleaginous. The odour of the berry is agreeably aromatic; the taste warm, bitterish, and camphorous, leaving in the mouth a peculiar sensation of coolness, like that produced by the oil of peppermint. The powder is dark coloured and of an oily aspect. From 1000 parts of cubebs M. Monheim obtained 30 parts of a ceruminous substance, 25 of a green volatile oil, 10 of a yellow volatile oil, 45 of cubebin, 15 of a balsamic resin, 10 of chloride of sodium, 60 of extractive, and 650 of lignin, with 155 parts lost. According to MM. Capitaine and Soubeiran, *cubebin* is best obtained by expressing cubebs from which the oil has been distilled, preparing with them an alcoholic extract, treating this with a solution of potassa, washing the residue with water, and purifying it by repeated crystallizations in alcohol. Thus prepared, it is white, inodorous, and insipid, not volatilizable by heat, almost insoluble in water, slightly soluble in cold alcohol, freely so in that liquid when hot, and soluble also in ether, acetic acid, and the fixed and volatile oils. It bears a close resemblance to piperin, but materially differs from it in composition, as it contains no nitrogen. (*Journ. de Pharm.*, xxv. 355.) The volatile oil is officinal. (See *Oleum Cubebæ.*) Cubebs gradually deteriorate by age, and in powder become rapidly weaker, in consequence of the escape of their volatile oil. They should be kept whole, and pulverized when dispensed. The powder is said to be sometimes adulterated with that of pimento.

Medical Properties and Uses. Cubebs are gently stimulant, with a special direction to the urinary organs. In considerable quantities they excite the circulation, increase the heat of the body, and sometimes occasion headache and giddiness. At the same time they frequently produce an augmented flow of the urine, to which they impart a peculiar odour. Among these effects are also occasionally nausea and moderate purging; and they are said to occasion a sense of coolness in the rectum during the passage of the feces. We have no evidence that they were known to the ancients. They were probably first brought into Europe by the Arabians, and were formerly employed for similar purposes with black pepper; but they were found much less powerful and fell into disuse. Some years since they were again brought into notice in England as a remedy in gonorrhœa. This application of cubebs was derived from India, where they have long been used in gonorrhœa and gleet, and as a grateful stomachic and carminative in disorders of the digestive organs. They are said to have sometimes produced swelled testicle, when given in gonorrhœa; and, though recommended in all its stages, will probably be found most safe and effectual in cases where the inflammation is confined to the mucous membrane of the urethra. If not speedily useful, they should be discontinued. They have been given also in leucorrhœa, cystirrhœa, abscess of the prostate gland, piles, and chronic bronchial inflammation. They are best administered in powder, of which the dose in gonorrhœa is from one to three drachms, three or four times a day. For other affections, the dose is sometimes reduced to ten grains. The volatile oil may be substituted, in the dose of ten or twelve drops, suspended in water by means of sugar. An ethereal extract is directed by the U. S. Pharmacopœia, and considerably used. (See *Extractum Cubebæ Fluidum.*) An infusion, made in the proportion of an ounce of powdered cubebs to a pint of water, has been employed as an injection in discharges from the vagina, with asserted advantage.

Off. Prep. Extractum Cubebæ Fluidum; Oleum Cubebæ; Tinctura Cubebæ. W.

CUPRUM.

Copper.

Cuivre, *Fr.;* Kupfer, *Germ.;* Rame, *Ital.;* Cobre, *Span.*

This metal is very generally diffused in nature, and exists principally in four states; as native copper, as an oxide, as a sulphuret, and as a salt. Its principal native salts are the sulphate, carbonate, arseniate, and phosphate. In the United States it occurs in various localities, but especially in the neighbourhood of Lake Superior, where a mass of metallic copper, weighing more than 3000 pounds, has been found. The principal copper mines of Europe are those of the Pyrenees in France, Cornwall in England, and Fahlun in Sweden.

Properties. Copper is a brilliant, sonorous metal, of a reddish colour, and very ductile, malleable, and tenacious. It has a slightly nauseous taste, and emits a disagreeable smell when rubbed. Its texture is granular, and its fracture hackly. Its sp. gr. is 8·89, and its fusing point 1996° F., according to Daniell, being intermediate between that of silver and that of gold. Its equivalent number is 31·6. Exposed to the air it undergoes a slight tarnish. Its combinations are numerous and important. With oxygen it forms two well characterized oxides, a red suboxide or dioxide, consisting of two eqs. of copper and one of oxygen, and a black protoxide formed of one eq. of metal and one of oxygen. The latter oxide, which alone is salifiable, forms with acids several salts, important in medicine and the arts. With metals, copper forms numerous alloys, of which that with zinc, called brass, is the most useful.

Characteristics. Copper is recognised by its colour, and the effect of tests on its nitric solution. This solution, with potassa, soda, and ammonia, yields a blue precipitate, soluble in excess of the latter alkali, with which it forms a deep blue liquid. Ferrocyanuret of potassium occasions a brown precipitate of ferrocyanuret of copper; and a bright plate of iron, immersed in the solution, immediately becomes covered with a film of metallic copper. The ferrocyanuret of potassium is an exceedingly delicate test for detecting minute portions of copper in solution. Another test, proposed by M. Verguin, is to precipitate the copper in the metallic state on platinum by electro-chemical action. For this purpose a drop of the liquid to be examined is placed on a slip of platinum foil, and a slip of bright iron is brought in contact with the platinum and the liquid. If copper be present, it will be instantly precipitated on the surface of the platinum.

Action on the Animal Economy. Copper, in its pure state, is perfectly inert, but in combination is highly deleterious. Nevertheless, a minute portion of the metal, so far as researches have extended, is always present in the healthy body. According to Millon, the copper in the blood, like the iron, is attached to the red corpuscles. To bring the copper into a state favourable for ready detection, he advises that blood, as it escapes from a vein, be received in about three times its bulk of water, and the mixture poured into a bottle of chlorine and agitated. The whole, upon being rapidly filtered, furnishes a liquid in which copper is readily detected. (*Chem. Gaz.*, June 1, 1848.) Its combinations, when taken in poisonous doses, produce a coppery taste in the mouth; nausea and vomiting; violent pain of the stomach and bowels; frequent black and bloody stools; small, irregular, sharp, and frequent pulse; faintings; burning thirst; difficulty of breathing; cold sweats; paucity of urine; violent headache; cramps, convulsions, and finally death. The best treatment in cases of poisoning by copper, is to administer white of eggs, diffused in water, in large and repeated doses. If this remedy be not at hand, the patient must in the mean time be gorged with warm water or with milk, and the throat irritated by the finger or a feather, in order to excite vomiting. Should vomiting not

take place by these means, the stomach-pump may be employed. Magnesia has been proposed as an antidote to the poisonous effects of the salts of copper by M. Roucher. (See *page* 308.)

In medico-legal examinations, where cupreous poisoning is suspected, Orfila recommends that the viscera be boiled in distilled water for an hour, and that the matter obtained by evaporating the filtered decoction to dryness, be carbonized by nitric acid. The matter thus treated will contain the copper. By proceeding in this way, there is no risk of obtaining the copper naturally existing in the animal tissues. This method of proceeding is preferable to that of examining the contents of the stomach and intestines, from which copper may be absent, while yet it may have penetrated the different organs by absorption, especially the abdominal viscera.

Vessels of copper should be discontinued in all operations connected with pharmacy and domestic economy; for, although the metal uncombined is inert, yet the risk is great that the vessels may be acted on; in which event, whatever may be contained in it would be rendered deleterious.

The following is a list of all the preparations containing copper in the U. S. and British Pharmacopœias.

Cupri Subacetas, *U. S.*, *Dub.*; Ærugo, *Lond.*, *Ed.*; Anglicè, *Verdigris.*
Cupri Subacetas Præparatum, *Dub.*; Anglicè, *Prepared verdigris.*
Unguentum Cupri Subacetatis, *U. S.*, *Dub.*; Ung. Æruginis, *Ed.*
Linimentum Æruginis, *Lond.*
Emplastrum Cantharidis Compositum, *Ed.*
Cupri Sulphas, *U. S.*, *Ed.*, *Dub.*; Cupri Sulphas Venalis, *Lond.*
Cupri Sulphas, *Lond.*
Cuprum Ammoniatum, *U. S.*, *Ed.*; Cupri Ammonio-Sulphas, *Lond.*, *Dub.*
Cupri Ammoniati Solutio, *Ed.*; Liquor Cupri Ammonio-Sulphatis, *Lond.*
Pilulæ Cupri Ammoniati, *Ed.* B.

CUPRI SUBACETAS. *U. S.*, *Dub.*

Subacetate of Copper.

Impure subacetate of copper. *U. S.*

Off. Syn. ÆRUGO. *Lond.*, *Ed.*

Verdigris; Acetate de cuivre brut, Vert-de-gris, *Fr.*; Grünspan, *Germ.*; Verde rame, *Ital.*; Cardenillo, *Span.*

Preparation. Verdigris is prepared in large quantities in the South of France, more particularly in the neighbourhood of Montpellier. It is also manufactured in Great Britain and Sweden. In France the process is conducted in the following manner. Sheets of copper are stratified with the refuse of the grape which is left after the expression of the juice in making wine, and are allowed to remain in this state for a month or six weeks. At the end of this time, the plates are found coated with a considerable quantity of verdigris. This is scraped off, and the plates are then replaced as at first, to be further acted on. The scrapings thus obtained form a paste, which is afterwards well beaten with wooden mallets, and packed in oblong leathern sacks, about ten inches in length by eight in breadth, in which it is dried in the sun, until the loaf of verdigris, as it is called, attains the proper degree of hardness. The rationale of the process is easily understood. The grape-refuse contains a considerable quantity of juice, which, by contact with the air, undergoes the acetous fermentation. The copper becomes oxidized, and

the resulting oxide, by combination with the acetic acid generated during the fermentation, forms the subacetate of copper or verdigris. In England, a purer verdigris is prepared by alternating copper plates with pieces of woollen cloth steeped in pyroligneous acid.

Verdigris comes to this country exclusively from France, being imported principally from Bordeaux and Marseilles. The leathern packages in which it is put up, called sacks of verdigris, weigh generally from twenty-five to thirty pounds, and arrive in casks, each containing from thirty to forty sacks.

Properties. Verdigris is in masses of a pale-green colour, and composed of a multitude of minute silky crystals. Sometimes, however, it occurs of a bright blue colour. Its taste is coppery. It is insoluble in alcohol, and, by the action of water, a portion of it is resolved into the neutral acetate which dissolves, and a trisacetate which remains behind in the form of a dark green powder, gradually becoming black. It is hence evident that, when verdigris is prepared by levigation with water, as was formerly done by the Dublin College, it is altered in its nature. The neutral acetate is the crystallized acetate of copper, or *crystals of Venus.* When verdigris is acted on by sulphuric acid, it is decomposed, vapours of acetic acid being evolved, easily recognised by their vinegar odour. It is soluble almost entirely in ammonia, and dissolves in muriatic and dilute sulphuric acids with the exception of impurities, which should not exceed five per cent. When of good quality, it has a lively green colour, is free from black or white spots, and is dry and difficult to break. The green rust, called in popular language verdigris, which copper vessels are apt to contract when not kept clean, is a carbonate of copper, and should not be confounded with real verdigris.

Composition. Verdigris, apart from its impurities, is a variable mixture of the subacetates of copper; the basic sesquiacetate predominating in the green variety, the diacetate in the blue. The London College defines it to be a diacetate of copper; the Edinburgh, the commercial diacetate. When acted on by water, two eqs. of the portion consisting of diacetate are converted into one eq. of soluble neutral acetate, and one of insoluble trisacetate.

Medical Properties and Uses. Verdigris is used externally as a detergent and escharotic, and is occasionally applied to chronic eruptions, foul and indolent ulcers, and venereal warts. The special applications of it will be mentioned under its preparations. For its effects as a poison, see *Cuprum.*

Off. Prep. Cupri Subacetas Præparatum; Emplastrum Cantharidis Compositum; Linimentum Æruginis; Unguentum Cupri Subacetatis. B.

CUPRI SULPHAS. *U. S., Ed., Dub.*

Sulphate of Copper.

Off. Syn. CUPRI SULPHAS VENALIS. *Lond.*

Blue vitriol, Roman vitriol, Blue stone; Sulfate de cuivre, Vitriol bleu, Couperose bleu, *Fr.;* Schwefelsaures Kupfer, Kupfervitriol, Blauervitriol, Blauer Galitzenstein, *Germ.;* Rame solfato, Vitriolo di rame, *Ital.;* Sulfato de cobre, Vitriolo azul, *Span.*

Preparation, &c. Sulphate of copper occasionally exists in nature, in solution in the water which flows through copper mines. In this case the salt is obtained by merely evaporating the waters which naturally contain it. Another method for obtaining it is to roast the native sulphuret in a reverberatory furnace, whereby it is made to pass, by absorbing oxygen, into the state of sulphate. The roasted mass is lixiviated, and the solution obtained is evaporated that crystals may form. The salt, procured by either of these methods, contains a little tersulphate of the sesquioxide of iron, from which it may be freed by adding an excess of protoxide of copper, which has the effect

of precipitating the sesquioxide of iron. A third method consists in wetting, and then sprinkling with sulphur, sheets of copper, which are next heated to redness, and afterwards plunged into water while hot. The same operation is repeated until the sheets are entirely corroded. At first a sulphuret of the metal is formed, which, by the action of heat and air, gradually passes into the state of sulphate of the oxide. This is dissolved in the water, and obtained in crystals by evaporation. A fourth method is to dissolve copper scales to saturation in sulphuric acid, contained in a wooden vessel, lined with sheet lead. The scales consist of metallic copper, mixed with oxide, and are obtained in the process of annealing sheet copper.

Sometimes sulphate of copper is obtained in pursuing one of the methods for separating silver from gold. The silver is dissolved by boiling the alloy in sulphuric acid. The sulphate of silver formed is then decomposed by the immersion of copper plates in its solution, with the effect of forming sulphate of copper and precipitating the silver.

Properties. Sulphate of copper has a rich deep-blue colour, and strong metallic styptic taste. It reddens vegetable blues, and crystallizes in large, transparent, rhomboidal prisms, which effloresce slightly in the air, and are soluble in four parts of cold, and two of boiling water, but insoluble in alcohol. When heated it first melts in its water of crystallization, and then dries and becomes white. If the heat be increased, it next undergoes the igneous fusion; and finally, at a high temperature, loses its acid, protoxide of copper being left. Potassa, soda, and ammonia throw down from it a bluish-white precipitate of hydrated protoxide of copper, which is immediately dissolved by an excess of the last-mentioned alkali, forming a rich deep-blue solution, called *aqua sapphirina*. It is also decomposed by the alkaline carbonates, and by borax, acetate and subacetate of lead, acetate of iron, nitrate of silver, corrosive chloride of mercury, tartrate of potassa, and chloride of calcium; and it is precipitated by all astringent vegetable infusions. If it become very green on the surface by the action of the air, it shows the presence of sesquioxide of iron. This oxide may also be detected by ammonia, which will throw it down along with the oxide of copper, without taking it up when added in excess. When sulphate of copper is obtained from the dipping liquid of manufacturers of brass or German silver ware, it is always contaminated with sulphate of zinc, as pointed out by Mr. S. Piesse. This liquid is at first a mixture of sulphuric and nitric acids, but becomes, at last, nearly saturated with copper. When zinc is present in sulphate of copper, it will be taken up by solution of potassa, added in excess, from which it may be thrown down, in white flocks, by a solution of bicarbonated alkali.

Sulphate of copper consists of one eq. of sulphuric acid 40, one of protoxide of copper 39·6, and five of water 45=124·6.

Medical Properties. Sulphate of copper, in small doses, is astringent and tonic; in large ones a prompt emetic. With a view to its tonic effect it has been given in intermittent fever, as well as in epilepsy and other spasmodic diseases; and as an emetic, for discharging poisons from the stomach, especially opium. In croup it has been employed as an emetic with encouraging success. It has also been highly recommended in chronic diarrhœa. Externally it is employed in solution as a stimulant to ill-conditioned ulcers, as an escharotic for destroying warts, fungous granulations, and callous edges, and as a styptic to bleeding surfaces. It is found, in not a few instances, to promote the cicatrization of ulcers, and is not unfrequently employed, with that view, as a wash for chancres. In weak solution, either alone or associated with other substances, it forms a useful collyrium in the chronic stages of some forms of ophthalmia. Eight grains of it, mixed with an equal weight of Armenian bole and two grains of camphor, and added to half a pint of

boiling water, forms, after becoming limpid by rest, a collyrium strongly recommended by Mr. Ware in the purulent ophthalmia of infants. The dose, as an astringent or tonic, is a quarter of a grain, gradually increased; as an emetic, from two to five grains. As a stimulant wash, the solution may be made of the strength of two, four, or eight grains to the fluidounce of water. Orfila cautions against giving large doses of this salt as an emetic in cases of poisoning; as it is apt, from its poisonous effects, to increase the mischief, when it happens not to be expelled by vomiting. Upon the whole, such is the activity of the sulphate of copper, that it should be exhibited with caution. For its effects as a poison, see *Cuprum.*

M. Roucher, from the results of some experimental trials, has proposed magnesia as an antidote for sulphate of copper. To be efficacious, the earth must be administered in a short time after the ingestion of the sulphate, and in a quantity, at least, eight times its amount. From the manner in which magnesia reacts with the other salts of copper, M. Roucher infers that it will prove an antidote to all of them.

Off. Prep. Cupri Sulphas, *Lond.;* Cuprum Ammoniatum. B.

CURCUMA. *U. S. Secondary, Ed.*

Turmeric.

The rhizoma of Curcuma longa. *U. S., Ed.*

Safran des Indes, *Fr.;* Kurkuma, Gelbwurz, *Germ.;* Curcuma, *Ital., Span.;* Zirsood, *Arab.;* Huldie, *Hindoo.*

Curcuma. *Sex. Syst.* Monandria Monogynia.—*Nat. Ord.* Zingiberaceæ.

Gen. Ch. Both limbs of the corolla three partite. *Anther* with two spurs at the base. *Seeds* with an arillus. *Loudon's Encyc.*

Curcuma longa. Willd. *Sp. Plant.* i. 14; Woodv. *Med. Bot.* p. 737, t. 252. The root of this plant is perennial, tuberous, palmate, and internally of a deep yellow or orange colour. The leaves are radical, large, lanceolate, obliquely nerved, sheathing at their base, and closely embrace each other. The scape or flower-stem, which rises from the midst of the leaves, is short, thick, smooth, and constitutes a spike of numerous imbricated bracteal scales, between which the flowers successively make their appearance. The plant is a native of the East Indies and Cochin-china, and is cultivated in various parts of Southern Asia, particularly in China, Bengal, and Java, whence the root is exported. The best is said to come from China.

The dried root is in cylindrical or oblong pieces, about as thick but not as long as the finger, tuberculated, somewhat contorted, externally yellowish-brown or greenish-yellow, internally deep orange-yellow, hard, compact, breaking with a fracture like that of wax, and yielding a yellow or orange-yellow powder. Another variety, comparatively rare, is round or oval, about the size of a pigeon's egg, and marked externally with numerous annular wrinkles. Sometimes it comes cut into two transverse segments. It is distinguished by the name of *curcuma rotunda*, the former being called *curcuma longa*. The two varieties have a close resemblance in sensible properties, and are thought to be derived from the same plant, though formerly ascribed to different species of Curcuma. The odour of turmeric is peculiar; the taste warm, bitterish, and feebly aromatic. It tinges the saliva yellow. Analyzed by Pelletier and Vogel, it was found to contain lignin, starch, a peculiar yellow colouring matter called *curcumin*, a brown colouring matter, gum, an odorous and very acrid volatile oil, and a small quantity of chloride of calcium. Curcumin is obtained, mixed with a little volatile oil, by digesting the alcoholic extract of turmeric in ether, and evaporating the ethereal tincture. It

may be procured perfectly pure by separating it from its combination with oxide of lead. It is brown in mass, but yellow in the state of powder, without odour or taste, scarcely soluble in water, but very soluble in alcohol, ether, and the oils. The alkalies rapidly change its colour to a reddish-brown; and paper tinged with tincture of turmeric is employed as a test of their presence. Berzelius, however, states that its colour is changed to red or brownish-red by the concentrated mineral acids, by pure boracic acid, especially when dissolved in alcohol, and by numerous metallic salts; so that its indications cannot be certainly relied on. Its alcoholic solution produces coloured precipitates with acetate of lead, nitrate of silver, and other salts. Turmeric is used for dyeing yellow; but the colour is not permanent.

Medical Properties, &c. This root is a stimulant aromatic, bearing some resemblance to ginger in its operation, and is much used in India as a condiment. It is a constant ingredient in the curries so generally employed in the East. In former times it had some reputation in Europe as a remedy in jaundice and other visceral diseases; but at present it is employed only to impart colour to ointments, and other pharmaceutic preparations.

Turmeric paper, used as a test, is prepared by tinging white unsized paper with a tincture or decoction of turmeric. The tincture may be made with one part of turmeric to six parts of proof spirit; the decoction, with one part of the root to ten or twelve of water. The access of acid or alkaline vapours should be carefully avoided. W.

CYDONIUM. *U. S. Secondary, Lond.*

Quince Seed.

The seeds of Cydonia vulgaris. *U. S., Lond.*

Semences de coings, *Fr.;* Quittenkerne, *Germ.;* Semi di cotogno, *Ital.;* Simiente de membrillo, *Span.*

The quince tree has been separated from the genus *Pyrus*, and erected into a new one with the title *Cydonia*, which is now generally admitted by botanists. It differs from Pyrus in the circumstance that the cells of its fruit contain many seeds, instead of two only as in the latter.

Cydonia. *Sex. Syst.* Icosandria Pentagynia.—*Nat. Ord.* Pomaceæ.

Gen. Ch. Calyx five-parted, with leafy divisions. *Apple* closed, many-seeded. *Testa* mucilaginous. *Loudon's Encyc.*

Cydonia vulgaris. Persoon, *Enchir.* ii. 40.—*Pyrus Cydonia.* Willd. *Sp. Plant.* ii. 1020; Woodv. *Med. Bot.* p. 505, t. 182. The common quince tree is characterized as a species by its downy deciduous leaves. It is supposed to be a native of Crete, but grows wild in Austria, on the banks of the Danube. It is abundantly cultivated in this country. The fruit is about the size of a pear, yellow, downy, of an agreeable odour, and a rough, astringent, acidulous taste; and in each of its five cells contains from eight to fourteen seeds. Though not eaten raw, it forms a very pleasant confection; and a syrup prepared from it may be used as a grateful addition to drinks in sickness, especially in looseness of the bowels, which it is supposed to restrain by its astringency. The seeds are the officinal portion.

They are ovate, angled, reddish-brown externally, white within, inodorous, and nearly insipid, being slightly bitter when long chewed. Their coriaceous envelope abounds in mucilage, which is extracted by boiling water. Two drachms of the seeds will render a pint of water thick and ropy. It has been proposed to evaporate the decoction to dryness, and powder the residue. Three grains of this powder form a sufficiently consistent mucilage with an ounce of water. According to M. Garot, one part communicates to a thou-

sand parts of water a semi-syrupy consistence. (*Journ. de Pharm. et de Chim.*, 3*e sér.*, iii. 298.) Dr. Pereira considers the mucilage of quince seeds as a peculiar substance, and proposes to call it *cydonin*. It differs from arabin in not yielding a precipitate with silicate of potassa, and from bassorin and cerasin, in being soluble in water both hot and cold.

Medical Properties, &c. The mucilage of quince seeds may be used for the same purposes as other mucilaginous liquids. It is preferred by some practitioners as a local application in conjunctival ophthalmia, but in this country is less used for that purpose than the infusion of sassafras pith.

Off. Prep. Decoctum Cydonii. W.

CYMINUM. *Lond.*

Cumin Seed.

Cuminum Cyminum. The fruit. *Lond.*

Off. Syn. CUMINUM. Fruit of Cuminum Cyminum. *Ed.*

Cumin, *Fr.;* Römischer Kümmel, *Germ.;* Comino, *Ital., Span.*

CUMINUM. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Apiaceæ or Umbelliferæ.

Gen. Ch. Fruit ovate, striated. *Partial umbels* four. *Involucres* four-cleft.

Cuminum Cyminum. Willd. *Sp. Plant.* i. 1440; Woodv. *Med. Bot.* p. 142, t. 56. This is an annual plant, about six or eight inches high, having a round, slender, branching stem, with numerous narrow, linear, pointed, smooth, grass-like leaves, of a deep green colour. The flowers are white or purple, and disposed in numerous terminal umbels, which have very few rays, and are attended with general and partial involucres, consisting of three or four linear leaflets. The fruit consists of two oblong plano-convex half-fruits, commonly called seeds, united by their flat sides. The plant is a native of Egypt, but is cultivated for its fruit in Sicily, Malta, and other parts of Europe.

The cumin seeds of the shops are elliptical, flat on one side, convex, furrowed, and rough on the other, about one-sixth of an inch in length, and of a light-brown colour. Each has seven longitudinal ridges. Two seeds are sometimes united together as upon the plant. Their odour is peculiar, strong, and heavy; their taste warm, bitterish, aromatic, and disagreeable. They contain much essential oil, which is lighter than water, yellowish, and has the sensible properties of the seeds. According to Schweitzer and Völckel, it consists of two distinct oils, one called *carvene*, containing no oxygen, and isomeric with oil of turpentine, the other consisting of carbon, hydrogen, and oxygen, and named *carvole*. (*Ann. der Chem. und Pharm.*, lxxxv. 246.)

Medical Properties and Uses. In medical properties cumin seeds resemble the other aromatic fruits of umbelliferous plants, but are more stimulating. They are seldom used in the United States, and appear to have been retained by the London College merely as an ingredient in a stimulant and discutient plaster. The dose is from fifteen grains to half a drachm.

Off. Prep. Emplastrum Cumini. W.

DELPHINIUM. *U. S. Secondary.*

Larkspur.

The root of Delphinium Consolida. *U. S.*

Pied d'allouette, *Fr.;* Feld-Rittersporn, *Germ.*

DELPHINIUM. *Sex. Syst.* Polyandria Trigynia.—*Nat. Ord.* Ranunculaceæ.

Gen. Ch. Calyx none. *Petals* five. *Nectary* bifid, horned behind. *Pods* three or one. *Willd.*

Delphinium Consolida. Willd. *Sp. Plant.* ii. 1226; Loudon's *Encyc. of Plants*, p. 473, 7832. The larkspur is a showy annual plant, with an erect, branched, slightly pubescent stem. Its leaves are divided into linear segments, widely separated, and forked at the summit. The flowers are usually of a beautiful azure-blue colour, and disposed in loose terminal racemes, with peduncles longer than the bractes. The nectary is one-leaved, with an ascending horn nearly equalling the corolla. The seeds are contained in smooth, solitary capsules. This species of larkspur has been introduced from Europe into the United States, where it has become naturalized, growing in the woods and fields, and flowering in June and July.

Various parts of the larkspur have been employed in medicine; and the plant is said to have properties closely analogous to those of *Delphinium Staphisagria.* (See *Staphisagria.*) The flowers are bitter and acrid, and, having formerly been supposed to possess the power of healing wounds, gave the name of *consolida* to the species. They were considered diuretic, emmenagogue, and vermifuge; but are not now used. The seeds are very acrid, are esteemed diuretic, and in large doses produce vomiting and purging. They were analyzed by Mr. Thomas C. Hopkins, of Baltimore, and found to contain *delphinia*, volatile oil, fixed oil, gum, resin, chlorophylle, gallic acid, and salts of potassa, lime, and iron. (*Am. Journ. of Pharm.*, xi. 8.) A tincture prepared by macerating an ounce of the seeds in a pint of diluted alcohol, has been found useful in spasmodic asthma and dropsy. The dose is ten drops, to be gradually increased till some effects upon the system are evinced. The remedy has been employed both in America and England; and the seeds of an indigenous species, *D. exaltatum*, have been applied to a similar purpose. The root probably possesses the same properties as other parts of the plant; but, though designated in the Pharmacopœia, is little if at all used. W.

DIGITALIS. *U. S., Lond., Ed., Dub.*

Foxglove.

The leaves of Digitalis purpurea. *U. S., Ed., Dub.* The fresh and dried leaf of the stem of the wild herb. *Lond.*

Digitale pourprée, Doightier, *Fr.;* Purpurrother Fingerhut, *Germ.;* Digitale purpurea, *Ital.;* Dedalera, *Span.*

DIGITALIS. *Sex. Syst.* Didynamia Angiospermia.—*Nat. Ord.* Scrophulariaceæ.

Gen. Ch. Calyx five-parted. *Corolla* bell-shaped, five-cleft, ventricose. *Capsule* ovate, two-celled. *Willd.*

Digitalis purpurea. Willd. *Sp. Plant.* iii. 383; Woodv. *Med. Bot.* p. 218, t. 78. The foxglove is a beautiful plant, with a biennial or perennial, fibrous root, which, in the first year, sends forth large tufted leaves, and in the following summer, a single erect, downy, and leafy stem, rising from two to five feet in height, and terminating in an elegant spike of purple flowers. The lower leaves are ovate, pointed, about eight inches in length and three in breadth, and stand upon short, winged footstalks; the upper are alternate, sparse, and lanceolate; both are obtusely serrated at their edges, and have wrinkled velvety surfaces, of which the upper is of a fine deep-green colour, the under paler and more downy. The flowers are numerous, and attached to the upper part of the stem by short peduncles, in such a manner as generally to hang down upon one side. At the base of each peduncle is a floral leaf, which is sessile, ovate, and pointed. The calyx is divided into five segments, of which the uppermost is narrower than the others. The corolla is monopetalous, bell-form, swelling on the lower side, irregularly divided at

the margin into short obtuse lobes, and in shape and size bearing some resemblance to the end of the finger of a glove, a circumstance which has suggested most of the names by which the plant is designated in different languages. Its mouth is guarded by long soft hairs. Externally, it is in general of a bright purple colour; internally, is sprinkled with black spots upon a white ground. There is a variety of the plant in which the flowers are white. The filaments are white, curved, and surmounted by large yellow anthers. The style, which is simple, supports a bifid stigma. The seeds are very small, numerous, grayish-brown, and contained in a pyramidal, two-celled capsule.

The foxglove grows wild in the temperate parts of Europe, where it flowers in the middle of summer. In this country it is cultivated both as an ornamental plant and for medicinal purposes. The leaves are the part usually employed. Much care is requisite in selecting, preparing, and preserving them, in order to insure their activity. They should be gathered in the second year, immediately before or during the period of inflorescence, and those only chosen which are full-grown and perfectly fresh. (*Geiger.*) It is said that those plants are preferable which grow spontaneously in elevated places, exposed to the sun. (*Duncan.*) As the leaf-stalk and midrib are comparatively inactive, they may be rejected. Withering recommends that the leaves should be dried either in the sunshine, or by a gentle heat before the fire; and care should be taken to keep them separate while drying. Pereira states that a more common, and, in his opinion, a preferable mode, is to dry them in a basket, in a dark place, in a drying stove. It is probably owing, in part, to the want of proper attention in preparing digitalis for the market, that it is so often inefficient. Much of the medicine kept in our shops is obtained from the settlement of the Shakers in New York, and is in oblong compact masses, into which the leaves have been compressed. In some of these cakes the digitalis is of good quality; but we have seen others in which it was quite the reverse, and some which were mouldy in the interior; and, upon the whole, cannot but consider this mode of preparing the drug as objectionable. The dried leaves should be kept in tin canisters, well closed so as to exclude light and moisture; or they may be pulverized, and the powder preserved in well-stopped and opaque phials. As foxglove deteriorates by time, it should be frequently renewed, as often, if possible, as once a year. Its quality must be judged of by the degree in which it possesses the characteristic properties of colour, smell, and especially taste.

The seeds contain more of the active principle than the leaves, are less apt to suffer in drying, and keep better; and might, therefore, be substituted for them with propriety.

Properties. Foxglove is without smell in the recent state, but acquires a faint narcotic odour when dried. Its taste is bitter and nauseous. The colour of the dried leaf is a dull pale green, modified by the whitish down upon the under surface; that of the powder is a fine deep green. Digitalis yields its virtues both to water and alcohol. These virtues reside in a peculiar bitter principle, which was first isolated by M. Homolle. In the extraction of this principle, called *digitalin*, he employed the agency of tannic acid, as originally proposed by M. O. Henry. The latter chemist has somewhat simplified the process of M. Homolle. An alcoholic extract is first prepared. This is treated with distilled water acidulated with acetic acid, and heated to about 110° F., a little animal charcoal being added. To the liquor, filtered, and partially neutralized by ammonia, a fresh concentrated infusion of galls is gradually added, so long as a precipitate is produced. This precipitate, which is tannate of digitalin, is obtained separate by decanting the liquid, is washed with pure water, mixed with a little alcohol, and then

rubbed in a mortar with one-third of its weight of very finely powdered litharge. The mixture is heated gently, and submitted to the action of twice its volume of alcohol at about 90°. The alcoholic solution is treated with a little animal charcoal, filtered, and evaporated at a very gentle heat. The residue is acted on twice or three times with cold sulphuric ether, which removes impurities, and leaves the digitalin. This may be powdered, or obtained in small scales by dissolving it in the least quantity of alcohol, and allowing the concentrated solution to evaporate in a stove upon plates of glass. From 1000 parts of the leaves, M. Henry obtained between 9 and 10 parts of digitalin. (*Journ. de Pharm.*, 3*e sér.*, vii. 462.) This substance is white, inodorous, crystallizable with difficulty, of an intense bitterness, sternutatory when powdered, slightly decomposed at a boiling heat, soluble in about 2000 parts of cold water, more soluble in boiling water, which retains one part in 1000 when it cools, very soluble in alcohol cold or hot, very slightly soluble in ether, incapable of precipitating salts, without alkaline or acid reaction, and destitute of nitrogen. It forms an insoluble compound with tannic acid. It has the characteristic property of giving a fine emerald-green colour to concentrated muriatic acid. In the plant, it is rendered soluble in water by means of saline or extractive matters. It has the effects of digitalis on the system. In the dose of about one-thirteenth of a grain, three times a day, continued for three days, it lessened the frequency of the pulse to 50 in the minute, produced headache and other unpleasant effects on the brain, and sensibly increased the urine. The effect continued for two days after the suspension of its use. (*Ibid.*, vii. 65.) Besides the bitter principle, digitalis contains a volatile oil, a fatty matter, a red colouring substance analogous to extractive, chlorophylle, albumen, starch, sugar, gum, lignin, and salts of potassa and lime, among which, according to Rein and Haase, is superoxalate of potassa. M. Morin, of Geneva, has discovered in the leaves two acids; one fixed, called *digitalic acid*, the other volatile and resembling valerianic acid, which he proposes to name *antirrhinic acid*. (*Ibid.*, vii. 294.) Dr. Morries obtained a narcotic empyreumatic oil by the destructive distillation of the leaves.

Medical Properties and Uses. Digitalis is narcotic, sedative, and diuretic. When administered in quantities sufficient to bring the system decidedly under its influence, it is apt to produce a sense of tightness or weight with dull pain in the head, vertigo, dimness or other disorder of vision, and more or less confusion of thought. At the same time, it occasionally gives rise to irritation in the pharynx and œsophagus, which extends to the larynx and trachea, producing hoarseness; and, in more than one instance, ptyalism has been observed to result. It sometimes also disturbs the bowels, and excites nausea, or even vomiting. Another and highly important effect is an augmented flow of urine. This has been ascribed by some to the increased absorption which digitalis is supposed to produce; and, in support of this opinion, it is stated that its diuretic operation is observable only when dropsical effusion exists; but the fact seems to be, that it is capable of augmenting the quantity of urine in health, and it probably exerts a directly stimulating influence upon the secretory function of the kidneys. This influence is said sometimes to extend to the genital organs. Besides the effects above detailed, digitalis exerts a remarkably sedative operation upon the heart. This is exhibited in the reduction both of the force and frequency of the pulse, which sometimes sinks fom the ordinary standard to 50, 40, or even 30 strokes in the minute. In some instances, however, it undergoes little change; in others only becomes irregular; and we are told that it is even occasionally increased in frequency. It was observed by Dr. Baildon that the effects of digitalis upon the circulation were very much influenced by posture. Thus,

in his own case, the pulse, which had been reduced from 110 to 40 in the recumbent position, was increased to 72 when he sat, and to 100 when he stood. We do not discover anything remarkable in this circumstance. It is well known that the pulse is always more frequent in the erect than in the horizontal posture, and the difference is greater in a state of debility than in health. Digitalis diminishes the frequency of the pulsations of the heart by a directly debilitating power; and this very debility, when any exertion is made which calls for increased action in that organ, causes it to attempt, by an increase in the number of its contractions, to meet the demand which it is unable to supply by an increase in their force. According to Dr. Traube, it directly diminishes animal temperature in febrile and inflammatory diseases, without antecedent effect on the circulation. (See *Archives Gén.*, 4*e sér.*, xxviii. 338.) Dr. A. Buchner states that digitalin arrests vinous fermentation, and consequently poisons the yeast plant. (See *Am. Journ. of Pharm.*, xxiv. 154.)

The effects above detailed may result from digitalis given in remediate doses. In larger quantities its operation is more violent. Nausea and vomiting, stupor or delirium, cold sweats, extreme prostration of strength, hiccough, convulsions, and syncope, are among the alarming symptoms which indicate its poisonous character. These effects are best counteracted by stimulants, such as brandy, the volatile alkali, and opium. Should any of the poison be suspected to remain, it would be proper, before employing other measures, to evacuate the stomach by the free use of warm liquids. From the experiments of M. Bonjean, it appears that powdered digitalis may be given to fowls, in large quantities, with entire impunity. (*Journ. de Pharm.*, 3*e sér.*, iv. 21.)

A peculiarity of digitalis is that, after having been given in moderate doses for several days, without apparent effect, it sometimes acts suddenly with an accumulated influence, endangering even life. It is, moreover, very permanent in its operation, which, having once commenced, is maintained like that of mercury, for a considerable period, without any fresh accessions of the medicine. The practical inferences deducible from these properties of digitalis are, first, that, after it has been administered for some time without effect, great care should be taken not to increase the dose, nor to urge the medicine too vigorously; and, secondly, that, after its effects have begun to appear, it should be suspended for a time, or exhibited in smaller doses, lest a dangerous accumulation of its influence should be experienced. In numerous instances death has resulted from its incautious employment.

Digitalis has been long known to possess medicinal powers; but it was never regarded as a standard remedy, till after its application by Withering to the treatment of dropsy, about the year 1775. It is at present employed very extensively, both for its diuretic power, and for its sedative influence over the circulation. The former renders it highly useful in dropsical diseases, though like all other remedies it very frequently fails; the latter adapts it to the treatment of cases in which the action of the heart requires to be controlled. The idea was at one period entertained, that it might serve as a substitute for the lancet in febrile and inflammatory complaints; and it has been much employed for this purpose by the advocates of the *contra-stimulant* doctrine in Italy; but experience has proved that it is a very frail support in any case in which the symptoms of inflammation are such as to call for the loss of blood. As an adjuvant to the lancet, and in cases in which circumstances forbid the employment of that remedy, it is often useful. Though it certainly has not the power, at one time ascribed to it by some, of curing phthisis, it acts beneficially as a palliative in that complaint by depressing the excited movements of the heart. In the same way it proves advantageous in aneurism, hypertrophy and dilatation of the heart, palpitations from

rheumatic or gouty irritation, and in various forms of hemorrhage, after action has been sufficiently reduced by the lancet. It has also been prescribed in mania, epilepsy, pertussis, and spasmodic asthma; and highly respectable testimony can be adduced in favour of its occasional efficacy in these complaints. In delirium tremens it has been recommended as a specific, given in the form of infusion, in the full dose, repeated every two hours till symptoms of narcotism are induced; but the practice is somewhat hazardous, unless the patient be carefully watched. (*Am. Journ. of Med. Sci.*, xvii. 501.) The medicine, externally applied, is said to act speedily and powerfully as a diuretic, and to have been useful in dropsy. For this purpose the fresh leaves bruised, or the tincture may be rubbed over the abdomen, and on the inside of the thighs. (*Revue Médicale*, May, 1834.)

Digitalis is administered in substance. The dose of the powder is one grain, repeated twice or three times a day, and gradually increased till some effect is produced upon the head, stomach, pulse, or kidneys, when it should be omitted or reduced. The infusion and tincture are officinal preparations often resorted to. (See *Infusum Digitalis* and *Tinctura Digitalis.*) The extract has also been employed; and Orfila found it, whether prepared with water or alcohol, more powerful than the powder. Enormous doses of this medicine have been given with asserted impunity; and, when they occasion full vomiting, it is possible that they may sometimes prove harmless; but, when the alarming effects sometimes experienced from comparatively moderate doses are considered, the practice must be condemned as exceedingly hazardous.

Digitalin has been used internally, but its employment requires great caution. It appears to have all the powers of digitalis, and possesses the advantage of more equable strength, and consequently greater precision and certainty in regard to the dose. It may be used for any of the purposes to which the leaves are applicable; and may be administered in pill, or alcoholic solution. The dose to begin with should not exceed the fortieth or fiftieth of a grain, and should not be carried beyond the twelfth.

Off. Prep. Extractum Digitalis; Infusum Digitalis; Pilulæ Digitalis et Scillæ; Tinctura Digitalis. W.

DIOSPYROS. *U. S. Secondary.*

Persimmon.

The unripe fruit of Diospyros Virginiana. *U. S.*

Dyospyros. *Sex. Syst.* Dicœcia Octandria.—*Nat. Ord.* Ebenaceæ.

Gen. Ch. Male. *Calyx* four to six-cleft. *Corolla* urceolate, four to six-cleft. *Stamens* eight to sixteen; filaments often producing two anthers. Female. *Flower* as the male. *Stigmas* four to five. *Berry* eight to twelve-seeded. *Nuttall.*

Dyospyros Virginiana. Willd. *Sp. Plant.* iv. 1107; Michaux, *N. Am. Sylv.* ii. 219. The persimmon is an indigenous tree, rising sometimes in the Southern States to the height of sixty feet, with a trunk twenty inches in diameter; but seldom attaining more than half that size near its northern limits, and often not higher than fifteen or twenty feet. The stem is straight, and in the old tree covered with a furrowed blackish bark. The branches are spreading; the leaves ovate-oblong, acuminate, entire, smooth, reticulately veined, alternate, and supported on pubescent footstalks. The buds are smooth. The male and female flowers are on different trees. They are lateral, axillary, solitary, nearly sessile, of a pale orange colour, and not conspicuous. The fruit is a globular berry, dark-yellow when perfectly ripe, and containing numerous seeds embedded in a soft yellow pulp.

This tree is very common in the Middle and Southern States; but, according to Michaux, does not flourish beyond the forty-second degree of north latitude. The flowers appear in May or June; but the fruit is not ripe till the middle of autumn. While green, the fruit is excessively astringent; but, when perfectly mature, and after having been touched by the frost, it is sweet and palatable. Michaux states that, in the Southern and Western States, it is made into cakes with bran, and used for preparing beer with the addition of water, hops, and yeast. A spirituous liquor may be obtained by the distillation of the fermented infusion. The unripe fruit was examined by Mr. B. R. Smith, of Philadelphia, and found to contain tannic acid, sugar, malic acid, colouring matter, and lignin. (*Am. Journ. of Pharm.*, xviii. 167.) It has been used by Dr. Mettauer, of Virginia, in diarrhœa, chronic dysentery, and uterine hemorrhage. He gave it in infusion, syrup, and vinous tincture, prepared in the proportion of about an ounce of the bruised fresh fruit, to two fluidounces of the vehicle, and administered in the dose of a fluidrachm or more for infants, and half a fluidounce or more for adults. The bark is astringent and very bitter, and is said to have been used advantageously in intermittents, and in the form of a gargle in ulcerated sorethroat. W.

DRACONTIUM. *U. S. Secondary.*

Skunk Cabbage.

The root of Dracontium fœtidum—Ictodes fœtidus (*Bigelow*)—Symplocarpus fœtidus (Barton, *Med. Bot.*) *U. S.*

Botanists have had some difficulty in arranging this plant. It was attached by Willdenow to the genus *Dracontium*, by Michaux and Pursh was considered a *Pothos*, and by American botanists has been erected into a new genus, which Nuttall calls *Symplocarpus* after Salisbury, and Dr. Bigelow proposes to name *Ictodes*, expressive of the odour of the plant. The term *Symplocarpus*, though erroneous in its origin, was first proposed, and, having been adopted by several botanists, should be retained.

Symplocarpus. *Sex. Syst.* Tetrandria Monogynia.—*Nat. Ord.* Araceæ.

Gen. Ch. Spathe hooded. *Spadix* covered with perfect flowers. *Calyx* with four segments. *Petals* none. *Style* pyramidal. *Seeds* immersed in the spadix. *Bigelow.*

Symplocarpus fœtidus. Barton, *Med. Bot.* i. 123.—*Ictodes fœtidus.* Bigelow, *Am. Med. Bot.* ii. 41. The *skunk cabbage* is a very curious plant, and the only one of the genus. The root is perennial, large, abrupt, and furnished with numerous fleshy fibres, which penetrate to the depth of two feet or more. The spathe, which first appears, is ovate, acuminate, obliquely depressed at the apex, auriculated at the base, folded inwards at the edges, and of a brownish-purple colour, varied with spots of red, yellow, and green. Within the spathe, the flowers, which resemble it in colour, are placed in great numbers upon a globose, peduncled spadix, for which they form a compact covering. After the spathe has decayed, the spadix continues to grow, and, when the fruit is mature, has attained a size exceeding several times its original dimensions. At the base of each style is a roundish seed, immersed in the spadix, about the size of a pea, and speckled with purple and yellow. The leaves, which rise from the ground after the flowers, are numerous and crowded, oblong-cordate, acute, smooth, strongly veined, and attached to the root by long petioles, which are hollowed in front, and furnished with coloured sheathing stipules. At the beginning of May, when the leaves are fully developed, they are very large, being from one to two feet in length, and from nine inches to a foot in breadth.

This plant is indigenous, growing abundantly in meadows, swamps, and other wet places throughout the whole northern and middle sections of the Union. Its flowers appear in March and April, and in the lower latitudes often so early as February. The fruit is usually quite ripe, and the leaves are decayed before the end of August. The plant is very conspicuous from its abundance, and from the magnitude of its leaves. All parts of it have a disagreeable fetid odour, thought to resemble that of the offensive animal after which it is named. This odour resides in an extremely volatile principle, which is rapidly dissipated by heat, and diminished by desiccation. The root is the part usually employed in medicine. It should be collected in autumn, or early in spring, and dried with care.

The root, as found in the shops, consists of two portions; the body either whole or in transverse slices, and the separated radicles. The former, when whole, is cylindrical, or in the shape of a truncated cone, two or three inches long by about an inch in thickness, externally dark brown and very rough from the insertion of the radicles, internally white and amylaceous. The latter are of various lengths, about as thick as a hen's quill, very much flattened and wrinkled, white within, and covered by a yellowish reddish-brown epidermis, considerably lighter coloured than the body of the root. More or less of the fetid odour remains for a considerable period in the dried root. The taste, though less decided than in the fresh, is still acrid, manifesting itself, after the root has been chewed for a short time, by a pricking and smarting sensation in the mouth and throat. The acrimony, however, is dissipated by heat, and is quite lost in decoction. It is also diminished by time and exposure; and the root should not be kept longer than a single season. According to Mr. Turner (*Am. Journ. of Pharm.*, viii. 2), the radicles have less acrimony than the caudex. The seeds are very acrid, and, though inodorous when whole, give out strongly, when bruised, the peculiar odour of the plant.

Medical Properties and Uses. This root is stimulant, antispasmodic, and narcotic. In large doses it occasions nausea and vomiting, with headache, vertigo, and dimness of vision. Dr. Bigelow has witnessed these effects from thirty grains of the recently dried root. The medicine was introduced into notice by the Rev. Dr. Cutler, who recommended it highly in asthma; and it has been subsequently employed with apparent advantage in chronic catarrh, chronic rheumatism, hysteria, and dropsy. Dr. Heintzelman thinks it expectorant as well as antispasmodic, and has used it beneficially in hooping-cough, and pulmonary consumption. (*N. J. Med. Reporter*, iv. 310.)

It is best given in powder, of which the dose is from ten to twenty grains, to be repeated three or four times a day, and gradually increased till some evidence of its action is afforded. A strong infusion is sometimes employed, and the people in the country prepare a syrup from the fresh root; but the latter preparation is very unequal. The root itself, as kept in the shops, is of uncertain strength, in consequence of its deterioration by age. W.

DULCAMARA. *U. S., Lond., Ed., Dub.*

Bittersweet.

The stalks of Solanum Dulcamara. *U. S., Lond., Ed., Dub.*

Douce-amère, *Fr.;* Bittersüss, Alpranken, *Germ.;* Dulcamara, *Ital., Span.*

Solanum. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Solanaceæ.

Gen. Ch. Corolla wheel-shaped. *Anthers* somewhat coalescing, opening by two pores at the apex. *Berry* two-celled. *Willd.*

This genus includes numerous species, of which several have been used in

medicine. Besides *S. Dulcamara*, which is the only officinal species, two others merit notice. 1. *Solanum nigrum*, the *common garden* or *black nightshade*, is an annual plant from one to two feet high, with an unarmed herbaceous stem, ovate, angular-dentate leaves, and white or pale violet flowers, arranged in peduncled nodding umbel-like racemes, and followed by clusters of spherical black berries, about the size of peas. There are numerous varieties of this species, one of which is a native of the United States. The leaves are the part employed. They are said to produce diaphoresis, sometimes diuresis and moderate purging, and in large doses nausea and giddiness. As a medicine they have been used in cancerous, scrofulous, and scorbutic diseases, and other painful ulcerous affections, being given internally, and applied at the same time to the parts affected in the form of poultice, ointment, or decoction. A grain of the dried leaves may be given every night, and gradually increased to ten or twelve grains, or till some sensible effect is experienced. The medicine, however, is scarcely used at present. By some persons the poisonous properties ascribed to the common nightshade are doubted. M. Dunal, of Montpellier, states as the result of numerous experiments, that the berries are not poisonous to man or the inferior animals; and the leaves are said to be consumed in large quantities in the Isles of France and Bourbon as food, having been previously boiled in water. In the latter case, the active principle of the plant must have been extracted by decoction. 2. The leaves, stalks, and unripe berries of *Solanum tuberosum*, or the *common potato*, are asserted to be narcotic; and an extract prepared from the leaves has been employed in cough and spasmodic affections, in which it is said to act like opium. (*Geiger.*) From half a grain to two grains may be given as a dose. Dr. Latham, of London, found the extract to produce favourable effects in protracted cough, chronic rheumatism, angina pectoris, cancer of the uterus, &c. Its influence upon the nervous system was strongly marked, and, in many instances, the dose could not be increased above a few grains without giving rise to threatening symptoms. It appeared to Dr. Latham to be analogous in its operation to digitalis. His experiments were repeated in Philadelphia by Dr. Worsham with different results. The extract was found, in the quantity of nearly one hundred grains, to produce no sensible effect. (*Philad. Journ. of the Med. and Phys. Sciences*, vi. 22.) We can reconcile these opposite statements only upon the supposition, that the properties of the plant vary with the season, or with the place and circumstances of culture. Dr. Julius Otto found *solania* in the germs of the potato. He was induced to make the investigation by observing that cattle were destroyed by feeding on the residue of germinated potatoes, used for the manufacture of brandy.

Solanum Dulcamara. Willd. *Sp. Plant.* i. 1028; Woodv. *Med. Bot.* p. 237, t. 84; Bigelow, *Am. Med. Bot.* i. 169. The *bittersweet* or *woody nightshade* is a climbing shrub, with a slender, roundish, branching, woody stem, which, in favourable situations, rises six or eight feet in height. The leaves are alternate, petiolate, ovate, pointed, veined, soft, smooth, and of a dull green colour. Many near the top of the stem are furnished with lateral projections at their base, giving them a hastate form. Some have the projection only on one side. Most of them are quite entire, some cordate at the base. The flowers are disposed in elegant clusters, somewhat analogous to cymes, and standing opposite to the leaves. The calyx is very small, purplish, and divided into five blunt persistent segments. The corolla is wheel-shaped, with five-pointed reflected segments, which are of a violet-blue colour, with a darker purple vein running longitudinally through their centre, and two shining greenish spots at the base of each. The filaments are very short, and support large erect lemon-yellow anthers, which cohere in the form of a cone around

the style. The berries are of an oval shape and a bright scarlet colour, and continue to hang in beautiful bunches after the leaves have fallen.

This plant is common to Europe and North America. It flourishes most luxuriantly in damp and sheltered places, as on the banks of rivulets, and among the thickets which border our natural meadows. It is also found in higher and more exposed situations, and is frequently cultivated in gardens. In the United States it extends from New England to Ohio, and is in bloom from June to August. The root and stalk have medicinal properties, though the latter only is officinal. The berries, which were formerly esteemed poisonous, and thought to act with great severity on the stomach and bowels, are now said to be innoxious. Bittersweet should be gathered in autumn, after the fall of the leaf; and the extreme twigs should be selected. That grown in high and dry situations is said to be the best.

The dried twigs, as brought to the shops, are of various lengths, cylindrical, about as thick as a goose-quill, externally wrinkled and of a grayish-ash colour, consisting of a thin bark, an interior ligneous portion, and a central pith. They are inodorous, though the stalk in the recent state emits, when bruised, a peculiar, rather nauseous smell. Their taste, which is at first bitter, and afterwards sweetish, has given origin to the name of the plant. Boiling water extracts all their virtues. These are supposed to depend, at least in part, upon a peculiar alkaline principle called *solanin* or *solania*, which was originally discovered by M. Desfosses, of Besançon, in the berries of *Solanum nigrum*, and has subsequently been found in the stalks, leaves, and berries of *S. Dulcamara* and *S. tuberosum*. It is supposed to exist in the bittersweet combined with malic acid.* Solania is in the form of a white opaque powder, or of delicate acicular crystals, somewhat like those of sulphate of quinia, though finer and shorter. It is inodorous, of a bitter taste, fusible at a little above 212°, scarcely soluble in water, soluble in alcohol and ether, and capable of neutralizing the acids. It is distinguished by the deep-brown, or brownish-yellow colour which iodine imparts to its solution, and by its reaction with sulphuric acid, which becomes first reddish-yellow, then purplish-violet, then brown, and lastly again colourless, with the deposition of a brown powder. (*Pharm. Cent. Blatt*, A. D. 1843, p. 177.) Given to a cat, it was found by M Desfosses to operate at first as an emetic, and afterwards as a narcotic. Dr. J. Otto observed, among its most striking effects, a paralytic condition of the posterior limbs of animals. One grain of the sulphate of solania was sufficient to destroy a rabbit in six hours. Besides solania, the stalks of S. Dulcamara contain, according to Pfaff, a peculiar principle to which he gave the name of *picroglycion*, indicative of the taste at once bitter and sweet, which it is said

* Solania is most conveniently obtained from the sprouts of the common potato. The following is Wackenroder's process for extracting it. The sprouts, collected in the beginning of June, and pressed down in a suitable vessel, by means of pebbles, are macerated for twelve or eighteen hours in water enough to cover them, previously acidulated with sulphuric acid, so as to have a strongly acid reaction during the maceration. They are then expressed by the hand, and the liquor, with the addition of fresh portions of sulphuric acid, is added twice successively, as at first, to fresh portions of sprouts, and in like manner separated by expression. After standing for some days, it is filtered, and treated with powdered hydrate of lime in slight excess. The precipitate which forms is separated by straining, dried in a warm air, and boiled several times with alcohol. The alcoholic solution, having been filtered while hot, will, upon cooling, deposit the solania in flocculent crystals. An additional quantity of the alkali may be obtained by evaporating the mother liquor to one-quarter of its volume, and then allowing it to cool. The whole residuary liquor will assume a gelatinous consistence, and, upon being dried, will leave the solania in the form of a translucent, horny, amorphous mass. (*Pharm. Central Blatt*, 1843, p. 174.)

to possess. This has been obtained by Blitz, in the following manner. The watery extract is treated with alcohol, the tincture evaporated, the residue dissolved in water, the solution precipitated with subacetate of lead, the excess of this salt decomposed by sulphuretted hydrogen, the liquor then evaporated to dryness, and the residue treated with acetic ether, which yields the principle in small isolated crystals by spontaneous evaporation. Pfaff found also in dulcamara a vegeto-animal subtance, gummy extractive, gluten, green wax, resin, benzoic acid, starch, lignin, and various salts of lime.

Medical Properties and Uses. Dulcamara possesses feeble narcotic properties, with the power of increasing the secretions, particularly that of the kidneys and skin. We have observed, in several instances, when the system was under its influence, a dark purplish colour of the face and hands, and at the same time considerable languor of the circulation. Its narcotic effects do not become obvious, unless when it is taken in large quantities. In overdoses it produces nausea, vomiting, faintness, vertigo, and convulsive muscular movements. A case is recorded in Casper's *Wochenschrift*, in which a man took, in one forenoon, from three to four quarts of a decoction made from a peck of the stalks, and was attacked with pain in the joints, numbness of the limbs, dryness of the mouth, and palsy of the tongue, with consciousness unimpaired, the pulse quiet, but small and rather hard, and the skin cool. The symptoms disappeared under the use of stimulants. (*Lond. Med. Gaz.*, Sept. 1850, p. 548.) Dulcamara has been recommended in various diseases, but is now nearly confined to the treatment of cutaneous eruptions, particularly those of a scaly character, as lepra, psoriasis, and pityriasis. In these complaints it is often decidedly beneficial, especially in combination with minute doses of the antimonials. Its influence upon the secretions is insufficient to account for its favourable effects. Perhaps they may be ascribed to its sedative influence on the capillary circulation. It is said to have been beneficially employed in chronic rheumatism and chronic catarrh. Antaphrodisiac properties are ascribed to it by some physicians. We have seen it apparently useful in mania connected with strong venereal propensities. The usual form of administration is that of decoction, of which two fluidounces may be taken four times a day, and gradually increased till some slight disorder of the head indicates the activity of the medicine. (See *Decoctum Dulcamaræ.*) An extract may also be prepared, of which the dose is from five to ten grains. That of the powder would be from thirty grains to a drachm. In cutaneous affections, a strong decoction is often applied to the skin, at the same time that the medicine is taken internally.

Off. Prep. Decoctum Dulcamaræ; Extractum Dulcamaræ. W.

ELATERIUM. *U. S., Ed., Dub.*

Elaterium.

A substance deposited by the juice of the fruit of Momordica Elaterium. *U. S.* Feculence of the juice of the fruit. *Ed.* Ecbalium agreste. The feculence from the juice of the fruit. *Dub.*

Off. Syn. ELATERIUM. Ecbalium officinarum. The recent fruit, not quite ripe. EXTRACTUM ELATERII. *Lond.*

Elaterion, *Fr.;* Elaterium, *Germ.;* Elaterio, *Ital., Span.*

MOMORDICA. *Sex. Syst.* Monœcia Monadelphia.—*Nat. Ord.* Cucurbitaceæ. *Gen. Ch.* MALE. *Calyx* five-cleft. *Corolla* five-parted. *Filaments* three. FEMALE. *Calyx* five-cleft. *Corolla* five-parted. *Style* trifid. *Gourd* bursting elastically. *Willd.*

Momordica Elaterium. Willd. *Sp. Plant.* iv. 605; Woodv. *Med. Bot.* p. 192, t. 72.—*Ecbalium agreste.* Richard; Lindley, *Med. and Œcon. Bot.* p. 95.—*Ecbalium Elaterium. French Codex*, A. D. 1837. The *wild* or *squirting cucumber* is a perennial plant, with a large fleshy root, from which proceed several round, thick, rough stems, branching and trailing like the common cucumber, but without tendrils. The leaves are petiolate, large, rough, irregularly cordate, and of a grayish-green colour. The flowers are yellow, and proceed from the axils of the leaves. The fruit has the shape of a small oval cucumber, about an inch and a half long, an inch thick, of a greenish or grayish colour, and covered with stiff hairs or prickles. When fully ripe, it separates from the peduncle, and throws out its juice and seeds with considerable force through an opening at the base, where it was attached to the footstalk. The name of squirting cucumber was derived from this circumstance, and the scientific and officinal title is supposed to have had a similar origin; though some authors maintain that the term *elaterium* was applied to the medicine, rather from the mode of its operation upon the bowels, than from the projectile property of the fruit.*

This species of Momordica is a native of the South of Europe; and is cultivated in Great Britain, where, however, it perishes in the winter. Elaterium is the substance spontaneously deposited by the juice of the fruit, when separated and allowed to stand. From the experiments of Dr. Clutterbuck it has been supposed that only the free juice about the seeds, which is obtained without expression, affords the product. The substance of the fruit itself, the seeds, as well as other parts of the plant, have been thought to be nearly or quite inert. From the statements made by Mr. Bell (see *note*, page 322), these opinions must be somewhat modified; but there is no doubt that strong expression injures the product. When the fruit is sliced and placed upon a sieve, a perfectly limpid and colourless juice flows out, which after a short time becomes turbid, and in the course of a few hours begins to deposit a sediment. This, when collected and carefully dried, is very light and pulverulent, of a yellowish-white colour, slightly tinged with green. It is the genuine elaterium, and was found by Clutterbuck to purge violently in the dose of one-eighth of a grain. But the quantity contained in the fruit is very small. Clutterbuck obtained only six grains from forty cucumbers. Commercial elaterium is often a weaker medicine, owing in part, perhaps, to adulteration, but much more to the mode in which it is prepared. In order to increase the product, the juice of the fruit is often expressed with great force; and there is reason to believe that it is sometimes evaporated so as to form an extract, instead of being allowed to deposit the active matter. The French elaterium is prepared by expressing the juice, clarifying it by rest and filtration, and then evaporating it to a suitable consistence. As the liquid remaining after the deposition of the sediment is comparatively inert, it will be perceived that the preparation of the French Codex must be relatively feeble. The following are the directions of the London College, with which those of the Edinburgh and Dublin Colleges essentially correspond. "Slice the fruit, express the juice very gently, and pass it through a very fine hair sieve; then set it aside for some hours until the thicker part has subsided. Reject the thinner supernatant part, and dry the thicker part with a gentle heat." As the process is executed at Apothecaries' Hall, the juice, after expression, is allowed to stand for about two hours, when the supernatant liquor is poured off, and the matter deposited is carefully dried, constituting the finest elaterium. Another portion, of a paler colour, is deposited by the decanted liquor. (*Pereira.*) The slight

* From the Greek ελαυνω I drive, or ελατης driver. The word elaterium was used by Hippocrates to signify any active purge. Dioscorides applied it to the medicine of which we are treating.

pressure directed is necessary for the extraction of the juice from the somewhat immature fruit employed. The perfectly ripe fruit is not used; as, in consequence of its disposition to part with its contents, it cannot be carried to market. The medicine is incorrectly denominated by the London College *Extractum Elaterii;* being neither an extract, strictly speaking, nor an inspissated juice. The Edinburgh College calls it Elaterium in the Materia Medica list, but inconsistently admits the name of *Extractum Elaterii* in the preparations. In the U. S. and Dublin Pharmacopœias, it is named simply *Elaterium.* As the plant is not cultivated in this country for medicinal purposes, our Pharmacopœia very properly adopts, as officinal, the medicine as it is found in commerce. It is brought chiefly from England; but it is probable that a portion of the elaterium, of which Dr. Pereira speaks as coming from Malta, reaches our market also.*

Properties. The *best elaterium* is in thin flat or slightly curled cakes or fragments, often bearing the impression of the muslin upon which it was dried, of a greenish-gray colour becoming yellowish by exposure, of a feeble odour, and a bitter somewhat acrid taste. It is pulverulent and inflammable, and so light that it swims when thrown upon water. When of *inferior quality,* it is sometimes dark-coloured, much curled, and rather hard, either breaking with difficulty, or presenting a resinous fracture. The *Maltese elaterium* is in larger pieces, of a pale colour, sometimes without the least tinge of green, destitute of odour, soft, and friable; and not unfrequently gives evidence of having been mixed with chalk or starch. It sinks in water.

Dr. Clutterbuck first observed that the activity of elaterium resided in that portion of it which was soluble in alcohol and not in water. This fact was afterwards confirmed by Dr. Paris, who found that the alcoholic extract, treated with boiling distilled water, and afterwards dried, had the property of purging in very minute doses, while the remaining portion of the elaterium was inactive. The subsequent experiments of the late Mr. Hennel, of London, and Mr. Morries, of Edinburgh, which appear to have been nearly simultaneous, demonstrated the existence of a crystallizable matter in elaterium, which is probably the active

* The following notice of the cultivation of the elaterium plant, and the preparation of the drug at Mitcham, in Surrey, England, condensed from a paper by Mr. Jacob Bell in the Pharm. Journ. and Trans. for October, 1850, may have some interest for the American reader. The seeds are sown in March, and the seedlings planted in June. In the luxuriant plants, the stem sometimes acquires an extraordinary breadth. In one instance, though not thicker than the forefinger where it issued from the earth, it was in its broadest part four inches wide and half an inch thick. A wet season interferes with the productiveness of the plant. At the spontaneous separation of the fruit, it throws out its juice sometimes to the distance of twenty yards; and hazard of injury to the eyes is incurred by walking among the plants at their period of maturity. A bushel of the fruit weighs 40 pounds, and the price varies from 7 to 10 shillings sterling. In the manufacture of elaterium, which begins early in September, the fruit, having been washed, if necessary, to cleanse it from earthy matters, is sliced longitudinally into halves, and then submitted to expression, wrapped in a hempen cloth, in a common screw-press. Considerable force is used in the expression. The juice is then strained through hair, cypress, or wire sieves, and set aside for deposition. The deposit usually takes place in three or four hours. When this part of the process is completed, the supernatant liquor is carefully poured off, the deposit is placed on calico cloths resting on hair sieves, and allowed to drain for about twelve hours, after which it is removed by a knife, spread over small cloths, and dried on canvas frames in the drying stove. About half an ounce of fine elaterium is obtained from a bushel of fruit. Some obtain more; but the product is inferior, in consequence of the use of too much force in the expression. Good elaterium has a pale pea-green tint; that of inferior quality is of a duller hue. The juice expelled in bursting is said to undergo very little change in the air, while that expressed from the ripe fruit immediately afterwards, becomes milky, and deposits elaterium. The recently burst fruit, therefore, is nearly if not quite as good for the preparation of the drug, as that collected before perfect maturity.—*Note to the ninth edition.*

principle of the medicine, and for which Mr. Morries proposed the appropriate name *elaterin*. According to Mr. Hennel, 100 parts of elaterium contain 44 of elaterin, 17 of a green resin (chlorophylle), 6 of starch, 27 of lignin, and 6 of saline matters. The alcoholic extract, which Dr. Paris called *elatin*, is probably a mixture of elaterin and the green resin or chlorophylle.*

Elaterin, according to Mr. Morries, crystallizes when pure in colourless microscopic rhombic prisms, having a silky appearance when in mass. It is extremely bitter and somewhat acrid to the taste, insoluble in water and alkaline solutions, soluble in alcohol, ether, and hot olive oil, and sparingly soluble in dilute acids. At a temperature between 300° and 400° it melts, and at a higher temperature is dissipated in thick, whitish, pungent vapour, having an ammoniacal odour. It has no alkaline reaction. It may be easily procured by evaporating an alcoholic tincture of elaterium to the consistence of thin oil, and throwing the residue while yet warm into a weak boiling solution of potassa. The potassa holds the green resin or chlorophylle in solution, and the elaterin crystallizes as the liquor cools. Mr. Hennel obtained it by treating with ether the alcoholic extract procured by the spontaneous evaporation of the tincture. This consists of elaterin and the green resin, the latter of which being much more soluble in ether than the former, is completely extracted by this fluid, leaving the elaterin pure. But as elaterin is also slightly soluble in ether, a portion of this principle is wasted by Mr. Hennel's method. By evaporating the ethereal solution, the green resin is obtained separate. Mr. Hennel says that this was found to possess, in a concentrated state, the purgative property of the elaterium, as it acted powerfully in a dose less than one-third of a grain. But this effect was probably owing to the presence of a portion of elaterin which had been dissolved by the ether. The late Dr. Duncan, of Edinburgh, ascertained that the crystalline principle or elaterin produced, in the quantity of $\frac{1}{12}$ or $\frac{1}{16}$ of a grain, all the effects of a dose of elaterium. The proportion of elaterin varies exceedingly in different parcels of the drug. Mr. Morries obtained 26 per cent. from the best British elaterium, 15 per cent. from the worst, and only 5 or 6 per cent. from the French; while a portion, procured according to the directions of the London College, yielded to Mr. Hennel upwards of 40 per cent.

Choice of Elaterium. The inequality of elaterium depends probably more on diversities in the mode of preparation than on adulteration. It should possess the sensible properties above indicated as characterizing good elaterium, should not effervesce with acids, and should yield, as directed by the Edinburgh College, from one-seventh to one-fourth of elaterin.

Medical Properties and Uses. Elaterium is a powerful hydragogue cathartic, and in a large dose generally excites nausea and vomiting. If too freely administered, it operates with great violence both upon the stomach and bowels, producing inflammation of these organs, which has in some instances eventuated fatally. It also increases the flow of urine. The fruit was employed by the ancients, and is recommended in the writings of Dioscorides as a remedy in mania and melancholy. Sydenham and his contemporaries considered elaterium highly useful in dropsy; but, in consequence of some fatal results from its incautious employment, it fell into disrepute, and was generally neglected, till again brought into notice by Dr. Ferriar. It is now considered one of the most efficient hydragogue cathartics in the treatment of dropsical diseases, in which it has sometimes proved successful after all other remedies have failed. The full dose of commercial elaterium is often from one to two grains; but, as in this quantity it generally vomits, if of good quality, the best mode of administering it is

* The substance to which Pelletier gave the name of *chlorophylle*, under the impression that it was a peculiar proximate principle, has been ascertained by that chemist to be a mixture of wax, and a green fixed oil. (*Journ. de Pharm.*, xix. 109.)

in the dose of a quarter or half a grain, repeated every hour till it operates. The dose of Clutterbuck's elaterium is the eighth of a grain. That of elaterin is from the sixteenth to the twelfth of a grain, and is best given in solution. One grain may be dissolved in a fluidounce of alcohol with four drops of nitric acid, and from 30 to 40 minims may be given diluted with water. W.

ELEMI. *Lond., Ed., Dub.*

Elemi.

Concrete turpentine of an uncertain plant. *Lond.* Concrete resinous exudation from one or more unascertained plants. *Ed., Dub.*

Résine élemi, *Fr.;* Oelbaumharz, Elemi, *Germ.;* Elemi, *Ital.;* Goma de limon, *Span.*

AMYRIS. *Sex. Syst.* Octandria Monogynia.—*Nat. Ord.* Terebintaceæ, *Juss.;* Amyrideæ, *R. Brown, Lindley.*

Gen. Ch. Calyx four-toothed. *Petals* four, oblong. *Stigma* four-cornered. *Berry* drupaceous. *Willd.*

Some botanists separate from this genus the species which have their fruit in the form of a capsule instead of a nut, and associate them together in a distinct genus with the name of *Icica*. This is recognised by De Candolle.

Most of the trees belonging to these two genera yield, when wounded, a resinous juice analogous to the turpentines. It is not improbable that the drug usually known by the name of *elemi*, is derived from several different trees. That known to the ancients is said to have been obtained from Ethiopia, and all the elemi of commerce was originally brought from the Levant. The tree which afforded it was not accurately known, but was supposed to be a species of Amyris. At present the drug is said to be derived from three sources, namely, Brazil, Mexico, and Manilla. The Brazilian is believed to be the product of a plant mentioned by Marcgrav under the name of *icicariba*, and denominated by De Candolle *Icica Icicariba*. It is a lofty tree, with pinnate leaves, consisting of three or five pointed, perforated leaflets, which are smooth on their upper surface, and woolly beneath. It is erroneously stated in some works to be a native of Carolina. The elemi is obtained by incisions into the trees, through which the juice flows and concretes upon the bark. The Mexican is said by Dr. Royle to be obtained from a species of Elaphrium, which that author has described from dried specimens, and proposes to name *E. elemiferum.* (*Materia Medica*, Am. ed., p. 339.) The Manilla elemi is conjecturally referred to *Canarium commune.* (*Ibid.*, p. 340.)

Elemi is in masses of various consistence, sometimes solid and heavy like wax, sometimes light and porous; unctuous to the touch; diaphanous; of diversified colours, generally greenish with intermingled points of white or yellow, sometimes greenish-white with brown stains, sometimes yellow like sulphur; fragile and friable when cold; softening by the heat of the hand; of a terebinthinate somewhat aromatic odour, diminishing with age, and said, in some varieties, to resemble that of fennel; of a warm, slightly bitter, disagreeable taste; entirely soluble, with the exception of impurities, in boiling alcohol; and affording a volatile oil by distillation. A variety examined by M. Bonastre was found to consist of 60 parts of resin, 24 of a resinous matter soluble in boiling alcohol, but deposited when the liquid cools, 12·5 of volatile oil, 2 of extractive, and 1·5 of acid and impurities. M. Baup has found the resin to be of two kinds, one amorphous, the other crystallizable; for the latter of which he proposes the name of *elemin.* (*Journ. de Pharm.*, 3e *sér.*, xx. 331.) Elemi is sometimes adulterated with colophony and turpentine. The Manilla elemi is said to be in masses of a light-yellowish colour, internally soft, and of a strong odour of fennel. (*Royle.*) We have been informed that a considerable amount of elemi is used in this country by the hatters.

Medical Properties and Uses. Elemi has properties analogous to those of the turpentines; but is exclusively applied to external use. In the United States it is rarely employed even in this way. In the pharmacy of Europe it enters into the composition of numerous plasters and ointments. We are told that it is occasionally brought to this country in small fragments, mixed with the coarser kinds of gum Arabic from the Levant and India.

Off. Prep. Unguentum Elemi. W.

ERGOTA. *U. S., Lond., Ed., Dub.*

Ergot.

The diseased seeds of Secale cereale. *U. S.* The seed injured by a parasitic plant. *Lond.* An undetermined fungus, with degenerated seed of Secale cereale. *Ed.* A peculiar excrescence supposed to be caused by a parasitical fungus. *Dub.*

Spurred rye; Secale cornutum; Siegle ergoté, *Fr.;* Mutterkorn, *Germ.*

In all the *Graminaceæ* or grass tribe, and in some of the *Cyperaceæ*, the place of the seeds is sometimes occupied by a morbid growth, which, from its resemblance to the spur of a cock, has received the name of *ergot*, adopted from the French. This product is most frequent in the rye, *Secale cereale* of botanists, and, having been found, as occurring in that plant, to possess valuable medicinal properties, was adopted in the first edition of the U. S. Pharmacopœia under the name of *secale cornutum* or *spurred rye*. In the edition of 1840, this name was changed for *Ergota*, in conformity with the nomenclature of the London and Edinburgh Colleges, by whom the medicine had in the mean time been adopted.

Considerable difference of opinion has existed in relation to the nature of this singular substance. It was at one time thought to be merely the seed altered by disease; the morbid condition being ascribed by some to the agency of an insect, by others to excess of heat and moisture. A second opinion considered it a parasitic fungus, occupying the place of the seed. This was entertained by De Candolle, who called the fungus *Sclerotium Clavus*. According to a third and intermediate opinion, the ergot is the seed, diseased and entirely perverted in its nature by the influence of a parasitic fungus, attached to it from the very beginning of its development. This view was put forth by M. Léveillé, in a memoir published in the Annals of the Linnæan Society of Paris for the year 1826. He gave to the supposed fungus the name of *Sphacelia segetum;* but his observations as to its characters have not been sustained. To the late Mr. E. J. Quekett, of London, belongs the credit of having fully investigated this subject; and of having satisfactorily established the last mentioned view of the nature of ergot. According to Mr. Quekett, the beginning of the growth of the ergot is marked by the appearance, about the young grain and its appendages, of multitudes of minute filaments like cobwebs, which run over all its parts, cementing anthers and stigmas together, and of a white coating upon the surface of the grain, from which, upon immersion in water, innumerable minute particles separate, and after a time sink in the fluid. These particles, when examined by the microscope, prove to be the reproductive agents, germs, or *sporidia* of a species of fungus, and may be observed to sprout and propagate in various ways under favourable circumstances. Their length, upon the average, is about the four-thousandth of an inch. The filaments are the results of the growth of these singular germs. The sporidia and filaments do not increase with the increase of the ergot; and, when this has projected beyond the paleæ and become visible, it has lost a portion of its white coating, and presents a dark violet colour. It now increases with great rapidity, and attains its full size in a few days. When

completely developed, it exhibits very few of the filaments or sporidia upon its surface. But Quekett believed that the germs of the fungus emit their filaments through the tissue of the ergot when young and tender, and that, as this increases, it is made up partly of the diseased structure of the grain, and partly of the fungous matter. The fungus was named by Quekett *Ergotætia abortifaciens;* for which title Dr. Pereira, at the suggestion of the Rev. M. J. Berkeley, substituted that of *Oidium abortifaciens.* This view of the nature and cause of ergot is strongly supported by the asserted facts, that the microscopic fungus has an existence independent of the morbid grain, being found in various other parts of the plant, and growing even when entirely separated from it; and that the sporidia or white dust upon the surface of ergot, if applied to the seeds of certain Graminaceæ before germination, or sprinkled in the soil at the roots of the plants after they have begun to grow, will give rise to ergotized fruit. That the ergot is not itself a peculiar fungus, but the perverted grain, is evinced by the frequent remains of the stigma upon its summit, by the scales at its base, and by the circumstance that in some instances only a portion of the seed is ergotized. How far its peculiar medical properties may depend upon the morbid substance of the grain, and how far on the fungous matter associated with it, has not been determined. (See *Am. Journ. of Pharm.*, xi. 116 and 237.)

The ergot usually projects out of the glume or husk beyond the ordinary outline of the spike or ear. In some spikes the place of the seeds is wholly occupied by the ergot, in others only two or three spurs are observed. It is said to be much more energetic when collected before than after harvest. Rye has generally been thought to be most subject to the disease in poor and wet soils, and in rainy seasons; and intense heat succeeding continued rains is said to favour its development, especially if these circumstances occur at the time the flower is forming. It is now, however, asserted that moisture has little or nothing to do with its production.* It should not be collected until some days after it has begun to form; as, according to M. Bonjean, if gathered on the first day of its formation, it does not possess the poisonous properties which it exhibits when taken on the sixth day. (See *Pharm. Journ. and Trans.*, Jan. 1842.)

Properties. Ergot is in solid, brittle yet somewhat flexible grains, from a third of an inch to an inch and a half long, from half a line to three lines in thickness, cylindrical or obscurely triangular, tapering towards each end, obtuse at the extremities, usually curved like the spur of a cock, marked with one or two longitudinal furrows, often irregularly cracked or fissured, of a violet-brown colour and often somewhat glaucous externally, yellowish-white, or violet-white within, of an unpleasant smell when in mass, resembling that of putrid fish, and of a taste which is at first scarcely perceptible, but ultimately disagreeable and slightly acrid. Under the microscope, the surface appears more or less covered with sporidia, which occasion its glaucous aspect; and the interior structure is found to be composed of minute roundish cells, containing, according to Quekett, particles of oil. Ergot yields its virtues to water and alcohol. The aqueous infusion or decoction is claret-coloured, and has an acid reaction. It is precipitated by acetate and subacetate of lead, nitrate of silver, and tincture of galls; but affords with iodine no evidence of the presence of starch. Long boiling impairs the virtues of the medicine.

Ergot has been analyzed by Vauquelin, Winckler, Wiggers, Wright, Legrip, and several others. The analysis by M. Legrip is among the most recent and complete. That chemist obtained from 100 parts of ergot 34·50 parts of a thick,

* Mr. J. Price Wetherill informed the author that, in two seasons, he had found rye, sown very late, so as scarcely to come up before spring, to be almost universally ergotized; while neighbouring rye, sown at the proper season, in the same kind of soil precisely, had nothing of the disease, though the seed was the same in both cases.—*Note to the sixth edition.*

very fluid, fixed oil, of a fine yellow colour; 2·75 of starch; 1·00 of albumen; 2·25 of inulin; 2·50 of gum; 1·25 of uncrystallizable sugar; 2·75 of a brown resin; 3·50 of *fungin;* 13·50 of vegeto-animal matter; 0·75 of osmazome; 0·50 of a fatty acid; 24·50 of lignin; 0·50 of colouring principles; an odorous principle not isolated; 2·25 of fungate of potassa; 0·50 of chloride of sodium; 0·50 of sulphate of lime and magnesia; 1·25 of subphosphate of lime; 0·25 of oxide of iron; 0·15 of silica; and 2·50 of water, with 2·35 loss. (*Ann. de Thérap.*, A. D. 1845, p. 44.) Wiggers obtained a peculiar principle, which he denominated *ergotin*, under the impression that it was the active ingredient. It was reddish-brown, of a peculiar nauseous odour and a bitter slightly acrid taste, soluble in alcohol, but insoluble in water or ether. It was obtained by digesting ergot in ether and afterwards in alcohol, evaporating the alcoholic solution, and treating the extract thus obtained with water, which left the ergotin undissolved. It was given with fatal effects to a hen. Dr. Wright supposed the virtues of ergot to reside in the fixed oil, which he therefore recommended as a substitute for the medicine. The *oil of ergot*, when obtained from grains recently collected, is, according to Dr. Wright, often quite free from colour; but, as usually prepared, is reddish-brown. It has a disagreeable, somewhat acrid taste, is lighter than water, and is soluble in alcohol and alkaline solutions. It is prepared by forming an ethereal tincture of ergot by the process of displacement, and evaporating the ether with a gentle heat. (*Ed. Med. and Surg. Journ.* for 1839–40.) Experience seems to have shown that, though the oil thus prepared with ether may have produced effects analogous to those of ergot, they were to be ascribed rather to some principle extracted along with the oil by the menstruum than to the oil itself; for, when procured by simple expression, this has been found to be inactive. (*Journ. de Pharm., N. S.*, i. 183.) The opinion of M. Bonjean, that there are two active principles in ergot, the oil which is poisonous, and another resident in the watery extract, and possessing anti-hemorrhagic properties without being in the least degree poisonous, requires confirmation. That writer is certainly not warranted in giving to his extract, however purified, the name of ergotin, until he can show that it is a characteristic principle.

Dr. F. L. Winckler has recently found in ergot a volatile alkaloid, which he calls *secalin*, and believes to exist in that substance combined with the ergotin of Wiggers, to which he ascribes acid properties. But the accounts which we have seen of his investigations are too indefinite to permit any precise statement of results. He seems disposed to ascribe the virtues of the medicine to this compound, which he denominates *ergotate of secalin*, or to one of its components. He also found in ergot a peculiar red colouring matter, analogous if not identical with hematin. (See *Pharm. Journ. and Trans.*, xiii. 86.) The same chemist, by distilling the watery extract of ergot with potassa, obtained a volatile alkaloid, which he considered to be identical with *propylamin*, the odorous principle of herring pickle, previously obtained from narcotina by the reaction of potassa. (See *Am. Journ. of Pharm.*, xxiv. 346.)

Ergot, when perfectly dry and kept in well-stopped bottles, will retain its virtues for a considerable time; but, exposed to air and moisture, it speedily undergoes chemical changes and deteriorates. It is, moreover, apt to be attacked by a minute worm, which consumes the interior of the grain, leaving merely the exterior shell and an excrementitious powder. This insect is sometimes found in the ergot before removal from the plant. In the state of powder, the medicine still more readily deteriorates. It is best, as a general rule, to renew it every year or two. M. Viel recommends that it should be well dried at a gentle heat, and incorporated with double its weight of loaf sugar, by means of which, if protected from moisture, it will retain its virtues for many years. Camphor is said to prevent injury from worms.

Medical Properties and Uses. Given in small doses, ergot produces, in the

system of the male, no obvious effects; but, in the female, exhibits a strong tendency to the uterus, upon the contractile property of which it operates with great energy. In the quantity of half a drachm or a drachm it often occasions nausea or vomiting, and in still larger doses produces a sense of weight and pain in the head, giddiness, dilatation of the pupils, delirium, and even stupor, proving that it possesses narcotic properties. It is said also to excite febrile symptoms; but our own observation coincides with that of authors who ascribe to it the power of reducing the frequency of the pulse. We have seen this effect produced by it in a remarkable degree, even without nausea. Dr. Hardy, of the Dublin Lying-in-Hospital, found it to diminish the pulsations of the fœtal heart. Its long-continued and copious use is highly dangerous, even when no immediate effects are perceptible. Terrible and devastating epidemics in different parts of the continent of Europe, particularly in certain provinces of France, have long been ascribed to the use of bread made from rye contaminated with this degenerate grain. Dry gangrene, typhus fever, and disorder of the nervous system attended with convulsions, are the forms of disease which have been observed to follow the use of this unwholesome food. It is true that ergot has been denied to be the cause; but accurate investigations, made by competent men upon the spot where the epidemics have prevailed, together with the result of experiments made upon inferior animals, leave no room for reasonable doubt upon the subject. Very large quantities are required for immediate poisonous effects. From two to eight drachms have been given at one dose to a man without very serious results, and three ounces, according to Dr. Wright, were required to kill a small dog. Death from single doses, in inferior animals, is preceded by symptoms indicating irritation of the stomach and bowels, great muscular prostration, loss of sensation, and sometimes slight spasms. A case of acute poisoning from ergot is recorded by Dr. Pratschke, in which uneasiness in the head, oppression of stomach, diarrhœa, urgent thirst, burning pains in the feet, tetanic spasms, violent convulsions, and death ensued upon eating freely of ergotized grain. (*Lond. Med. Gaz.*, Oct. 1850, p. 579.)

Ergot has been much used for promoting the contraction of the uterus. On the continent of Europe, in Germany, France, and Italy, it has long been empirically employed by midwives for this purpose; and its German name of *mutterkorn* implies a popular acquaintance with its peculiar powers. But the attention of the medical profession was first called to it by a letter from Dr. Stearns, of Saratoga county, in the State of New York, addressed to Dr. Ackerly, A. D. 1807, and published in the eleventh volume of the New York Medical Repository. The journals afterwards teemed with communications attesting its efficacy in facilitating parturition; and, though it sometimes failed, the general opinion was so decidedly in its favour, that it soon took a place among the established articles of the materia medica. When it proves wholly inefficient, the result is ascribable to peculiarity of constitution in the individual, or inferiority in the particular parcel employed. In its operation upon the pregnant uterus it produces a constant unremitting contraction and rigidity, rather than that alternation of spasmodic effort and relaxation which is observable in the natural process of labour. Hence, unless the os uteri and external parts are sufficiently relaxed, the medicine is apt to produce injury to the fœtus by the incessant pressure which it maintains; and the death of the child is thought not unfrequently to have resulted from its injudicious employment. The cases to which it is thought to be especially adapted are those of lingering labour, when the os uteri is sufficiently dilated, and the external passages sufficiently relaxed, when no mechanical impediment is offered to the passage of the child, and the delay is ascribable solely to want of energy in the uterus. Other cases are those in which the death of the fœtus has been ascertained, and when great exhaustion or dangerous constitutional irritation imperiously calls for speedy delivery. The medicine may also be

given to promote the expulsion of the placenta, to restrain inordinate hemorrhage after delivery, and to hasten the discharge of the fœtus in protracted cases of abortion. In women subject to dangerous flooding, a dose of ergot given immediately before delivery is said to have the happiest effects. It has also been recommended for the expulsion of coagula of blood, polypi, and hydatids from the uterine cavity. It has been accused of producing puerperal convulsions, hour-glass contraction of the uterus, and hydrocephalus in the new-born infant. (Dr. Catlett, *Ed. Med. and Surg. Journ.*, Jan. 1842.) In uterine hemorrhage, unconnected with pregnancy, the medicine is deemed highly useful; and its employment has been extended to other hemorrhages with asserted advantage. We have seen it promptly effectual in pulmonary hemorrhage, after all the usual means had failed. May it not have the power of producing contraction of the capillaries in general, or of interfering in some other way with the circulation of the blood in these vessels, as by the exertion of a direct sedative or paralyzing influence upon them? We might in this way account for the dry gangrene which results from its abuse, as well as for its influence in restraining hemorrhage. It has also been employed in amenorrhœa, but not with encouraging success. Gonorrhœa, gleet, leucorrhœa, dysmenorrhœa, chronic dysentery and diarrhœa, paraplegia, paralysis or debility of the bladder and of the rectum, spermatorrhœa, hysteria, and intermittent fever, are among the complaints in which it has been recommended.

Ergot is usually given in substance, infusion, or decoction. The dose of the powder to a woman in labour is fifteen or twenty grains, to be repeated every twenty minutes till its peculiar effects are experienced, or till the amount of a drachm has been taken. Of an infusion made in the proportion of a drachm of ergot to four fluidounces of water, one-third may be given for a dose, and repeated with the same interval. For other purposes the dose of the medicine is ten or fifteen grains, repeated three times a day, and gradually increased, but not continued for a great length of time. In urgent cases of hemorrhage, the dose may be repeated every two hours, or oftener if necessary. A wine of ergot is directed by the United States Pharmacopœia. (See *Vinum Ergotæ.*) The *oil of ergot*, prepared by means of ether, as already described (page 327), was given by Dr. Wright in the dose of from twenty to fifty drops, diffused in cold water, warm tea, or weak spirit and water.

Under the name of *ergotin*, Bonjean's purified extract is sometimes used in the dose of from five to ten grains. It is made by exhausting ergot with water, evaporating to the consistence of syrup, precipitating the albumen, gum, &c., by a large excess of alcohol, decanting the clear liquid, and evaporating to the consistence of a soft extract.

Mr. Laidley, of Richmond, Va., proposes a *fluid extract*, made by exhausting ergot successively with ether, alcohol, and water, allowing the ethereal solution to evaporate spontaneously, evaporating the tincture and infusion till they measure as many fluidounces as there were troy ounces of ergot employed, then adding enough sugar to preserve the liquid, incorporating with it the ethereal extract or oil, and finally adding so much water as to cause a fluidrachm of the preparation to represent forty grains or two doses of the ergot. (*Am. Journ. of Pharm.*, xxiv. 160.)

Ergot has been employed externally. Dr. Müller found it to check the bleeding from large divided arteries; and Dr. Wright states that either in powder or infusion it has a prompt effect in arresting hemorrhage. It is recommended by the latter practitioner as an injection in uterine hemorrhage. It should be used, however, with some caution; as the powder applied to abraded surfaces has produced sloughing in the lower animals.

Ergot should be powdered only when wanted for use.

Off. Prep. Infusum Ergotæ; Tinctura Ergotæ; Tinctura Ergotæ Ætherea; Vinum Ergotæ. W.

ERIGERON CANADENSE. *U. S. Secondary.*

Canada Fleabane.

The herb of Erigeron Canadense. *U. S.*

Erigeron. *Sex. Syst.* Syngenesia Superflua.—*Nat. Ord.* Compositæ-Asteroideæ, *De Cand.* Asteraceæ, *Lindley.*

Gen. Ch. Calyx imbricated, sub-hemispherical, in fruit often reflected. *Florets of the ray* linear, very narrow, numerous. *Receptacle* naked. *Pappus* double, exterior minute, interior pilose, of few rays. *Nuttall.*

Erigeron Canadense. Willd. *Sp. Plant.* iii. 1954. This is an indigenous annual plant, with a stem from two to six feet high, covered with stiff hairs, and divided into numerous branches. The leaves are linear-lanceolate, and edged with hairs; those at the root are dentate. The flowers are very small, numerous, white, and arranged in terminal panicles. They differ from those of the other species of Erigeron in having an oblong calyx, the rays very minute and more numerous than the florets of the disk, and the seed-down simple. Hence by some botanists the plant is placed in a sub-genus with the title *Cænotus.* Another variety of *E. Canadense*, which Mr. Nuttall makes a distinct species, with the title *E. pusilum*, is not more than from four to six inches high, and has an erect smooth stem, less branched than the preceding, with all its leaves entire, and scabrous on the margin. The panicle is simple, and the peduncles filiform, nearly naked, divaricate, each bearing two or three flowers.

Canada fleabane is very common throughout the northern and middle sections of the United States, and has become naturalized in many parts of Europe. It abounds in neglected fields, and blooms in July and August. The plant, all parts of which are medicinal, should be collected while in flower. The leaves and flowers are said to possess its peculiar virtues in greatest perfection.

This species of Erigeron has an agreeable odour, and a bitterish, acrid, somewhat astringent taste. Among its constituents, according to Dr. De Puy, are bitter extractive, tannin, gallic acid, and volatile oil. Both alcohol and water extract its virtues. Its acrimony is diminished by decoction, in consequence, probably, of the escape of the oil.

Medical Properties and Uses. From the observations of Dr. De Puy, it appears to be diuretic, tonic, and astringent; and has been found useful in dropsical complaints and diarrhœa. It may be given in substance, infusion, tincture, or extract. The dose of the powder is from thirty grains to a drachm; of an infusion prepared in the proportion of an ounce of the plant to a pint of boiling water, from two to four fluidounces; of the aqueous extract from five to ten grains. In each case, the dose should be repeated every two or three hours. W.

ERIGERON HETEROPHYLLUM. *U. S. Secondary.*

Various-leaved Fleabane.

The herb of Erigeron heterophyllum. *U. S.*

ERIGERON PHILADELPHICUM. *U. S. Secondary.*

Philadelphia Fleabane.

The herb of Erigeron Philadelphicum. *U. S.*

Erigeron. See ERIGERON CANADENSE.

1. *Erigeron heterophyllum.* Willd. *Sp. Plant.* iii. 1956; Barton, *Am. Med. Bot.* i. 231.—*E. annuum.* Persoon, *Syn.* ii. 431; Torrey and Gray, *Flor. of N. Am.* ii. 175. This is a biennial herbaceous plant, belonging both to North America and Europe. It has a branching root, from which proceed several erect, roundish, striated, pubescent stems, much divided near the top, and rising two or three feet in height. The lower leaves are ovate, acute, deeply toothed, and supported upon long winged footstalks; the upper are lanceolate, acute, deeply serrate in the middle, and sessile; the floral leaves are lanceolate and entire; all, except those from the root, are ciliate at the base. The flowers are in terminal corymbs. The florets of the disk are yellow; those of the ray numerous, very slender, and of a white, pale-blue, or pale-purple colour. The flowering period is from June to October.

Erigeron Philadelphicum. Barton, *Med. Bot.* i. 227.—*E. strigosum.* Willd. *Sp. Plant.* iii. 1956; Torrey and Gray, *Flor. of N. Am.* ii. 176. The Philadelphia fleabane is perennial and herbaceous, with a branching yellowish root, and from one to five erect stems, which rise two or three feet in height, and are much branched at top. The whole plant is pubescent. The lower leaves are ovate-lanceolate, nearly obtuse, ciliate on the margin, entire or marked with a few serratures, and supported on very long footstalks; the upper are narrow, oblong, somewhat wedge-shaped, obtuse, entire, sessile, and slightly embrace the stem; the floral leaves are small and lanceolate. The flowers are numerous, radiate, and disposed in a panicled corymb, with long peduncles bearing from one to three flowers. They resemble those of the preceding species in colour, and make their appearance about the same period.

We include these two species under one head, because they grow together, possess identical medical properties, and are indiscriminately employed. They are found in various parts of the United States, and abound in the fields about Philadelphia, where they are known and used under the common though inaccurate name of *scabious.* The whole herb is used, and should be collected while the plants are in flower. It has a feebly aromatic odour, and bitterish taste, and imparts its properties to boiling water.

Medical Properties and Uses. Fleabane is diuretic, without being offensive to the stomach. It has been a favourite remedy with some highly respectable practitioners of Philadelphia in gravel and other nephritic diseases, and has been employed with advantage in dropsy. By the late Dr. Wistar it was recommended in hydrothorax complicated with gout. It cannot be relied on for the cure of dropsy; but may be employed as an adjuvant to more efficient medicines. It is most conveniently administered in infusion or decoction, of which a pint, containing the virtues of an ounce of the herb, may be given in twenty-four hours. W.

ERYNGIUM. *U. S. Secondary.*

Button Snakeroot.

The root of Eryngium aquaticum. *U. S.*

Eryngium. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Apiaceæ or Umbelliferæ.

Gen. Ch. Flowers capitate. *Involucrum* many-leaved. Proper *Calyx* five-parted, superior, persistent. *Corolla* of five petals. *Receptacle* foliaceous, segments acute or cuspidate. *Fruit* bipartite. *Nuttall.*

Eryngium aquaticum. Willd. *Sp. Plant.* i. 1357. The *button snakeroot* or *water eryngo* is an indigenous herbaceous plant, with a perennial tuberous root, and a stem two or three feet high, sometimes, according to Pursh, six feet, generally branching by forks, but trichotomous above. The leaves are very long,

linear-lanceolate on the upper part of the stem, sword-shaped below, with bristly spines at distant intervals upon their margin. The floral leaves are lanceolate and dentate. The flowers are white or pale, and disposed in globose heads, with the leaflets of the involucrum shorter than the head, and, like the scales of the receptacle, entire. This plant is found in low wet places, from Virginia to Carolina. Its period of flowering is August.

The root, which is the medicinal portion, has a bitter, pungent, aromatic taste, provoking, when chewed, a flow of saliva. It is diaphoretic, expectorant, in large doses occasionally emetic; and is used by some physicians in decoction as a substitute for seneka. (*Bigelow.*) We are told in Barton's *Collections*, that it is nearly allied to the contrayerva of the shops. W.

ERYTHRONIUM. *U. S. Secondary.*

Erythronium.

The root and herb of Erythronium Americanum. *U. S.*

ERYTHRONIUM. *Sex. Syst.* Hexandria Monogynia.—*Nat. Ord.* Liliaceæ.

Gen. Ch. Calyx none. *Corolla* inferior, six-petalled; the three inner petals with a callous prominence on each edge near the base. *Bigelow.*

Erythronium Americanum. Muhl. *Catalogue*, 84; Bigelow, *Am. Med. Bot.* iii. 151.—*E. lanceolatum.* Pursh, p. 230. This is an indigenous perennial bulbous plant, sometimes called, after the European species, *dog's tooth violet.* The bulb (cormus), which is brown externally, white and solid within, sends up a single naked slender flower stem, and two smooth, lanceolate, nearly equal leaves, sheathing at their base, with an obtuse callous point, and of a brownish-green colour diversified by numerous irregular spots. The flower is solitary, nodding, yellow, with oblong-lanceolate petals obtuse at the point, a club-shaped undivided style, and a three-lobed stigma.

The Erythronium grows in woods and other shady places throughout the Northern and Middle States. It flowers in the latter part of April or early in May. All parts of it are active.

In the dose of twenty or thirty grains, the recent bulb acts as an emetic. The leaves are said to be more powerful. The activity of the plant is diminished by drying. So far as we are at present acquainted with its virtues, it may be considered a useless addition to the Materia Medica. W.

EUPATORIUM. *U. S.*

Thoroughwort.

The tops and leaves of Eupatorium perfoliatum. *U. S.*

EUPATORIUM. *Sex. Syst.* Syngenesia Æqualis.—*Nat. Ord.* Compositæ-Eupatoriaceæ, *De Cand.* Asteraceæ, *Lindley.*

Gen. Ch. Calyx simple or imbricate, oblong. *Style* long and semi-bifid. *Receptacle* naked. *Pappus* pilose, or more commonly scabrous. *Seed* smooth and glandular, quinquestriate. *Nuttall.*

Of this numerous genus, comprising not less than thirty species within the limits of the United States, most of which probably possess analogous medical properties, *E. perfoliatum* alone now holds a place in our national Pharmacopœia. *E. purpureum* and *E. teucrifolium* were originally in the *Secondary List*, but were discarded at the revision of 1840. They merit, however, a brief notice here, if only from their former officinal rank.

Eupatorium purpureum, or *gravel root*, is a perennial herbaceous plant, with

a purple stem, five or six feet in height, and furnished with ovate-lanceolate, serrate, rugosely veined, slightly scabrous, petiolate leaves, placed four or five together in the form of whorls. The flowers are purple, and consist of numerous florets contained in an eight-leaved calyx. It grows in swamps and other low grounds, from Canada to Virginia, and flowers in August and September. The root has, according to Dr. Bigelow, a bitter, aromatic, and astringent taste, and is said to operate as a diuretic. Its vulgar name of gravel root indicates the popular estimation of its virtues.

Eupatorium teucrifolium (Willd. *Sp. Plant.* iii. 1753), *E. pilosum* (Walt. *Flor. Car.* 199), *E. verbenæfolium* (Mich. *Flor. Am.* ii. 98), commonly called *wild horehound*, is also an indigenous perennial, with an herbaceous stem, which is about two feet high, and supports sessile, distinct, ovate, acute, scabrous leaves, of which the lower are coarsely serrate at the base, the uppermost entire. The flowers are small, white, composed of five florets within each calyx, and arranged in the form of a corymb. The plant grows in low wet places from New England to Georgia, and is abundant in the Southern States. It is in flower from August to November. The whole herb is employed. In sensible properties it corresponds with *E. perfoliatum*, though less bitter and disagreeable. It is said to be tonic, diaphoretic, diuretic, and aperient; and in the South has been much employed as a domestic remedy in intermittent and remittent fevers. Dr. Jones, formerly president of the Georgia Medical Society, was the first to make its properties known to the profession. It is usually administered infused in water. One quart of the infusion, containing the virtues of an ounce of the plant, may be given in separate portions during the day.

E. Cannabinum, of Europe, the root of which was formerly used as a purgative, and *E. Aya-pana*, of Brazil, the leaves of which at one time enjoyed a very high reputation, have fallen into entire neglect. The *Aya-pana* is an aromatic bitter, like *E. perfoliatum*, but weaker.

Eupatorium perfoliatum. Willd. *Sp. Plant.* iii. 1761; Bigelow, *Am. Med. Bot.* i. 33; Barton, *Med. Bot.* ii. 125. *Thoroughwort*, or *boneset*, is an indigenous perennial plant, with numerous herbaceous stems, which are erect, round, hairy, from two to five feet high, simple below, and trichotomously branched near the summit. The leaves serve to distinguish the species at the first glance. They may be considered either as perforated by the stem, *perfoliate*, or as consisting each of two leaves joined at the base, *connate*. Considered in the latter point of view, they are opposite and in pairs, which decussate each other at regular distances upon the stem; in other words, the direction of each pair is at right angles with that of the pair immediately above or beneath it. They are narrow in proportion to their length, broadest at the base where they coalesce, gradually tapering to a point, serrate, much wrinkled, paler on the under than the upper surface, and beset with whitish hairs which give them a grayish-green colour. The uppermost pairs are sessile, not joined at the base. The flowers are white, numerous, supported on hairy peduncles, in dense corymbs, which form a flattened summit. The calyx, which is cylindrical and composed of imbricated, lanceolate, hairy scales, encloses from twelve to fifteen tubular florets, having their border divided into five spreading segments. The anthers are five, black, and united into a tube, through which the bifid filiform style projects above the flower.

This species of Eupatorium inhabits meadows, the banks of streams, and other moist places, growing generally in bunches, and abounding in almost all parts of the United States. It flowers from the middle of summer to the end of October. All parts of it are active; but the herb only is officinal.

It has a faint odour, and a strongly bitter somewhat peculiar taste. The virtues of the plant are readily imparted to water and alcohol. Mr. W. Peterson

found it to contain a peculiar bitter principle, chlorophylle, resin, a crystalline matter of undetermined character, gum, tannin, yellow colouring matter, extractive, lignin, and salts. (*Am. Journ. of Pharm.*, xxiii. 210.)

Medical Properties and Uses. Thoroughwort is tonic, diaphoretic, and in large doses emetic and aperient. It is said to have been employed by the Indians in intermittent fever, and has proved successful in the hands of several regular practitioners. The general experience, however, is not in its favour in that complaint. We have seen it effectual in arresting intermittents when given freely in warm decoction, immediately before the expected recurrence of the paroxysm; but it operated in this instance by its emetic rather than its tonic power. The medicine has also been used as a tonic and diaphoretic in remittent and typhoid fevers, and is said to have been productive of advantage in yellow fever. Given in warm infusion, so as to produce vomiting or copious perspiration, at the commencement of catarrh, it will frequently arrest that complaint; and has been especially recommended in the treatment of influenza. It has also been recommended as a diaphoretic in acute rheumatism; and may prove serviceable in the absence of high arterial excitement. As a tonic it is given with advantage in dyspepsia, general debility, and other cases in which the simple bitters are employed.

With a view to its tonic effects, it is best administered in substance, or in cold infusion. The dose of the powder is twenty or thirty grains, that of the infusion a fluidounce, frequently repeated. (See *Infusum Eupatorii.*) The aqueous extract has been used with advantage. When the diaphoretic operation is required in addition to the tonic, the infusion should be administered warm, and the patient remain covered in bed. As an emetic and cathartic, a strong decoction, prepared by boiling an ounce with three half pints of water to a pint, may be given in doses of one or two gills, or more.

Off. Prep. Infusum Eupatorii. W.

EUPHORBIA COROLLATA. *U. S. Secondary.*

Large-flowering Spurge.

The root of Euphorbia corollata. *U. S.*

EUPHORBIA. *Sex. Syst.* Dodecandria Trigynia, *Linn.;* Monœcia Monadelphia, *Michaux.*—*Nat. Ord.* Euphorbiaceæ.

Gen. Ch. Involucrum caliciform, eight to ten toothed, exterior alternate dentures glanduloid or petaloid. *Stamina* indefinite, twelve or more, rarely less; *filaments* articulated. *Receptacle* squamose. *Female flower* solitary, stipitate, naked. *Capsule* three-grained. *Nuttall.*

In the flower of the Euphorbiæ, the stamina are arranged two or more together, in distinct parcels, which correspond in number with the inner segments of the calyx. These parcels were considered by Michaux as distinct male florets; while the central stipitate germ, with its three bifid styles, was considered as a distinct female floret, and the calyx took the name of an involucre. He accordingly placed the genus in the class and order *Monœcia Monadelphia*, and in this respect has been followed by most American botanists. The genus Euphorbia contains numerous species, which have the common property of yielding a milky juice. They are herbaceous or shrubby, with or without leaves; and the leafless species, which are chiefly confined to the African deserts, have fleshy, naked, or spiny stems, resembling the genus Cactus. They nearly all afford products which act powerfully as emetics and cathartics, and in over-doses give rise to dangerous if not fatal prostration, with symptoms of inflamed gastro-intestinal mucous membrane. Their milky juice, which concretes on exposure

to the air, usually possesses these properties in a high degree, and, in addition, that of powerfully irritating the skin when externally applied. Two species only are acknowledged in our national Pharmacopœia, *E. corollata* and *E. Ipecacuanha*, which are both indigenous. *E. hypericifolia*, which is also indigenous, has been very highly commended as a remedy in dysentery after due depletion, diarrhœa, menorrhagia, and leucorrhœa, by Dr. W. Zollickoffer. He infuses half an ounce of the dried leaves in a pint of boiling water, and gives half a fluidounce every hour in dysentery till the symptoms begin to yield, the same quantity after every evacuation in diarrhœa, and two fluidounces, morning, noon, and night, in menorrhagia and fluor albus. The herb, according to Dr. Zollickoffer, is at first sweetish, afterwards harsh and astringent to the taste, and from his experiments appears to contain tannin. Its effects upon the system are those of an astringent and feeble narcotic. It differs, therefore, considerably, both in sensible and medicinal properties, from most of the other species. (*Am. Journ. of the Med. Sciences*, xi. 22.) In a subsequent communication by the same author, it is stated that *E. maculata* possesses similar properties. (*Ibid., N. S.*, iii. 125.)

Euphorbia corollata. Willd. *Sp. Plant.* ii. 916; Bigelow, *Am. Med. Bot.* iii. 119. The *blooming* or *large-flowering spurge*, frequently called *milk-weed*, is a tall erect plant, with a large, perennial, branching, yellowish root, which sends up several stems from two to five feet in height, round and generally simple. The leaves, which stand irregularly upon the stem, and without foot-stalks, are oblong-obovate, wedge-form or linear, flat or revolute at the margin, smooth in some plants, and hairy in others. The flowers are disposed upon a large terminal umbel, with a five-leaved involucrum, and five trifid and dichotomous rays, at each fork of which are two oblong bractes. The calyx is large, rotate, white, with five obtuse segments closely resembling a corolla, from which the species has been named. At the base of these divisions are five interior smaller segments, which are described as nectaries by many systematic writers, while the larger are considered as belonging to a real corolla. The stamens are twelve, evolving gradually, with double anthers. Many flowers have only stamens. The pistil, when existing, is stipitate, nodding, rounded, with three bifid styles. The fruit is a smooth, three-celled, three-seeded capsule.

The plant grows in various parts of the United States, from Canada to Florida, and abounds in Western Pennsylvania, Maryland, and Virginia. It prefers a dry, barren, and sandy soil, seldom growing in woods or on the borders of streams. Its flowers appear in July and August. The root is the only part used.

This, when full grown, is sometimes an inch in thickness, and two feet in length. It is without unpleasant taste, producing only a sense of heat a short time after it has been taken. The medical virtues are said to reside in the cortical portion, which is thick, and constitutes two-thirds of the whole root. They are taken up by water and alcohol, and remain in the extract formed by the evaporation of the decoction or tincture.

Medical Properties and Uses. In a full dose, the root of *E. corollata* operates actively and with sufficient certainty as an emetic, producing ordinarily several discharges from the stomach, and not unfrequently acting with considerable energy upon the bowels. In quantities insufficient to vomit, it excites nausea, almost always followed by brisk purging. In still smaller doses it is diaphoretic and expectorant. It cannot, however, like ipecacuanha, be given largely in cases of insensibility of stomach, without endangering hypercatharsis with inflammation of the mucous coat of the stomach and bowels. It is in fact greatly inferior to this emetic in mildness, while it is no less inferior to the tartarized antimony in certainty. It is objectionable as a purge, in consequence of the nausea which it occasions, when given in cathartic doses. Dr. Zollickoffer was the first to introduce it to the particular notice of the medical profession. It is little prescribed,

and seldom kept in the shops. The dose of the dried root as an emetic is from ten to twenty grains, as a cathartic from three to ten grains. The recent root, bruised and applied to the skin, produces vesication. W.

EUPHORBIA IPECACUANHA. *U. S. Secondary.*

Ipecacuanha Spurge.

The root of Euphorbia Ipecacuanha. *U. S.*

EUPHORBIA. See EUPHORBIA COROLLATA.

Euphorbia Ipecacuanha. Willd. *Sp. Plant.* ii. 900; Barton, *Med. Bot.* i. 211; Bigelow, *Am. Med. Bot.* iii. 108. *Ipecacuanha spurge*, or, as it is sometimes called, *American ipecacuanha*, is a singular plant, varying so much in the shape and colour of its leaves, and in its whole aspect, that mere individual peculiarities might without care be attributed to a specific difference. The root is perennial, yellowish, irregular and very large, penetrating sometimes to the depth of six or seven feet in the sand, and in its thickest part, when full grown, from three-quarters of an inch to an inch and a half in diameter. The stems are numerous, herbaceous, erect or procumbent, smooth, dichotomous, jointed at the forks, white under the ground, red, pale-green, or yellow above, sometimes almost buried in the sand, usually forming thick low bunches upon its surface. The leaves are opposite, sessile, entire, smooth, generally oval, but sometimes round, obovate, or even lanceolate, or linear. They are small early in the spring, and increase in size with the age of the plant. Their colour varies from green to crimson. The flowers are solitary, on long axillary peduncles. The calyx is spreading, with five exterior obtuse segments, and the same number of inner, smaller segments. The fertile flowers have a roundish, drooping, pedicelled germ, crowned with six revolute stigmas. The capsule is three-celled, and contains three seeds.

E. Ipecacuanha is indigenous, growing in pine barrens and other sandy places in the Middle and Southern States, especially along the sea-board, and abundantly in New Jersey, on the banks of the Delaware. It blooms from May to August. The root, which is the officinal portion, is, according to Dr. Barton, equally efficacious at whatever period collected.

The dried root is light and brittle, of a grayish colour externally, white within, inodorous, and of a sweetish not unpleasant taste. Its active principle has not been isolated. Dr. Bigelow inferred from his experiments that it contained caoutchouc, resin, gum, and probably starch.

Medical Properties and Uses. Ipecacuanha spurge is an energetic, tolerably certain emetic, rather milder than *E. Corollata*, but like it, disposed to act upon the bowels, and liable, if given in over-doses, to produce excessive nausea and vomiting, general prostration, and alarming hypercatharsis. It is, therefore, unfit to supersede ipecacuanha. In small doses it is diaphoretic. The specific name of the plant indicates that the emetic property of the root has been long known. The late Professor Barton alludes to it in his "Collections;" but it did not come into general notice till after the publication of Dr. W. P. C. Barton's Medical Botany. The late Dr. Hewson, of Philadelphia, informed us, that this emetic was the subject of an inaugural essay by Dr. Royal, and that experiments, conducted with it among the convicts in the Walnut Street prison, proved it to be advantageously available for all the purposes of an emetic; while, in consequence of its want of nauseous taste, it seemed to answer even better than ipecacuanha as an expectorant and diaphoretic. The dose of the powdered root is from ten to fifteen grains. W.

EUPHORBIUM. *Ed.*

Euphorbium.

Concrete resinous juice of undetermined species of Euphorbia. *Ed.*
Euphorbe, *Fr.;* Euphorbium, *Germ.;* Euforbio, *Ital., Span.*
EUPHORBIA. See EUPHORBIA COROLLATA.

Euphorbium is obtained from one or more species of Euphorbia; but its precise source is somewhat uncertain. It has been ascribed to *E. officinarum*, growing in the North of Africa and at the Cape of Good Hope, *E. canariensis*, a native of the Canary Islands and Western Africa, and *E. antiquorum*, inhabiting Egypt, Arabia, and the East Indies, and supposed to be the plant from which the ancients derived this resinous product. These species of Euphorbia bear a considerable resemblance in their general form to the *Cactus*, having leafless, jointed, angular stems, divided into branches of a similar structure, and furnished with double prickles at the angles. When wounded, they yield an acrid milky juice, which concretes on the surface of the plant, and, being removed, constitutes the euphorbium of commerce.

This occurs in the shape of tears, or in oblong or roundish masses, about the size of a pea or larger, often forked, and perforated with one or two small conical holes, produced by the prickles of the plant, around which the juice has concreted, and which sometimes remain in the holes. The masses are occasionally large and mixed with impurities. The surface is dull and smooth, bearing some resemblance to that of tragacanth; the consistence somewhat friable; the colour light yellowish or reddish; the odour scarcely perceptible; the taste at first slight, but afterwards excessively acrid and burning. The colour of the powder is yellowish. The sp. gr. of euphorbium is 1·124. Triturated with water it renders the liquid milky, and is partially dissolved. Alcohol dissolves a larger portion, forming a yellowish tincture, which becomes milky on the addition of water. Its constituents, according to Pelletier, are resin, wax, malate of lime, malate of potassa, lignin, bassorin, volatile oil, and water. Brandes found caoutchouc. It contains no soluble gum. The proportions of the ingredients are variously stated by different chemists, and probably vary in different specimens. The most abundant is resin, and the remainder consists chiefly of wax and malate of lime. The resin is excessively acrid, is soluble in alcohol, and, when exposed to heat, melts, takes fire, and burns with a brilliant flame, diffusing an agreeable odour.

Medical Properties and Uses. Euphorbium taken internally is emetic and cathartic, often acting with great violence, and in large doses producing severe gastric pain, excessive heat in the throat, and symptoms of great prostration. In consequence of the severity of its action, its internal use has been entirely abandoned. Applied to the mucous membrane of the nostrils, it excites violent irritation, attended with incessant sneezing and sometimes bloody discharges. They who powder it are under the necessity of guarding their eyes, nostrils, and mouth against the fine dust which rises. Largely diluted with wheat flour or starch, it may be used as an errhine in amaurosis, deafness, and other obstinate affections of the head. Externally applied, it inflames the skin, often producing vesication; and on the continent of Europe is sometimes used as an ingredient of epispastic preparations. It is employed in veterinary practice, with a view to its vesicating power. As an article of the materia medica, however, it might well be dispensed with.

Off. Prep. Acetum Cantharidis. W.

EXTRACTUM CANNABIS. *U. S. Secondary.*

Extract of Hemp.

An alcoholic extract of the dried tops of Cannabis sativa, variety *Indica. U. S. Off. Syn.* EXTRACTUM CANNABIS INDICÆ. Cannabis Indica. The extract. *Dub.*

CANNABIS. *Sex. Syst.* Dicœcia Pentandria. — *Nat. Ord.* Cannabinaceæ.

Gen. Ch. MALE. *Calyx* five parted. *Stamens* five. FEMALE. *Calyx* one-leaved, rolled up. *Styles* two. *Lindley.*

Cannabis sativa. Linn. *Sp. Plant.* 1457; Griffith, *Med. Bot.* p. 572. Hemp is an annual plant, from four to eight feet or more in height, with an erect, branching, angular stem. The leaves are alternate or opposite, on long, lax footstalks, roughish, and digitate with linear-lanceolate, serrated segments. The stipules are subulate. The flowers are axillary; the male in long, branched, drooping racemes; the female in erect simple spikes. The stamens are five, with long pendulous anthers; the pistils two, with long, filiform, glandular stigmas. The fruit is ovate, and one-seeded. The whole plant is covered with a very fine pubescence, scarcely visible to the naked eye, and is somewhat viscid to the touch. The hemp growing in India, from which the medicine is derived, has been considered by some as a distinct species, and named *Cannabis Indica;* but the most observant botanists, upon comparing it with our cultivated plant, have been unable to discover any specific difference. It is now, therefore, regarded merely as a variety, and is distinguished by the epithet *Indica.* Dr. Pereira states that, in the female plant, the flowers are somewhat more crowded than in the common hemp; but that, in comparing the male plants of the two varieties, he found them in all respects the same. It is unfortunate that the name of *Indian hemp* has been attached to the medicinal product; as, in the United States, the same name has long been appropriated to *Apocynum cannabinum;* and some confusion has hence arisen.

C. sativa is a native of the Caucasus, Persia, and the hilly regions in the North of India. It is cultivated in many parts of Europe and Asia, and largely in our Western States. It is from the Indian variety exclusively that the medicine is obtained; the heat of the climate in Hindostan apparently favouring the development of its active principle.

The seeds, though not now officinal, have been used in medicine. They are about the eighth of an inch long, roundish-ovate, somewhat compressed, of a shining ash-gray colour, inodorous, and of a disagreeable, oily, sweetish taste. They yield by expression a considerable quantity of fixed oil, which has the drying property, and is used in the arts. They contain also uncrystallizable sugar and albumen, and when rubbed with water form an emulsion, which may be used advantageously in inflammations of the mucous membranes, though without narcotic properties. They are much used as food for birds, which are fond of them.

In Hindostan, Persia, and other parts of the East, hemp has long been habitually employed as an intoxicating agent. The parts used are the tops of the plant, and a resinous product obtained from it. The plant is cut after flowering, and formed into bundles, about two feet long by three inches in diameter, which are sold in the bazaars under the name of *gunjah.* The *hashish* of the Arabs is essentially the same. The name *bang* is given to a mixture of the larger leaves and capsules without the stems. There is on the surface of the plant a resinous exudation to which it owes its clammy feel. Men clothed in leather run through the hemp fields, brushing forcibly against the plants, and thus separating the resin, which is subsequently scraped from their dress, and formed into balls.

These are called *churrus*. In these different states of preparation, the hemp is smoked like tobacco, with which it is said to be frequently mixed. An infusion or decoction of the plant is also sometimes used as an exhilarating drink.

The *medicinal resin* or *extract of hemp*, directed by the U. S. Pharmacopœia, is made by evaporating a tincture of the dried tops. Dr. O'Shaughnessy directs it to be prepared by boiling the tops of the gunjah in alcohol until all the resin is dissolved, and evaporating to dryness by means of a water-bath. Mr. Robertson, of the Calcutta Medical College, prepares it by passing the vapour of boiling alcohol from the boiler of a still into the dried plant contained in a convenient receptacle, and evaporating the condensed liquor by a heat not exceeding 150° F. The Messrs. Smith, of Edinburgh, obtain a purer resin by the following process. Bruised gunjah is digested, first in successive portions of warm water, till the expressed liquid comes away colourless; and afterwards, for two days, with a moderate heat, in a solution of carbonate of soda, containing one part of the salt for two of the dried herb. It is then expressed, washed, dried, and exhausted by percolation with alcohol. The tincture, after being agitated with milk of lime containing one part of the earth for twelve of the gunjah used, is filtered; the lime is precipitated by sulphuric acid; the filtered liquor is agitated with animal charcoal, and again filtered; most of the alcohol is distilled off, and to the residue twice its weight of water is added; the liquid is then allowed to evaporate gradually; and, finally, the resin is washed with fresh water until it ceases to impart a sour or bitter taste to the liquid, and is then dried in thin layers. Thus obtained, it retains the odour and taste of the gunjah, of which 100 pounds yield 6 or 7 pounds of the extract.

The Dublin College purifies the commercial extract, by treating it with alcohol, allowing the dregs to subside, decanting the clear liquor, and evaporating, by means of a water-bath, to the consistence of a soft extract. The preparation is denominated "Extractum Cannabis Indicæ Purificatum." From this the College prepares a tincture. (See *Tinctura Cannabis Indicæ.*)

Properties. Fresh hemp has a peculiar narcotic odour, which is said to be capable of producing vertigo, headache, and a species of intoxication. It is much less in the dried tops, which have a feeble bitterish taste. According to Dr. Royle, the churrus is when pure of a blackish-gray, blackish-green, or dirty olive colour, of a fragrant and narcotic odour, and a slightly warm, bitterish, and acrid taste. Schlesinger found in the leaves a bitter substance, chlorophylle, green resinous extractive, colouring matter, gummy extract, extractive, albumen, lignin, and salts. The plant also contains volatile oil in very small proportion. The resin is probably the active principle, and has received the name of *cannabin*. It is soluble in alcohol and ether, and is separated from the alcoholic solution by water, as a white precipitate. Its taste is warm, bitterish, acrid, somewhat balsamic, and its odour fragrant, especially when heated. It is not possessed of acid properties.

Medical Properties. Extract of hemp is a powerful narcotic, causing exhilaration, intoxication, delirious hallucinations, and, in its subsequent action, drowsiness and stupor, with little effect upon the circulation. It is asserted also to act as a decided aphrodisiac, to increase the appetite, and occasionally to induce the cataleptic state. In morbid states of the system, it has been found to produce sleep, to allay spasm, to compose nervous inquietude, and to relieve pain. In these respects it resembles opium in its operation; but it differs from that narcotic in not diminishing the appetite, checking the secretions, or constipating the bowels. It is much less certain in its effects; but may sometimes be preferably employed, when opium is contraindicated by its nauseating or constipating effects, or its disposition to produce headache, and to check the bronchial secretion. The complaints in which it has been specially recommended are neuralgia,

gout, rheumatism, tetanus, hydrophobia, epidemic cholera, convulsions, chorea, hysteria, mental depression, insanity, and uterine hemorrhage. Dr. Alexander Christison, of Edinburgh, has found it to have the property of hastening and increasing the contractions of the uterus in delivery, and has employed it with advantage for this purpose. It acts very quickly, and without anæsthetic effect. It appears, however, to exert this influence only in a certain proportion of cases. (*Ed. Month. Journ. of Med. Sci.*, xiii. 117, and xv. 124.) The strength of the extract varies much as found in commerce; and therefore no definite dose can be fixed. When it is of good quality half a grain or a grain will affect the system. The Messrs. Smith found two-thirds of a grain of their extract to produce powerful narcotic effects. In some instances it will be necessary to give as much as ten or twelve grains of the extract; and half an ounce of it has been taken without sensible effect. The proper plan is to begin with a grain, repeated at intervals of two, three, or four hours, and gradually increased until its influence is felt, and the strength of the parcel employed is thus ascertained. A tincture is prepared by dissolving six drachms of the extract in a pint of alcohol. The dose of this, equivalent to a grain of the extract, is about twenty minims, or forty drops. Dr. O'Shaughnessy gave ten drops every half hour in cholera, and a fluidrachm every half hour in tetanus. As the resin is precipitated by water, the tincture should be administered in mucilage or sweetened water. Alarming effects have been produced by over-doses. W.

EXTRACTUM GLYCYRRHIZÆ. *U. S., Lond., Ed., Dub.*

Liquorice.

The extract of the root of Glycyrrhiza glabra. *U. S.*

Extrait de reglisse, *Fr.;* Süssholzsaft, *Germ.;* Sugo di liquirizia, *Ital.;* Regaliza en bollos, *Span.*

For an account of *glycyrrhiza glabra*, see article GLYCYRRHIZA.

The British Colleges give directions for preparing this extract; but, as it is seldom made in this country, it is very properly placed, in the U. S. Pharmacopœia, in the catalogue of the Materia Medica.

Liquorice is an article of export from the North of Spain, particularly Catalonia, where it is obtained in the following manner. The roots of the *G. glabra*, having been dug up, thoroughly cleansed, and half dried by exposure to the air, are cut into small pieces, and boiled in water till the liquid is saturated. The decoction is then allowed to rest, and, after the dregs have subsided, is decanted, and evaporated to the proper consistence. The extract thus prepared is formed into rolls from five to six inches long by an inch in diameter, which are dried in the air, and wrapped in laurel leaves.

Much liquorice is also prepared in Calabria, according to M. Fée, from the *G. echinata* which abounds in that country. The process is essentially the same as that just described, but conducted with greater care; and the Italian liquorice is purer and more valuable than the Spanish. We have been informed that most of the extract brought to this country comes from the ports of Leghorn and Messina. It is in cylinders generally somewhat smaller than the Spanish, and sometimes stamped with the manufacturer's name.*

Crude liquorice is in cylindrical rolls, somewhat flattened, and often covered with bay leaves. We have seen it in the London market in large cubical masses. When good, it is very black, dry, brittle, breaking with a shining fracture, of a

* We have been informed that a very good extract is prepared in New York, as black as the imported, but less dry and hard, more soluble in water, and having more of the taste of the root.—*Note to the ninth edition.*

very sweet, peculiar, slightly acrid or bitterish taste, and almost entirely soluble in water. It is frequently, however, very impure, either from adulteration or improper preparation. Starch, sand, the juice of prunes, &c., are sometimes added; and carbonaceous matter, and even particles of copper are found in it, the latter arising from the boilers in which the decoction is evaporated. Four pounds of the extract have yielded two drachms and a half of metallic copper. (*Fée.*) It is rarely quite soluble in water. Neumann obtained 460 parts of watery extract from 480 of Spanish liquorice. A bitter and empyreumatic taste are signs of inferior quality. Before being used internally it generally requires to be purified.

The *refined liquorice*, kept in the shops in small cylindrical pieces not thicker than a pipe stem, is prepared by dissolving the impure extract in water without boiling, straining the solution, and evaporating. The object of this process is to separate not only the insoluble impurities, but also the acrid oleo-resinous substance, which is extracted by long boiling from the liquorice root, and is necessarily mixed with the unrefined extract. It is customary to add during the process a portion of sugar, and sometimes perhaps mucilage or glue; and flour or starch is a frequent adulteration. The preparation is sometimes attacked by small worms, probably in consequence of the farinaceous additions. Excellent liquorice is prepared, in some parts of England, from the root cultivated in that country. The *Pontefract cakes* are small lozenges of liquorice of a very superior quality, made in the vicinity of Pomfret.

Medical Properties and Uses. Liquorice is a useful demulcent, much employed as an addition to cough mixtures, and frequently added to infusions or decoctions, in order to cover the taste or obtund the acrimony of the principal medicine. A piece of it held in the mouth and allowed slowly to dissolve, is often found to allay cough by sheathing the irritated membrane of the fauces. It is used in pharmacy to impart consistence to pills and troches, and to modify the taste of other medicines.

Off. Prep. Decoctum Aloës Compositum; Mistura Glycyrrhizæ Composita; Pilulæ Aloës cum Sapone; Tinctura Aloës; Tinctura Rhei et Sennæ; Trochisci Glycyrrhizæ; Trochisci Glycyrrhizæ et Opii; Trochisci Lactucarii. W.

FARINA. *Lond., Ed., Dub.*

Wheat Flour.

Triticum vulgare. The flour of the seed. *Lond., Ed.* Triticum æstivum. The flour from the seeds. *Dub.*

Farine de froment, *Fr.;* Waizenmehl, *Germ.;* Farina di frumento, *Ital.;* Flor del trigo, Acemite, *Span.*

TRITICUM. *Sex. Syst.* Triandria Digynia.—*Nat. Ord.* Graminaceæ.

Gen. Ch. Calyx two-valved, solitary, transverse, many-flowered, on a flexuose, toothed receptacle. *Rees's Cyclopædia.*

Triticum hybernum. Willd. *Sp. Plant.* i. 477.—*T. vulgare,* var. β. *hybernum.* Kunth, *Gramin.* 438. The *common winter wheat* has a fibrous root, and one or more erect, round, smooth, jointed stems, which rise from three to five feet in height, and are furnished with linear, pointed, entire, flat, many-ribbed, rough, somewhat glaucous leaves, and jagged bearded stipules. The flowers are in a solitary, terminal, dense, smooth spike, two or three inches long. The calyx is four-flowered, tumid, imbricated, abrupt, with a short compressed point. In the upper part of the spike it is more elongated; and in this situation the corolla is more or less awned. The grain is imbricated in four rows.

The native country of wheat is unknown; but its cultivation is supposed to

have spread from Sicily over Europe. It is now an object of culture in almost all countries which enjoy a temperate climate. Sown in the autumn, it stands the winter, and ripens its seeds in the following summer. Numerous varieties have been produced by cultivation, some of which are usually described as distinct species. Among these may perhaps be ranked *T. æstivum*, or spring wheat, distinguished by its long beards, and *T. compositum*, or Egyptian wheat, by its compound spikes. The seeds are too well known to need description. They are prepared for use by grinding and sifting, by which the interior farinaceous part is separated from the husk. The former is divided according to its fineness into different portions, but so far as regards its medical relations may be considered under one head, that of *farina* or *flour*. The latter is called *bran*, and constitutes from 25 to 33 per cent.

Flour is white, inodorous, and nearly insipid. Its chief constituents are starch, gluten, albumen, saccharine matter, and gum, the proportions of which are by no means constant. Vauquelin obtained, as an average product, from eight varieties of flour which he examined, 10·25 per cent. of water, 10·80 of gluten (including coagulated albumen), 68·08 of starch, 5·61 of sugar, and 4·11 of gum. According to Christison, subsequent experiments have given an average of 16 or 17 per cent. of gluten and albumen. The ashes of wheat, which amount only to about 0·15 per cent., contain, according to Henry, superphosphates of soda, lime, and magnesia. The gummy substance found in wheat flour is not precisely identical with ordinary gum; as it contains nitrogen, and does not yield mucic acid by the action of nitric acid. The starch, which is by far the most abundant ingredient, is much employed in a separate state. (See *Amylum.*) The gluten, however, is not less important; as it is to the large proportion of this principle in wheat flour, that it owes its superiority over that from other grains for the preparation of bread. The *gluten* here alluded to is the substance first noticed as a distinct principle by Beccaria. It is the soft viscid fibrous mass which remains, when wheat flour, enclosed in a linen bag, is exposed to the action of a stream of water, and at the same time pressed with the fingers till the liquor comes away colourless. But this has been ascertained to consist, in fact, of two different substances. When boiled in alcohol, one portion of it is dissolved, while another remains unaffected. Einhof ascertained that the part of the glutinous mass left behind by alcohol is identical with *vegetable albumen*, while the dissolved portion only is strictly entitled to the name of *gluten*, which had been previously applied to the whole mass. As these two principles are contained in numerous vegetable products, and as they are frequently referred to in this work, it is proper that they should be briefly noticed. They both contain nitrogen, and both, when left to themselves in a moist state, undergo putrefaction. From these circumstances, and from their close resemblance to certain proximate animal principles in chemical habitudes and relations, they are sometimes called, in works on chemistry, *vegeto-animal substances*. They are separated from each other by boiling the gluten of Beccaria, above referred to, with successive portions of alcohol, till the liquid, filtered while yet hot, ceases to become turbid on cooling. The proper gluten dissolves, and may be obtained by adding water to the solution, and distilling off the alcohol. Large cohering flakes float in the liquor, which, when removed, form a viscid elastic mass, consisting of the substance in question with some slight impurity. The part left behind by the alcohol is coagulated albumen.

Pure *gluten*, now called *vegetable fibrin*, is a pale-yellow, adhesive, elastic substance, which, by drying, becomes of a deeper yellow colour and translucent. It is almost insoluble in water, and quite insoluble in ether, and in the oils both fixed and volatile. Hot alcohol dissolves it much more readily than cold; and from its solution in ordinary alcohol, at the boiling temperature, it is deposited unchanged when the liquor cools. It is soluble in the dilute acids, and in caustic

alkaline solutions, in consequence of forming soluble compounds with the acids and alkalies. With the earths and metallic oxides it forms nearly insoluble compounds, which are precipitated when the earthy or metallic salts are added to the solution of gluten in liquid potassa. Corrosive sublimate precipitates it from its acid as well as alkaline solutions, and, added in solution to moist gluten, forms with it a compound, which, when dry, is hard, opaque, and incorruptible. Gluten is also precipitated by infusion of galls. Its name originated in its adhesive property. It exists in most of the farinaceous grains, and in the seeds of some leguminous plants.

Vegetable albumen is destitute of adhesiveness, and, when dried, is opaque, and of a white, gray, or brown colour. Before coagulation, it is soluble in water, but insoluble in alcohol. By heat it coagulates and becomes insoluble in water. It is dissolved by the solutions of the caustic alkalies. Most of the acids, if added to its solution in excess, precipitate compounds of the acids respectively with the albumen, which, though soluble in pure water, are insoluble in that liquid when acidulated. It is not, however, precipitated by an excess of phosphoric or acetic acid. Its relations to the earthy and metallic salts are similar to those of gluten. Corrosive sublimate precipitates it from its solutions, except from those in phosphoric and acetic acids, and, when added in a state of solution to moist albumen, forms with it a hard, opaque compound. It is also precipitated by infusion of galls. This principle derived its name from its very close resemblance to animal albumen. It is associated with gluten in most of the farinaceous grains, is a constituent of all the seeds which form a milky emulsion with water, and exists in all the vegetable juices which coagulate by heat.

The mixture of vegetable fibrin and albumen which constitutes the gluten of Beccaria, exercises an important influence over starch, which, with the presence of water and the aid of a moderate heat, it converts partly into gum and partly into sugar. The production of saccharine matter in the germination of seeds, and in the formation of malt, which is an example of germination, is thus accounted for. The gluten itself becomes acid in the process, and loses the property of reacting on starch.

It is now thought by many chemists that *vegetable albumen* is identical in all respects with *animal albumen*, and the *gluten* of vegetables with animal *fibrin;* and that both these principles, as well as another named *casein*, found also both in the animal and vegetable kingdoms, consist of a principle named *protein*, combined with a very small proportion of mineral substances, such as sulphur and phosphorus. *Protein* consists of nitrogen, carbon, hydrogen, and oxygen; and its formula, according to Liebig, is $N_6C_{48}H_{36}O_{14}$. It is procured by dissolving any one of the substances above named in a strong solution of potassa, keeping the solution for some time at a heat of 120°, and precipitating with acetic acid. (*Turner's Chemistry, 7th Lond. ed.*)

It is scarcely necessary to state that bread is formed by making flour into a paste with water, with the addition of yeast, setting it aside to ferment, and then exposing it to the heat of an oven. The fermentation excited by the yeast is accompanied with the extrication of carbonic acid gas, which, being retained by the tenacity of the gluten, forms innumerable little cells throughout the mass, and thus renders the bread light.

Medical Properties and Uses. Wheat flour in its unaltered state is seldom used in medicine. It is sometimes sprinkled on the skin in erysipelatous inflammation, and various itching or burning eruptions, particularly the nettle-rash; though rye flour is generally preferred for this purpose.

Bread is more employed. An infusion of toasted bread in water is a nutritive drink, well adapted to febrile complaints. Within our experience, no drink has been found more grateful in such cases than this infusion, sweetened with a little

molasses, and flavoured by lemon-juice. Boiled with milk, bread forms a good emollient poultice, which may be improved by the addition of a little perfectly fresh lard. Slices of it steeped in lead-water, or the crumb mixed with the fluid and confined within gauze, afford a convenient mode of applying this preparation to local inflammations. The crumb—*mica panis*—is, moreover, frequently used to give bulk to minute doses of very active medicines, administered in the form of pill. It should be recollected that it always contains common salt, which is incompatible with certain substances, as, for example, the nitrate of silver.

Bran is sometimes used in decoction, as a demulcent in catarrhal affections and complaints of the bowels. When taken in substance, it is laxative, and may be used with advantage to prevent costiveness. Bran bread, made from the unsifted flour, forms an excellent laxative article of diet in some dyspeptic cases. The action of the bran is probably mechanical, consisting in the irritation produced upon the mucous membrane of the bowels by its coarse particles. Bran also forms an excellent demulcent bath.

Off. Prep. Cataplasma Fermenti. W.

FERRUM.

Iron.

Fer, *Fr.;* Eisen, *Germ.;* Ferro, *Ital.;* Hierro, *Span.*

Iron is the most abundant and useful of the metals, and so interwoven with the wants of mankind, that the extent of its consumption by a nation may be taken as an index of its progress in civilization. It is universally diffused throughout nature, not only in the mineral kingdom, but also in vegetables and animals. There are very few minerals in which traces of it may not be found, and it is an essential constituent in many parts of animals, but particularly in the blood. It is one of the few metals which are devoid of deleterious action on the animal economy.

Iron occurs, 1. native; 2. sulphuretted, forming magnetic and cubic pyrites; 3. oxidized, embracing the magnetic, specular, red, brown, and argillaceous oxides of iron; 4. in saline combination, forming the carbonate, sulphate, phosphate, and arseniate of iron. Those minerals of iron which admit of being worked to advantage are called iron ores. These include the different native oxides, and the carbonate (sparry iron). The best iron is obtained from those varieties of the native oxide, usually called magnetic iron ore and specular iron ore. These occur very abundantly in Sweden, and furnish the superior iron of that country. As a general rule, those ores yield the best iron which occur in primitive formations.

Extraction. The mode of extracting iron from its ores varies somewhat with the nature of the ore; but the general principles of the operation are the same for all. The ore, previously broken into small pieces and roasted, is exposed to the action of an intense heat, in contact with carbonaceous matter, such as charcoal, coke, or anthracite, and in connexion with some flux, capable of fusing with the impurities of the ore. The flux varies with the nature of the ore, and is generally either limestone or clay; limestone being employed when the ore is argillaceous, clay when it is calcareous. The flux, whatever it may be, enters into fusion with the impurities, and forms what is called the slag; while the carbonaceous matter, acting on the oxide of iron, reduces it to the metallic state. The reduced metal, from its density, occupies the lower part of the furnace, and is protected from the action of the air by the melted slag which floats on its surface. When the reduction is completed, the slag is allowed to run out by a hole in the side of the furnace, and the melted metal by an aperture at its bottom; the latter being received into long triangular moulds, where it solidifies in masses, known in commerce by the name of *pig* or *cast iron.* In this state the metal

is brittle and far from being pure; as it contains carbon, silicon, phosphorus, sulphur, and sometimes manganese. It is purified, and thus brought to the state of malleable iron, by being fused, and subjected, while stirred, to the action of a current of air on its surface. By these means the carbon is nearly burnt out, and the other impurities are oxidized and made to rise to the surface as a slag. As the metal approaches to purity, it becomes tough and less liquid, and its particles agglutinate, so as to form semifused lumps, though the temperature of the furnace continues the same. These lumps are then taken out of the furnace, and their particles, by means of ponderous hammers, moved by steam or water power, are beaten together, so as to form one tenacious mass. The metal is finally rolled out into bars of a convenient size, when it constitutes the malleable iron of commerce.

Iron mines occur in most countries, but more particularly in northern ones. In Spain, the principal mines furnish sparry iron, and the red and brown oxides. The chief iron ores of France are the sparry iron, and the specular, brown, and argillaceous oxides; of Germany, the sparry iron and brown oxide. The island of Elba is celebrated for its rich and abundant specular iron ore. The ores which furnish the celebrated Swedish iron have already been indicated.

In the United States iron is abundant. The principal ores that are worked are the magnetic, brown, and argillaceous oxides. They occur in the greatest abundance in the States of New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania. The ores of the three last-mentioned States rival the best Swedish in quality.

Properties. Iron is a hard, malleable, very ductile and tenacious metal, of a grayish-white colour and fibrous texture, and having a slightly styptic taste, and a sensible odour when rubbed. Its sp. gr. is about 7·7, and its fusing point very high. It possesses the magnetic and welding properties. It is combustible, and, when heated to whiteness, burns in atmospheric air, and with brilliant scintillations in oxygen gas. At a red heat, its surface is converted into black oxide, and at common temperatures, by the combined agency of air and moisture, it becomes covered with a reddish matter, called *rust*, which consists of the hydrated sesquioxide. It combines with all the non-metallic elements, except hydrogen and nitrogen, and with most of the metals, its equivalent being 28. It forms three principal combinations with oxygen, a protoxide and sesquioxide, which, by their union, form the native black oxide, and a teroxide, possessing acid properties, called ferric acid. The *protoxide* is of a dark-blue colour, attracted by the magnet, and spontaneously combustible in the air, being converted into sesquioxide. It is the base of green vitriol, and of the green salts of iron generally. It is very prone to absorb oxygen, and hence the salts which contain it are soon partially converted, when in solution, into salts of the sesquioxide. It consists of one eq. of iron 28, and one of oxygen 8=36. The *sesquioxide* is readily obtained pure by dissolving iron in nitromuriatic acid, precipitating by ammonia, and igniting the precipitate. It is of a red colour, not attracted by the magnet, and forms salts, which for the most part have a reddish colour. It is composed of two eqs. of iron 56, and three of oxygen 24=80. The *native black oxide*, the magnetic oxide of mineralogists, is officinal with the Dublin College under the name of *Ferri Oxidum Magneticum*. It consists of one eq. of protoxide 36, and one of sesquioxide 80=116. The medicinal black oxide of the Edinburgh College has a different composition. (See *Ferri Oxidum Nigrum.*) The *teroxide* or *ferric acid*, discovered by Frémy, may be formed, in union with potassa, by passing chlorine through a very concentrated solution of the alkali, holding hydrated sesquioxide of iron in suspension. It has also been obtained by Poggendorff by a galvanic combination of platinum in nitric acid, and cast iron in a solution of potassa. It forms as a ferrate of potassa, of a fine wine-red colour, becoming darker, around the cast iron. This acid consists of one eq. of iron 28, and three

of oxygen 24=52. Iron, combined with a minute proportion of carbon, and perhaps of the radicals of silica and alumina, forms *steel*, a modification of iron formerly used in medicine, but now very properly laid aside. It also forms a number of important salts, several of which, as the sesquichloride, iodide, ferrocyanuret, acetate, carbonate, subcarbonate, citrate, ammonio-citrate, nitrate, phosphate, sulphate, tartrate, and valerianate, are officinal.

Iron is readily detected, even in minute quantities, by bringing it to the state of sesquioxide in solution, and adding ferrocyanuret of potassium or tincture of galls; the former of which will strike a deep blue, the latter a black colour. The object of bringing it to the state of sesquioxide is readily effected by boiling the solution containing it with a little nitric acid.

Medical Properties. The preparations of iron are powerfully tonic, raising the pulse, promoting the secretions, and increasing the colouring matter of the blood. They are useful in diseases characterized by debility and a languid circulation, more especially when the consequence of inordinate discharges. The diseases in which they are usually employed are chronic anæmia or chlorosis, hysteria, fluor albus, gleet, scrofula, rickets, chorea, and all passive hemorrhages. Chalybeates are also proper in palsy after the inflammatory excitement has subsided, in dyspepsia dependent upon deficient energy of the digestive functions, and in neuralgia. They are contra-indicated in all inflammatory diseases, producing, when injudiciously employed, heat, thirst, headache, difficulty of breathing, and other symptoms of an excited circulation. The medicinal effects of iron, as modified in its different combinations, will be noticed under the head of each preparation.

The following table embraces all the preparations of iron to be found in the United States and British Pharmacopœias, together with the synonymes.

Iron is officinal—

I. In the metallic state.

Ferri Filum, *U. S., Ed.;* Ferrum in fila tractum, *Lond.;* Ferrum. Iron Wire, *Dub.*

Ferri Ramenta, *U. S.;* Ferri Limatura, *Ed.;* Ferrum. Turnings and Filings, *Dub.*

Mistura Ferri Aromatica, *Dub.*

Ferri Pulvis, *U. S., Dub.*

II. Oxidized.

Ferri Oxidum Nigrum, *Ed.*

Ferri Oxydum Magneticum, *Dub.*

Ferri Peroxydum, *Dub.*

Emplastrum Ferri, *Dub.*

Ferri Oxidum Hydratum, *U. S.;* Ferrugo, *Ed.;* Ferri Peroxydum Hydratum. *Dub.*

III. Sulphuretted.

Ferri Sulphuretum, *Ed., Dub.*

IV. In saline combination.

Tinctura Ferri Chloridi, *U. S.;* Tinctura Ferri Sesquichloridi, *Lond., Dub.;* Ferri Muriatis Tinctura, *Ed.*

Ferri Iodidum, *U. S., Ed., Dub.*

Liquor Ferri Iodidi, *U. S.*

Syrupus Ferri Iodidi, *Lond., Dub.;* Ferri Iodidi Syrupus, *Ed.*

Pilulæ Ferri Iodidi, *U. S.*

Ferri Ferrocyanuretum, *U. S.* Anglicè, *Pure Prussian blue.*

Tinctura Ferri Acetatis, *Dub.*

Ferri Carbonas cum Saccharo, *Lond.;* Ferri Carbonas Saccharatum, *Ed., Dub.*

Mistura Ferri Composita, *U. S., Lond., Ed., Dub.*
Pilulæ Ferri Carbonatis, *U. S., Ed.;* Anglicè, *Vallet's ferruginous pills.*
Pilulæ Ferri Compositæ, *U. S., Lond.*
Ferri Subcarbonas, *U. S.;* Ferri Sesquioxydum, *Lond.;* Ferri Oxidum Rubrum, *Ed.;* Ferri Carbonas, *Dub.;* Anglicè, *Precipitated subcarbonate of iron.*
Emplastrum Ferri, *U. S., Lond., Ed.*
Ferrum Ammoniatum, *U. S.;* Ferri Ammonio-Chloridum, *Lond.*
Tinctura Ferri Ammonio-Chloridi, *Lond.*
Ferri Citras, *U. S.*
Ferri Ammonio-Citras, *Lond., Dub.*
Liquor Ferri Nitratis, *U. S.;* Ferri Pernitratis Liquor, *Dub.*
Ferri Phosphas, *U. S.*
Ferri Sulphas Venalis, *Lond.*
Ferri Sulphas, *U. S., Lond., Ed., Dub.*
Pilulæ Aloës et Ferri, *Ed.*
Ferri Sulphas Exsiccatum, *Ed.*
Pilulæ Ferri Sulphatis, *Ed.*
Pilulæ Rhei et Ferri, *Ed.*
Ferri Sulphas Granulatum, *Dub.*
Ferri Sulphas Siccatum, *Dub.*
Ferri et Potassæ Tartras, *U. S.;* Ferri Potassio-Tartras, *Lond.;* Ferrum Tartarizatum, *Ed., Dub.*
Vinum Ferri, *Lond.*
Ferri Valerianas, *Dub.* B.

FERRI FILUM. *U. S., Ed.*

Iron Wire.

FERRI RAMENTA. *U. S.*

Iron Filings.

Off. Syn. FERRUM in fila tractum. *Lond.;* FERRI LIMATURA. Iron filings, *Ed.;* FERRUM. Rod Iron; Iron Wire; Turnings and Filings. *Dub.*
Fil de fer, *Fr.;* Eisendraht, *Germ.;* Fil di Ferro, *Ital.;* Hilo de hierro, *Span.*
Limailles de fer, *Fr.;* Eisenfeilicht, *Germ.;* Limatura di ferro, *Ital.;* Limadura de hierro, *Span.*

Iron, when employed in pharmaceutical operations, should be of the purest kind; and hence the different Pharmacopœias generally direct it, when wanted in small masses, to be in the form of iron wire, which is necessarily made from the softest and most ductile iron, and is readily cut into pieces of convenient size. The filings are sometimes used internally.

Medical Properties of Iron Filings. Iron, in its uncombined state, has no action on the animal economy; and hence iron filings would prove inert, were it not that they meet with acid in the stomach, or some other agent, whereby they become oxidized and dissolved. During the solution of iron in the stomach, the oxygen furnished to the metal is derived from water, the hydrogen of which, by being disengaged, gives rise to unpleasant eructations. Iron filings are generally obtained from the workshops of the blacksmith; but, as furnished from this source, they are generally very impure, and unfit for medicinal use. Neither can they be purified by the magnet; as they often have attached to them certain impurities, which are carried up with them. The only way to obtain pure iron filings,

is to file a piece of pure iron with a clean file. The French codex directs iron in an *impalpable powder*, prepared by porphyrizing bright and clean iron filings without water. A dull black powder is formed, which must be carefully preserved from moisture. An impalpable powder of the metal, obtained by reducing the sesquioxide by hydrogen, has been made officinal in the U. S. and Dublin Pharmacopœias of 1850. (See *Ferri Pulvis.*)

The dose of iron filings is from five to twenty grains, given in molasses or honey, or made into pills with some bitter extract.

Pharm. Uses. Iron wire is used as a chemical agent in preparing iodide of potassium, *Ed.*, *Dub.*, and iron filings, in preparing bromide of potassium, *U. S.*

Off. Prep. Ferri Iodidum; Ferri Sulphas; Ferri Sulphas Granulatum; Ferri Sulphuretum; Liquor Ferri Iodidi; Liquor Ferri Nitratis; Mistura Ferri Aromatica; Syrupus Ferri Iodidi; Tinctura Ferri Sesquichloridi; Vinum Ferri. B.

FERRI SULPHAS VENALIS. *Lond.*

Commercial Sulphate of Iron.

Sulfate de fer, vitriol de fer, couperose, *Fr.;* Schwefelsaures Eisenoxydul, Grüner Vitriol, *Germ.;* Vitriolo verde, Copparosa verde, *Ital.;* Vitriolo verde, *Span.*

Commercial sulphate of iron, under the name of *green vitriol* or *copperas*, is manufactured on a large scale, for the purposes of the arts, from the native sulphuret of iron, or iron pyrites, by roasting, oxidation by exposure to air and moisture, and lixiviation. The constituents of the mineral become sulphuric acid and protoxide of iron, which, by their union, form the salt in question. This salt is also obtained in many chemical processes as a collateral product; as in the manufacture of alum, in the precipitation of copper from solutions of sulphate of copper by scrap iron, &c.

Properties. Commercial sulphate of iron is far from being pure. Besides containing some sesquioxide of iron, it is generally contaminated with metallic and earthy salts; such as those of copper, zinc, alumina, and magnesia. Two principal kinds occur in the market; one in large grass-green crystals, the surface of which is studded with ochreous spots; the other, of a bluish-green colour, and ordinarily mixed with the powder of the effloresced salt. The commercial sulphate should never be dispensed by the apothecary, until it has undergone a careful purification in the manner directed by the London and Edinburgh Colleges. (See *Ferri Sulphas*, in the second part of this work.)

Commercial sulphate of iron has been newly introduced into the London Pharmacopœia, not as a medicine, but as a material from which the pure sulphate may be made. The properties and composition of sulphate of iron will be given under *Ferri Sulphas*, to which article the reader is referred.

Off. Prep. Ferri Sulphas. *Lond.* B.

FICUS. *U. S., Lond.*

Figs.

The dried fruit of Ficus Carica. *U. S.* The prepared fruit. *Lond.*

Off. Syn. FICI. Dried fruit of Ficus Carica. *Ed.* FICUS CARICA. The dried fruit. *Dub.*

Figues, *Fr.;* Feigen, *Germ.;* Fichi, *Ital.;* Higos, *Span.*

FICUS. *Sex. Syst.* Polygamia Dicœcia.—*Nat. Ord.* Urticaceæ.

Gen. Ch. Common receptacle turbinate, fleshy, converging, concealing the florets either in the same or distinct individuals. MALE. *Calyx* three-parted.

Corolla none. *Stamens* three. FEMALE. *Calyx* five-parted. *Corolla* none. *Pistil* one. *Seed* one, covered with the closed, persistent, somewhat fleshy calyx. *Willd.*

Ficus Carica. Willd. *Sp. Plant.* iv. 1131; Woodv. *Med. Bot.* p. 714, t. 244. The fig-tree, though often not more than twelve feet high, sometimes rises in warm climates to twenty-five or even thirty feet. Its trunk, which seldom exceeds seven inches in diameter, is divided into numerous spreading branches, covered with a brown or ash-coloured bark. Its large, palmate leaves, usually divided into five obtuse lobes, are deep green and shining above, pale green and downy beneath, and stand alternately on strong round footstalks. The flowers are situated within a common receptacle, placed upon a short peduncle in the axils of the upper leaves. This receptacle, the walls of which become thick and fleshy, constitutes what is commonly called the fruit; though this term is, strictly speaking, applicable to the small seeds found in great numbers on the internal surface of the receptacle, to which they are attached by fleshy pedicels. Cultivation has produced in the fig, as in the apple and peach, a great diversity in shape, size, colour, and taste. It is usually, however, turbinate or top-shaped, umbilicate at the large extremity, of the size of a small pear, of a whitish, yellowish, or reddish colour, and of a mild, mucilaginous, saccharine taste.

The fig-tree is supposed to have come originally from the Levant. It was introduced at a very early period into various parts of the South of Europe, and is now very common throughout the whole basin of the Mediterranean, particularly in Italy and France. To hasten the maturation of the fruit, it is customary to puncture it with a sharp-pointed instrument covered with olive oil. The ancient process of *caprification* is still practised in the Levant. It consists in attaching branches of the wild fig-tree to the cultivated plant. The fruit of the former contains great numbers of the eggs of an insect of the genus Cynips, the larvæ of which as soon as they are hatched, spread themselves over the cultivated fruit, and, by conveying the pollen of the male organs over which they pass to the female florets, hasten the impregnation of the latter, and cause the fig to come quickly to perfection, which might otherwise ripen very slowly, or wither and drop off before maturity. Some authors attribute the effect to the piercing of the fruit by the young insects.

The figs, when perfectly ripe, are dried by the heat of the sun or in ovens. Those brought to the United States come chiefly from Smyrna, packed in drums or boxes. They are more or less compressed, and are usually covered in cold weather with a whitish saccharine efflorescence, which melts in the middle of summer, and renders them moist. The best are yellowish or brownish, somewhat translucent when held to the light, and filled with a sweet viscid pulp, in which are lodged numerous small yellow seeds. They are much more saccharine than the fresh fruit. Their chief constituents are sugar and mucilage.

Medical Properties and Uses. Figs are nutritious, laxative, and demulcent. In the fresh state they are considered in the countries where they grow a wholesome and agreeable aliment, and have been employed from time immemorial. As we obtain them, they are apt, when eaten freely, to produce flatulence, pain in the bowels, and diarrhœa. Their chief medical use is as a laxative article of diet in cases of constipation. They occasionally enter into demulcent decoctions; and, when roasted or boiled, and split open, are sometimes applied as a suppurative cataplasm to parts upon which an ordinary poultice cannot be conveniently retained.

Off. Prep. Confectio Sennæ; Decoctum Hordei Compositum. W.

FILIX MAS. *U. S. Secondary.*

Male Fern.

The rhizoma of Aspidium Filix mas. *U. S.*

Off. Syn. FILIX. Rhizoma of Nephrodium Filix mas. (*Richard.*) *Male Shield Fern. Ed.*

Fougère male, *Fr.;* Johanniswurzel, *Germ.;* Félce maschio, *Ital.;* Helecho, *Span.*

ASPIDIUM. *Sex. Syst.* Cryptogamia Filices.—*Nat. Ord.* Filices, *Jussieu.* Filicales, *Lindley.*

Gen. Ch. Fructification in roundish points, scattered, not marginal. *Involucre* umbilicated, open almost on every side. *Smith.*

Aspidium Filix mas. Willd. *Sp. Plant.* v. 259; Smith, *Flor. Britan.*—*Nephrodium Filix mas.* Lindley, *Flor. Med.* 619.—*Polypodium Filix mas.* Linn.; Woodv. *Med. Bot.* p. 795, t. 267. The male fern has a perennial, horizontal root or rhizoma, from which numerous annual fronds or leaves arise, forming tufts from a foot to four feet in height. The stipe or footstalk, and midrib, are thickly beset with brown, tough, transparent scales; the frond itself is oval, lanceolate, acute, pinnate, and of a bright green colour. The pinnæ or leaflets are remote below, approach more nearly as they ascend, and run together at the summit of the leaf. They are deeply divided into lobes, which are of an oval shape, crenate at the edges, and gradually diminish from the base of the pinna to the apex. The fructification is in small dots on the back of each lobe, placed in two rows near the base, and distant from the edges. The plant is a native of Europe, Asia, and the North of Africa. It is said also to be indigenous, growing in shady pine forests from New York to Virginia; but it may be doubted whether the American plant is identical with the European.

The proper period for collecting the root is during the summer, when, according to M. Peschier, of Geneva, it abounds more in the active principle than at any other season. The same writer informs us that it deteriorates rapidly when kept, and in about two years becomes entirely inert. The roots of other species of fern are frequently substituted for the officinal; and in the dried state it is difficult to distinguish them.

Properties, &c. As taken from the ground, the root consists of a long cylindrical caudex, around which are closely arranged, overlapping each other like the shingles of a roof, the remains of the leafstalks or stipes, which are an inch or two in length, from two to four lines thick, somewhat curved and directed upwards, angular, brown, shining, and surrounded near their origin from the root with thin silky scales, of a light-brown colour. From between these remains of the footstalks, emerge numerous small radical fibres. The whole root, thus constituted, presents a somewhat flexible, cylindrical mass, one or two inches thick, and a foot or more in length. In this form, however, it is not usually found in our shops. The whole is ordinarily broken up into fragments, consisting of the separated remains of the leafstalks before described, with a small portion of the substance of the root attached to their base, where they are surrounded by the silky scales. These fragments, as ordinarily found in our shops, present the appearance of having been long kept, and are probably, as a general rule, much deteriorated by time. The following observations are made by Geiger in relation to the collection and preservation of the root. The inner part of the fresh root, and of the portions of stalk attached to it, are fleshy and of a light yellowish-green colour. In collecting them, all the black discoloured portions should be cut away, the fibres and scales separated, and only the sound green parts preserved. These should be immediately but carefully dried, and then re-

duced to powder; and the powder should be kept in small well stopped glass bottles. The powder thus prepared has a pale-yellowish colour with a greenish tinge.

Dried fern root is externally of a brown colour, internally yellowish-white or reddish, with a peculiar but feeble odour, which is most obvious in the powder and decoction, and a sweetish, bitter, astringent, nauseous taste. The most recent analysis is that of H. Bock, who gives as its constituents, volatile oil, fixed oil, resin, starch, vegetable gelatin, albumen, gum, sugar, tannic and gallic acids, pectin, lignin, and various salts. (See *Am. Journ. of Pharm.*, xxiv. 64.) Peschier ascertained that its active properties reside in the ethereal extract, which is the fixed oil in an impure state, containing volatile oil, resin, colouring matter, &c. It is a thick dark liquid, having the odour of the fern, and a nauseous, bitterish, somewhat acrid taste. Dr. E. Luck has found in the ethereal extract a peculiar acid, which he denominates *filicic acid*, and has extracted from the root two others which he names *tannaspidic and pteritannic acids.* (*Chem. Gaz.*, ix. 407 and 452.)

Medical Properties and Uses. Male fern is slightly tonic and astringent; but produces, when taken internally, no very obvious effects upon the system. It was used by the ancients as a vermifuge; and is mentioned in the works of Dioscorides, Theophrastus, Galen, and Pliny. Its anthelmintic powers were also noticed by some of the earlier modern writers, among whom was Hoffmann. But it does not appear to have been generally known to the profession, till attention was attracted to it, about the year 1775, by the publication of the mode of treating tænia, employed by Madame Nouffer. This lady, who was the widow of a surgeon in Switzerland, had acquired great celebrity in the cure of tape-worm by a secret remedy. Her success was such as to attract the attention of the medical profession at Paris; and some of the most eminent physicians of that city, who were deputed to examine into the subject, having reported favourably of the remedy, the secret was purchased by the King of France, and published by his order. The outlines of her plan were to give a dose of the powdered root of the male fern, and two hours afterwards a powerful cathartic, to be followed, if it should not operate in due time, by some purging salt; and this process was to be repeated, with proper intervals, till the worm should be evacuated. A German physician, of the name of Herrenschwand, had used the male fern in a manner somewhat similar, before Madame Nouffer's secret was known. Different opinions have been held of the value of this anthelmintic; but the accounts of its efficacy in the treatment of tape-worm are too numerous and authentic to admit of any reasonable doubt on the subject. Dr. Peschier stated that, in the course of nine months, one hundred and fifty tape-worms had been expelled by the ethereal extract of the male fern root. Dr. Ebers found the same preparation completely successful in eight cases. The testimony of Brera is also strongly in favour of the remedy, which he found effectual even against the armed tænia. M. Ronzel cured with it more than a hundred cases of tænia, and never found it to fail. (*Journ. de Pharm.*, 3e *sér.*, iv. 474.) Perhaps the different results obtained by different practitioners may in part be ascribed to the variable strength and character of the root employed. It is said that the remedy proves more effectual against the tape-worm of the Swiss (*Bothriocephalus latus*) than against the *Tænia solium*, which is more frequent in France and England. (*Bremser.*) It appears to act as a poison to the worm, which it destroys, and thereby enables it to be expelled by the ordinary peristaltic movement of the bowels, or by purgatives.

The medicine may be given in powder, or, as recommended by Dr. Peschier, in ethereal extract. The dose of the powder is from one to three drachms, to be given in the form of electuary or emulsion, and repeated morning and evening for one or two days successively. M. Ronzel gives half an ounce to adults, made into boluses, and swallowed within the space of fifteen minutes, in the morning, on an empty stomach. The dose of the ethereal extract (*oil of fern*) is from twelve

to twenty-four grains. Dr. Mayor, of Geneva, recommends it in the dose of from thirty to fifty drops, one-half to be taken at night, the other half in the morning, and followed, at the interval of an hour, by an ounce and a half of castor oil. The decoction has also been employed, in the proportion of an ounce of the root to a pint of water. It is customary to follow the medicine by some brisk cathartic, though Dr. Peschier does not consider this essential. W.

FŒNICULUM. *U. S., Lond., Ed., Dub.*

Fennel-seed.

The fruit of Fœniculum vulgare. *U. S.* Fœniculum dulce. The fruit. *Lond.* Fruit of Fœniculum officinale. *Ed.* The seeds. *Dub.*

Fenouil, *Fr.;* Fenchel, *Germ.;* Finnocchio, *Ital.;* Hinojo, *Span.*

The plant producing fennel-seed was attached by Linnæus to the genus *Anethum*, but was separated from it by De Candolle, and placed, with three or four others, in a new genus styled *Fœniculum*, which has been generally adopted by botanists. The *Anethum Fœniculum* of Linnæus embraced two varieties, the *common* or *wild fennel*, and the *sweet fennel*, the latter being the plant usually cultivated in the gardens of Europe. These are considered by De Candolle as distinct species, and named respectively *Fœniculum vulgare* and *Fœniculum dulce*. In the U. S. Pharmacopœia, the former of these is recognised as the source of the medicine; the London College adopts the latter; the Edinburgh College, the *F. officinale* of Allioni. The last mentioned plant De Candolle considers as belonging to his *F. vulgare* (see *Prodromus*, iv. 142); while Merat treats of it as a distinct species, differing both from the F. vulgare and F. dulce of De Candolle (*Dict. de Mat. Méd.*); and Dr. Christison, in his Dispensatory, is disposed to unite it with the last-mentioned plant. In this confusion it is impossible to arrive at any definite and satisfactory conclusion as to the botanical history of the drug under consideration. One thing, however, is certain, that there are two kinds of fennel-seed found in the shops; and it is highly probable that these are derived, if not from distinct species of fennel, at least from marked varieties of the plant. One of them corresponds closely with the description given of the fruit of F. vulgare, while the other is undoubtedly produced by the plant cultivated under the name of sweet fennel, whether that be the F. dulce of De Candolle, or F. officinale of Allioni and Merat.

FŒNICULUM. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Umbelliferæ or Apiaceæ.

Gen. Ch. Calyx a tumid obsolete rim. *Petals* roundish, entire, involute, with a squarish blunt lobe. *Fruit* nearly taper. *Half-fruits* with five prominent bluntly keeled ridges, of which the lateral are on the edge, and rather broadest. *Vittæ* single in the channels, two on the commissure. *Involucre* none. (*Lindley.*)

Fœniculum vulgare. De Cand. *Prodrom.* iv. 142.—*Anethum Fœniculum.* Linn.; Woodv. *Med. Bot.* p. 127, t. 49. *Common fennel* has a biennial or perennial tapering root, and an annual, erect, round, striated, smooth, green, and copiously branching stem, which usually rises three or four feet in height. The leaves, which stand alternately at the joints of the stem, upon membranous striated sheaths, are many times pinnate, with long, linear, pointed, smooth, deep-green leaflets. The flowers are in large, flat, terminal umbels, with from thirteen to twenty rays, and destitute both of general and partial involucres. The corolla consists of five petals, which, as well as the stamens, are of a golden yellow colour. The fruit is ovate, rather less than two lines in length by about a line in breadth, and of a dark colour, especially in the channels. The plant is a native of Europe, growing wild upon sandy and chalky ground throughout the continent.

F. officinale. Merat and De Lens, *Dict. de Mat. Méd.* iii. 270; Allioni, *Ed.*

Pharm. This, which is sometimes called *sweet fennel*, is also perennial, with shorter leaves and less elongated leaflets than the common fennel, but resembling it very closely except in the character of the fruit. This is twice as long as that of the former plant, a little curved, of a less dark colour, with prominent ridges, and a persistent peduncle. It is sweeter and more aromatic than common fennel-seed. The plant is a native of the South of Europe; but is cultivated elsewhere in gardens, and is probably the source of much of the fennel-seed of the shops. Whether it is a distinct species, or a mere variety of F. vulgare, is not determined. Some confound it with the following.

F. dulce. De Cand. *Prodrom.* iv. 142. This plant is eminently entitled to the name of *sweet fennel.* It bears a general resemblance to *F. vulgare*, but differs in having its stem somewhat compressed at the base, its radical leaves somewhat distichous, and the number of rays in the umbel only from six to eight. It is also a much smaller plant, being only about a foot in height; its flowers appear earlier; and its young shoots or turiones are sweeter and edible. It is a native of Portugal, Italy, and perhaps other parts of Southern Europe; and is cultivated largely in Italy and Sicily for the sake of the shoots, which are eaten raw, or in salad, or boiled as potherbs. The fruit is described by Merat and De Lens as "being globular-ovate, twice the size of that of common fennel, and with prominent ridges." This description does not answer to the character of any of the fennel-seed we have seen in the shops.

In all these species or varieties, the whole plant has an aromatic odour and taste, dependent on a volatile oil by which it is pervaded. The roots were formerly employed in medicine, but are greatly inferior in virtues to the fruit, which is now the only officinal portion. Our shops are partly supplied from our own gardens; but much the larger portion of the medicine is imported from Europe, and chiefly, as we have been informed, from Germany. The fennel-seed cultivated here is sweeter and more aromatic than that from abroad, probably in consequence of its greater freshness.

Fennel seeds (half-fruits) are oblong-oval, from one to three or four lines in length, flat on one side, convex on the other, not unfrequently connected by their flat surfaces, straight or slightly curved, of a dark grayish-green colour, with longitudinal yellowish ridges on the convex surface. There are two varieties, one of them from one to two lines long, dark-coloured, rather flat, almost always separate, and without footstalks; the other three or four lines, sometimes even five lines in length, lighter-coloured, with much more prominent ridges, often conjoined by their flat surface, and very frequently provided with a footstalk. They do not differ essentially in aromatic properties. The odour of fennel-seed is fragrant, its taste warm, sweet, and agreeably aromatic. It imparts its virtues to hot water, but more abundantly to alcohol. The essential oil may be separated by distillation with water. (See *Oleum Fœniculi.*) The seeds contain also fixed oil. From 960 parts of them, Neumann obtained 20 parts of the former and 120 of the latter.

Medical Properties and Uses. Fennel-seed was used by the ancients, is among our most grateful aromatics, and in this country is much employed as a carminative, and as a corrigent of other less pleasant medicines, particularly senna and rhubarb. It is recommended for these purposes by the absence of any very highly excitant property. The infusion, prepared by introducing two or three drachms of the seeds into a pint of boiling water, is the form usually preferred. The dose of the bruised or powdered seeds is from a scruple to half a drachm. In infantile cases, the infusion is frequently employed as an enema to produce the expulsion of flatus.

Off. Prep. Aqua Fœniculi; Confectio Piperis; Oleum Fœniculi; Spiritus Juniperi Compositus; Syrupus Sennæ; Tinctura Rhei et Sennæ. W.

FRASERA. *U. S. Secondary.*

American Columbo.

The root of Frasera Walteri. *U. S.*

Frasera. *Sex. Syst.* Tetrandria Monogynia.—*Nat. Ord.* Gentianaceæ.

Gen. Ch. Calyx deeply four-parted. *Corolla* four-parted, spreading; segments oval, with a bearded, orbicular gland in the middle of each. *Capsule* compressed, partly marginated, one-celled. *Seeds* few, imbricated, large, elliptical, with a membranaceous margin. *Nuttall.*

Frasera Walteri. Michaux, *Flor. Bor. Americ.* i. 96; Barton, *Med. Bot.* ii. 103.—*F. Carolinensis.* Walter. This is among our most elegant indigenous plants, and the only one of its genus. From the root, which is triennial, long, spindle-shaped, horizontal, fleshy, and of a yellow colour, a strong, succulent, solid, smooth stem rises, from five to ten feet in height. The leaves are sessile, entire, glabrous, of a deep-green colour, and disposed in whorls, which commence at the root, and ascend to the summit with successively diminishing intervals. The radical leaves, from five to twelve in number, are elliptical, obtuse, a foot or more in length by about four inches in breadth, and lie upon the ground in the form of a star. Those constituting the whorls upon the stem are successively smaller as they ascend; the lowest oblong-lanceolate, the upper lanceolate and pointed. The flowers are numerous, large, of a yellowish-white colour, and disposed in a beautiful terminal pyramidal panicle, from one to five feet long, the branches of which spring from the axils of the upper leaves. The segments of the calyx are lanceolate, acute, and somewhat shorter than those of the corolla. The filaments are inserted into the base of the corolla, between its segments, which they do not equal in length. The anthers are oblong and notched at the base. The germ is oblong-ovate, compressed, and gradually tapers into the style, which terminates in a bifid stigma. The fruit is an oval, acuminate, compressed, two-valved, one-celled, yellow capsule, containing from eight to twelve flat, elliptical seeds.

The Frasera flourishes in the southern and western portions of the United States, and in many situations is very abundant, especially in Arkansas and Missouri. It prefers rich woodlands and moist meadows. The period of flowering is from May to July; but the stems and flowers are produced only in the third year, the radical leaves being the only part of the plant which previously appear above ground. From this manner of growth, it is inferred that the root should be collected in the autumn of the second, or the spring of the third year. Before being dried, it should be cut into transverse slices.

As formerly found in the market, frasera was in pieces irregularly circular, an eighth of an inch or more in thickness, about an inch in diameter, somewhat shrunk in the middle, consisting of a central medullary matter and an exterior cortical portion, of a yellowish colour on the cut surfaces, with a light reddish-brown epidermis. In appearance these pieces bore some resemblance to columbo, but were easily distinguishable by the greater uniformity of their internal structure, the absence of concentric and radiating lines, and their purer yellow colour without a greenish tinge. We have met with a parcel of the root sliced longitudinally, so as somewhat to resemble gentian, though not likely to be confounded with it by an experienced person. It was called *American gentian.* The taste of frasera is bitter and sweetish. Water and diluted alcohol extract its virtues, and the tincture lets fall a precipitate upon the addition of water, but is not disturbed by tincture of galls; thus affording additional means of distinguishing the root from columbo.

Medical Properties and Uses. Frasera is a mild tonic, calculated to meet the same indications with the other simple bitters. It has been thought to resemble columbo in medical properties as well as in appearance, and hence has received the popular name of *American columbo;* but experience has not confirmed the high estimate which was at one time formed of its virtues; and though, perhaps, still occasionally employed in some parts of the country, it has failed to supplant the tonic of Mozambique. It may be given in powder or infusion. The dose of the former is from thirty grains to a drachm; that of an infusion, made in the proportion of an ounce of the bruised root to a pint of boiling water, is one or two fluidounces, to be repeated several times a day. The fresh root is said to operate as an emetic and cathartic, and has been given with a view to the latter effect. W.

GALBANUM. *U. S., Lond., Ed., Dub.*

Galbanum.

The concrete juice of an unknown plant. *U. S.* Galbanum officinale. The gum-resin. *Lond.* Concrete gummy-resinous juice of an imperfectly ascertained umbelliferous plant, probably a species of Opoidia. *Ed.* Opoïdia galbanifera. The gum-resinous exudation. *Dub.*

Galbanum, *Fr.;* Mutterharz, *Germ.;* Galbano, *Ital., Span.*

It is not certainly known from what plant galbanum is derived. At one time it was supposed to be the product of *Bubon Galbanum*, an umbelliferous plant growing on the eastern coast of Africa. It has also been referred to the *Ferula ferulago* of Linnæus, the *Ferula galbanifera* of Lobel, which inhabits the coasts of the Mediterranean, and is found also in Transylvania and the Caucasus. But no part of either of these plants possesses the odour of galbanum; and it is, therefore, scarcely probable that they yield the drug. Mr. Don, having found the seeds taken from a parcel of galbanum to belong to an undescribed genus of umbelliferous plants, and concluding that they came from the same source as the gum-resin itself, gave the title of Galbanum to the new genus, and named the species *Galbanum officinale.* This has been rather hastily adopted by the London College; as it is by no means certain that the same plant produced the seeds and the gum-resin. Specimens of a plant were received in England from Persia, having a concrete juice adhering to them, which was taken by Dr. Lindley for galbanum; and that botanist, finding that the plant belonged to an undescribed genus, named it *Opoïdia*, with the specific name *galbanifera.* Dr. Pereira, however, found the substance to be unlike galbanum, or any other product of the Umbelliferæ. This supposed origin of the drug, therefore, though admitted as probable by the Edinburgh College, and recognised by the Dublin, must be considered as more than doubtful. A German traveller, F. A. Bukse, who has resided in Persia, states that, in 1848, he met with the galbanum plant on the declivities of the Demawend, near the southern coast of the Caspian. He saw the gum-resin exuding spontaneously from the plant, and was informed by the natives that the drug was collected from it. The plant is a Ferula, and bears a close resemblance to the *F. erubescens* of Boissier (*Ann. des Sciences*, 1844, p. 316), if not identical with it. (*Pharm. Cent. Blatt*, March 17, 1852, p. 206.)

Galbanum is said to be obtained from the plant by making incisions into the stem, or cutting it off a short distance above the root. A cream-coloured juice exudes, which concretes upon exposure to the air. A portion of juice also exudes spontaneously from the joints, and hardens in the shape of tears. The drug is brought from India and the Levant.

Properties. Galbanum usually appears in the form of masses, composed of

whitish, reddish, or yellowish tears, irregularly agglutinated by a darker coloured yellowish-brown, or greenish substance, more or less translucent, and generally mixed with pieces of stalk, seeds, or other foreign matters. It is also found, though rarely in our markets, in the state of distinct roundish tears, about as large as a pea, of a yellowish-white or pale brownish-yellow colour, shining externally as if varnished, translucent, and often adhering together. Galbanum has in cool weather the consistence of firm wax; but softens in summer, and by the heat of the hand is rendered ductile and adhesive. At 212° F. it is sufficiently liquid to admit of being strained; and it generally requires to be strained before it can be used. A dark-brown or blackish colour, a consistence always soft, the absence of whitish grains, a deficiency in the characteristic odour and taste, and the intermixture of earthy impurities, are signs of inferiority.

The odour of galbanum is peculiar and disagreeable; its taste bitterish, warm, and acrid; its sp. gr. 1·212. Triturated with water, it forms an imperfect milky solution, which upon standing deposits the greater portion of what was taken up. Wine and vinegar act upon it in a similar manner. Alcohol dissolves a considerable proportion, forming a yellow tincture, which has the smell and taste of galbanum, and becomes milky by the addition of water, but affords no precipitate. In dilute alcohol it is wholly soluble, with the exception of impurities. Ether dissolves the greater portion. Pelletier found in 100 parts of it 66·86 parts of resin, 19·28 of gum, 6·34 of volatile oil including the loss, 7·52 of wood and impurities, with traces of supermalate of lime. A small proportion of bassorin was found by Meissner. The medicine is, therefore, a *gum-resin*. By distillation at the temperature of about 250° F., the essential oil is obtained of a fine indigo blue colour, which it imparts to alcohol. Procured by distillation with water, it is colourless, and becomes yellowish by age. It is lighter than water.

According to Ludewig, a gum-resin, designated as *Persian galbanum*, is received in Russia by the way of Astracan or Orenburg, and is the kind used in that country. It comes enclosed in skins, and is in masses of a reddish-brown colour with whitish streaks, of a disagreeable odour somewhat like that of assafetida, and of an unpleasant, bitter, resinous taste. It is so soft as to melt with a slight elevation of temperature. It differs from common galbanum in its odour, in its colour which is never greenish, and in the absence of tears, and is probably derived from a different plant. It abounds in impurities. (*Journ. de Pharm., N. S.*, i. 117.)

Medical Properties and Uses. Galbanum is stimulant, expectorant, and antispasmodic; and may be considered as intermediate in power between ammoniac and assafetida. It is, however, much less employed than either of these gum-resins, and in the United States is seldom prescribed internally. The complaints to which it was formerly thought applicable, were chiefly chronic affections of the bronchial mucous membrane, amenorrhœa, and chronic rheumatism. It is occasionally applied externally in the shape of plaster to indolent swellings, with the view of promoting resolution or suppuration. Galbanum was known to the ancients. The dose is from ten to twenty grains, and may be given in pill, or triturated with gum Arabic, sugar, and water, so as to form an emulsion.

Off. Prep. Emplastrum Assafœtidæ; Emplastrum Galbani Compositum; Emplastrum Gummosum; Galbanum Præparatum; Pilulæ Galbani Compositæ. W.

GALLA. *U. S., Lond.*

Galls.

Morbid excrescences upon Quercus infectoria. *U. S.* Swelling of the bud produced by Cynips Gallæ tinctoriæ. *Lond.*

Off. Syn. GALLÆ. Excrescences of Quercus infectoria, formed by Diplolepis gallæ tinctorum. *Ed.*, *Dub.*

Noix de galle, *Fr.*; Galläpfel, *Germ.*; Galla, *Ital.*; Agallas de Levante, *Span.*

Many vegetables, when pierced by certain insects, particularly those of the genus *Cynips*, are affected at the points of puncture with a morbid action, resulting in the production of excrescences, which, as they are derived from the proper juices of the plant, partake more or less of its predominant chemical character. Most of the oaks are susceptible of this kind of action; and the resulting excrescences, having in a high degree the astringency of the plant, have been employed for various practical purposes. They are known by the name of *galls*, a term which, as well as their employment in medicine, has been handed down to us from the ancients. *Quercus infectoria*, *Q. Ægilops*, *Q. excelsa*, *Q. Ilex*, *Q. Cerris*, and *Q. robur*, have been particularized as occasionally affording this product; but it is now generally admitted, upon the authority of Olivier, that the officinal galls are derived chiefly, if not exclusively, from *Q. infectoria*; and this is recognised as their source in the U. S. and British Pharmacopœias.*

Quercus. See QUERCUS ALBA.

Quercus infectoria. Willd. *Sp. Plant.* iv. 436; Olivier, *Voy. Orient.* t. 14 *et* 15; Carson, *Illust. of Med. Bot.* ii. 40, pl. 85. The *dyers' oak* is a small tree or shrub, with a crooked stem, seldom exceeding six feet in height. The leaves are obtusely toothed, smooth, of a bright-green colour on both sides, and stand on short footstalks. The acorn is elongated, smooth, two or three times longer than the cup, which is sessile, somewhat downy, and scaly. This species of Quercus grows, according to Olivier, throughout Asia Minor, from the Archipelago to the confines of Persia. Captain M. Kinneir found it also in Armenia and Kurdistan; General Hardwicke observed it growing in the neighbourhood of Adwanie; and it probably pervades the middle latitudes of Asia.

The gall originates from the puncture of the *Cynips quercûsfolii* of Linnæus, the *Diplolepis gallæ tinctoriæ* of Geoffroy, a hymenopterous insect or fly, with a fawn-coloured body, dark antennæ, and the upper part of its abdomen shining brown. The insect pierces the shoots and young boughs, and deposits its egg in the wound. This irritates the part, and a small tumour quickly rises, which is the result of a morbid growth, exhibiting various cells under the microscope, but no proper vegetable fibre. The egg grows with the gall, and is soon converted into a larva, which feeds upon the vegetable matter around it, and thus forms a cavity in the centre of the excrescence. The insect at length assumes the form of a fly, and escapes by eating its way out. The galls are in perfection when they have attained their full size, and before the egg has been hatched, or the fly has escaped. Collected at this period, they are called, from their dark colour, *blue*, *green*, or *black galls*, and are most highly esteemed. Those which are gathered later, and which have been injured by the insect, are called *white*

* Under the name of *Chinese galls*, a product has been brought from China, supposed to be caused by an insect allied to the Aphis, as such an insect has been found in the interior of them. A specimen, which came under our notice, consisted of irregularly spindle-shaped bodies, often more or less bent, with obtusely pointed protuberances, about two inches long by an inch in diameter at the central thickest part, of an ash colour and a soft velvety feel, very light, hollow, with translucent walls about a line in thickness, of a slight odour recalling that of ipecacuanha, and a bitter astringent taste. From an examination of fragments of leaves and petioles found among these galls, Dr. Schenck concluded that the tree on which they are found is a species of Rhus; but, according to M. Decaisne, professor at the Museum of Natural History in Paris, their true source is probably the *Distylium racemosum* of Zuccarini (*Flor. Japon.* i. p. 178, t. 94), a large tree of Japan, the leaves of which produce a velvety gall resembling the one in question. (Guibourt, *Hist. Nat. des Drogues*, A. D. 1850, iii. 703.) The Chinese make great use of this product both in dyeing and as a medicine. L. A. Buchner, jun., has found it to contain 65 per cent. of tannic acid identical with that of the officinal galls. (*Pharm. Cent. Blatt*, July, 1851, p. 526.)

galls. They are usually larger, less heavy and compact, and of a lighter colour than the former; and are considered much inferior.

The galls collected in Syria and Asia Minor are brought to this country chiefly from the ports of Smyrna and Trieste, or from London. As they are produced abundantly near Aleppo, it has been customary to designate them by the name of that town; though the designation, however correct it may formerly have been, is now wholly inapplicable, as they are obtained from many other places, and the produce of different parts of Asiatic Turkey is not capable of being discriminated, at least in our markets. Great quantities of galls, very closely resembling those from the Mediterranean, have been brought to the United States from Calcutta. Dr. Royle states that they are taken to Bombay from Bussorah through the Persian Gulf. We are, nevertheless, informed that they are among the products of Moultan. The galls of France and other southern countries of Europe have a smooth, shining, reddish surface, are little esteemed, and are seldom or never brought to the United States.

Properties. Galls are nearly round, from the size of a pea to that of a very large cherry, with a surface usually studded with small tuberosities, in the intervals of which it is smooth. The best are externally of a dark-bluish or lead colour, sometimes with a greenish tinge, internally whitish or brownish, hard, solid, brittle, with a flinty fracture, a striated texture, and a small spot or cavity in the centre, indicating the presence of the undeveloped or decayed insect. Their powder is of a light yellowish-gray. Those of inferior quality are of a lighter colour, sometimes reddish or nearly white, of a loose texture, with a large cavity in the centre, communicating externally by a small hole through which the fly has escaped. Galls are inodorous, and have a bitter, very astringent taste. From 500 parts Sir H. Davy obtained 185 parts of matter soluble in water, of which, according to his analysis, 130 were tannic acid, 31 gallic acid with a little extractive, 12 mucilage and matter rendered insoluble by evaporation, and 12 saline matter and calcareous earth. Braconnot discovered the presence of a small quantity of an acid to which he gave the name *ellagic*, derived from *galle*, the French name for galls, by reversing the order of the letters. According to M. Pelouze, however, neither gallic nor ellagic acid pre-exists in galls, being formed by the reaction of atmospheric oxygen upon their tannin. (*Journ. de Pharm.*, xx. 359.) Galls also yielded to Professor Branchi, by distillation with water, a concrete volatile oil. Guibourt found 65 per cent. of tannic acid, 10·5 of lignin, 5·8 of gum, sugar, and starch, 4·0 of gallic, ellagic, and luteo-gallic acids, and 11·5 of water, besides extractive, chlorophylle, volatile oil, albumen, and salts. All the soluble matter of galls is taken up by forty times their weight of boiling water, and the residue is tasteless; alcohol dissolves seven parts in ten, ether five parts. (*Thomson's Dispensatory.*) A saturated decoction deposits upon cooling a copious pale-yellow precipitate. The infusion or tincture affords precipitates with sulphuric and muriatic acids, lime-water, carbonate of ammonia, and carbonate of potassa; with solutions of acetate and subacetate of lead, the sulphates of copper and iron, the nitrates of silver and mercury, and tartrate of antimony and potassa; with the infusions of Peruvian bark, columbo, opium, and many other vegetables, especially those containing alkaloids, with most of which tannic acid forms insoluble compounds. The solution of gelatin also produces a precipitate. The infusion of galls reddens litmus paper, is rendered orange by nitric acid, milky by the corrosive chloride of mercury, and has its own colour deepened by ammonia; but yields no precipitate with either of these reagents. Sulphate of zinc was said by Dr. A. T. Thomson to occasion a slow precipitate, but this result was not obtained by Dr. Duncan.

Medical Properties and Uses. Galls are powerfully astringent. They are little employed as an internal remedy, though occasionally prescribed in chronic

diarrhœa and chronic dysentery. They have been recommended as an antidote to tartar emetic, and those vegetable poisons which depend for their activity upon organic alkalies; but, though the insoluble compounds which these principles form with galls may be less active than their soluble native compounds, they cannot be considered as inert. In the form of infusion or decoction, made in the proportion of half an ounce to a pint of water, galls may be advantageously used as an astringent gargle, lotion, or injection; and, mixed with simple ointment, in the proportion of one part of galls, in very fine powder, to eight parts of the unguent, they are frequently applied to the anus and rectum in hemorrhoidal affections. The dose of powdered galls is from ten to twenty grains, to be repeated several times a day.

Off. Prep. Acidum Gallicum; Acidum Tannicum; Decoctum Gallæ; Tinctura Gallæ; Unguentum Gallæ; Unguentum Gallæ Compositum. W.

GAMBOGIA. *U. S.*

Gamboge.

The concrete juice of an uncertain tree. *U. S.*

Off. Syn. CAMBOGIA. Gum-resin of an uncertain plant. *Lond.;* Hebradendron gambogioides. The gum-resinous exudation. *Dub.;* CAMBOGIA (SIAMENSIS). Gum-resin from an unascertained plant inhabiting Siam, probably a species of Hebradendron. CAMBOGIA (ZEYLANICA). Gummy-resinous exudation of Hebradendron cambogioides. *Ed.*

Gomme gutte, *Fr.;* Gummigutt, *Germ.;* Gomma-gotta, *Ital.;* Gutta gamba, *Span.*

Several plants belonging to the natural family of the *Guttiferæ*, growing in the equatorial regions, yield on incision a yellow opaque juice, which hardens on exposure to the air, and bears a close resemblance to gamboge; but it is not certainly known from which of these plants the officinal gum-resin is procured. Until recently the United States and all the British Pharmacopœias ascribed it to *Stalagmitis Cambogioides.* This genus and species were established by Murray of Göttingen, in 1788, from dried specimens belonging to König, procured in the island of Ceylon; and, from information derived from the same source, it was conjectured by Murray that the tree yielded not only the gamboge of Ceylon, but that also collected in Siam. It was on this authority that the British Colleges made the reference alluded to. But it has been ascertained by Dr. Graham, of Edinburgh, that there is no such plant as the Stalagmitis Cambogioides; the description of Murray having been drawn up from accidentally conjoined specimens of two distinct trees belonging to different genera; one being the *Xanthochymus oralifolius* of Roxburgh, and the other, the *Hebradendron Cambogioides* of Graham. By several botanists the gum-resin has been ascribed to *Garcinia Cambogia*, also a tree of Ceylon belonging to the family of Guttiferæ, and yielding a yellowish concrete juice; but a specimen of the product of this tree, sent to Edinburgh, was found by Dr. Christison to be different from gamboge both in composition and appearance, being of a pale lemon-yellow colour. Thus it appears that neither of these references is correct; and, besides, the important fact seems to have been overlooked, that commercial gamboge is never obtained from Ceylon, but exclusively from Siam and Cochin-china. A gum-resin from Ceylon having been found similar in composition to the gamboge of commerce; and the tree which produced it having been referred by Dr. Graham to a new genus, and named by him *Hebradendron Cambogioides;* the Edinburgh College, in the last edition of their Pharmacopœia, was induced to adopt this Ceylon gamboge as officinal, and to recognise the name proposed by Dr. Graham for the tree from which it is obtained. But as this variety is never found in

western commerce, and exists only in the cabinets of the curious, or the bazaars of India, it was scarcely worthy of a place in an officinal catalogue; and the sufficiency of the grounds upon which the new genus Hebradendron was separated from Garcinia is not universally admitted. The decision of the Edinburgh College would, therefore, seem to have been somewhat premature; though, from information received by Dr. Christison, there is some reason to believe that the Siam gamboge is really derived from a tree belonging to the same genus as the Hebradendron Cambogioides of Graham, but of a species hitherto undescribed.

Gamboge is collected in Siam and Cochin-china. Similar products are obtained in Ceylon; but they do not appear to be sent out of the island. Milburn does not mention gamboge among the exports. It is said to be procured in Siam by breaking off the leaves and young shoots of the tree, from which the juice issues in drops, and, being received in suitable vessels, gradually thickens, and at length becomes solid. Portions of it, when of the requisite consistence, are rolled into cylinders, and wrapped in leaves. The juice is sometimes received into the hollow joints of the bamboo, which give it a cylindrical form; and, as it contracts during the process of solidification, the cylinder is often hollow in the centre. The name *gummi gutta*, by which it is generally known on the continent of Europe, probably originated from the circumstance that the juice escapes from the plant by drops. The officinal title was undoubtedly derived from the province of Cambodia, in which the gum-resin is collected. It was first brought to Europe by the Dutch about the middle of the seventeenth century. We import gamboge from Canton and Calcutta, whither it is carried by the native or resident merchants. There is no difference in the appearance or character of the drug as brought from these two ports; an evidence that it is originally derived from the same place.

Varieties. The best gamboge is in cylindrical rolls, from one to three inches in diameter, sometimes hollow in the centre, sometimes flattened, often folded double, or agglutinated in masses in which the original form is not always readily distinguishable. The pieces sometimes appear as if rolled, but are in general striated longitudinally from the impression made by the inner surface of the bamboo. They are externally of a dull orange colour, which is occasionally displaced by greenish stains, or concealed by the bright yellow powder of the drug, which slightly adheres to the surface. In this form the drug is sometimes called *pipe gamboge*. Another variety is imported under the name of *cake* or *lump gamboge*. It is in irregular masses weighing two or three pounds or more, often mixed with sticks and other impurities, containing many air cells, less dense, less uniform in texture, and less brittle than the former variety, and breaking with a dull and splintery, instead of a shining and conchoidal fracture. The worst specimens of this variety, as well as of the cylindrical, are sometimes called by the London druggists *coarse gamboge*. They differ, however, from the preceding, only in containing a greater amount of impurities. Indeed, it would appear, from the experiments of Christison, that all the commercial varieties of this drug have a common origin, and that cake or lump gamboge differs from the cylindrical only from the circumstance that the latter is the pure concrete juice of the plant, while in the former farinaceous matter and other impurities have been added for the purpose of adulteration. The inferior kinds of gamboge may be known by their greater hardness and coarser fracture; by the brownish or grayish colour of their broken surface, which is often marked with black spots; by their obvious impurities; and by the green colour which their decoction, after having been cooled, gives with tincture of iodine. When pure, the gum-resin is completely dissolved by the successive action of ether and water.*

* *Ceylon gamboge*, derived from the *Hebradendron Cambogioides* of Graham (*Cambogia gutta*, Linn., *Garcinia Morella*, De Cand.), is procured by incisions, or by cutting away a

Properties. Gamboge, in its pure form, is brittle, with a smooth, conchoidal, shining fracture; and the fragments are slightly translucent at their edges. The colour of the mass when broken is a uniform reddish-orange, which becomes a beautiful bright yellow in the powder, or when the surface is rubbed with water. From the brilliancy of its colour, gamboge is highly esteemed as a pigment. It has no smell, and little taste; but, after remaining a short time in the mouth, produces an acrid sensation in the fauces. Its sp. gr. is 1·221. Exposed to heat it burns with a white flame, emitting much smoke, and leaving a light spongy charcoal. It is a gum-resin, without volatile oil. In 100 parts of it Braconnot found 19·5 parts of gum, 80 of resin, and 0·5 of impurities. John obtained 10·5 per cent. of gum, 89 of resin, and 0·5 of impurities. Christison has shown that the proportion of gum and resin varies in different specimens even of the purest drug. In one experiment, out of 100·8 parts he obtained 74·2 of resin, 21·8 of gum, and 4·8 of water. The gum is quite soluble in water, and of the variety denominated arabin. In a specimen of *cake gamboge* he found 11·2 per cent. of fecula and lignin, and in a very bad sample of *coarse gamboge*, no less than 41 per cent. of the same impurities. In addition to gum and resin, Ph. Büchner found a small and variable proportion of a peculiar reddish-yellow colouring matter, soluble both in alcohol and water. (*Journ. de Pharm.*, 3*e sér.*, iii. 303.) Gamboge is readily and entirely diffusible in water, forming a yellow opaque emulsion, from which the resin is very slowly deposited. It yields its resinous ingredient to alcohol, forming a golden yellow tincture, which is rendered opaque and bright yellow by the addition of water. Its solution in ammoniated alcohol is not disturbed by water. Sulphuric ether dissolves about four-fifths of it, taking up only the resin. It is wholly taken up by alkaline solutions, from which it is partially precipitated by the acids. The strong acids dissolve it; but the solution when diluted with water deposits a yellow sediment. The colour, acrimony, and medicinal power of gamboge, reside in the resin. This has the neutralizing property of the acids, and has been named *gambogic acid.* It is obtained by evaporating an ethereal tincture of the gum-resin. In mass it is of a cherry-red colour, but becomes of a deep-orange in thin layers, and yellow when powdered. So intense is its colour, that one part of it communicates a perceptible yellowness to ten thousand parts of water or spirit. It is insoluble in water, but soluble in alcohol, and very soluble in ether. It forms with the alkalies dark-red solutions of *gambogiates*, from which the acids throw down gambogic acid of a yellow colour, and the soluble salts of lead, copper, and iron, gambogiates of those metals respectively; the salt of lead being yellow, that of copper brown, and that of iron dark-brown. Its composition is given by Johnston as $C_{40}H_{23}O_8$. (*Lond. Philos. Trans.*, 1839.) In the dose of five grains it is said to produce copious watery stools, with little or no uneasiness. If this be the case, it is probable that, as it exists in the gum-resin, its purgative property is somewhat modified by the other ingredients.

Medical Properties and Uses. Gamboge is a powerful, drastic, hydragogue cathartic, very apt to produce nausea and vomiting when given in the full dose. In large quantities it is capable of producing fatal effects, and death has resulted from a drachm. It is much employed in the treatment of dropsy attended with torpid bowels, generally in combination with bitartrate of potassa or jalap. It is also prescribed in cases of obstinate constipation, and has frequently been found

portion of the bark, and scraping off the juice which exudes. The specimens sent to Dr. Christison were in flattish or round masses, eight or nine inches in diameter, apparently composed of aggregated irregular tears, with cavities which are lined with a grayish and brownish powdery incrustation. Its general aspect was that of coarse gamboge; but the individual tears had the characters of the best kind, and its chemical composition was identical. It is used as a pigment and purgative in Ceylon, but is not an article of commerce. (*Christison's Dispensatory.*)

effectual in the expulsion of the tape-worm. It is often combined with other and milder cathartics, the action of which it promotes and accelerates, while its own is moderated. The full dose is from two to six grains, which in cases of tænia has been raised to ten or fifteen grains. As it is apt to occasion much sickness and griping, the best plan, under ordinary circumstances, is to give it in small doses, repeated at short intervals till it operates. It may be given in pill or emulsion, or dissolved in an alkaline solution. The last method of administration has been recommended in dropsical complaints.

Off. Prep. Pilulæ Catharticæ Compositæ; Pilula Cambogiæ Comp. W.

GAULTHERIA. *U. S.*

Partridge-berry.

The leaves of Gaultheria procumbens. *U. S.*

GAULTHERIA. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Ericaceæ.

Gen. Ch. Calyx five-cleft, bibracteate at the base. *Corolla* ovate. *Capsule* five-celled, invested with the berried calyx. *Pursh.*

Gaultheria procumbens. Willd. *Sp. Plant.* ii. 616; Bigelow, *Am. Med. Bot.* ii. 27; Barton, *Med. Bot.* i. 171. This is a small, indigenous, shrubby, evergreen plant, with a long, creeping, horizontal root, which sends up at intervals one and sometimes two erect, slender, round, reddish stems. These are naked below, leafy at the summit, and usually less than a span in height. The leaves are ovate or obovate, acute, revolute at the edges with a few mucronate serratures, coriaceous, shining, bright-green upon the upper surface, paler beneath, of unequal size, and supported irregularly on short red petioles. The flowers, of which not more than from three to five are usually found upon each stem, stand on curved, drooping, axillary peduncles. The calyx is white, five-toothed, and furnished at its base with two concave cordate bractes, which are by some authors described as an outer calyx. The corolla is white, ovate or urceolate, contracted at its mouth, and divided at its border into five small acute segments. The stamens consist of curved, plumose filaments, and oblong orange-coloured anthers opening on the outside. The germ, which rests upon a ring having ten teeth alternating with the ten stamens, is roundish, depressed, and surmounted by an erect filiform style, terminating in an obtuse stigma. The fruit is a small, five-celled, many-seeded capsule, enclosed in a fleshy covering, formed by the enlarged calyx, and presenting the appearance of a bright scarlet berry.

The plant extends from Canada to Georgia, growing in large beds in mountainous tracts, or in dry barrens and sandy plains, beneath the shade of shrubs and trees, particularly of other evergreens, as the Kalmiæ and Rhododendra. It is abundant in the pine barrens of New Jersey. In different parts of the country, it is known by the various names of *partridge-berry*, *deer-berry*, *tea-berry*, *wintergreen*, and *mountain-tea*. The flowers appear from May to September, and the fruit ripens at corresponding periods. Though the leaves only are officinal, all parts of the plant are endowed with the peculiar flavour for which these are employed, and which is found in several other plants, particularly in the bark of *Betula lenta*, or sweet birch. The fruit possesses it in a high degree, and, being at the same time sweetish, is much relished by some persons, and forms a favourite article of food with partridges, deer, and other wild animals. To the very peculiar aromatic odour and taste which belong to the whole plant, the leaves add a marked astringency. The aromatic properties reside in a volatile oil, which may be separated by distillation. (See *Oleum Gaultheriæ.*)

Medical Properties and Uses. Gaultheria has the usual stimulant operation of the aromatics, united with astringency; and may, therefore, be used with ad-

vantage in some forms of chronic diarrhœa. Like other substances of the same class, it has been employed as an emmenagogue, and with the view of increasing the secretion of milk; but its chief use is to impart an agreeable flavour to mixtures and other preparations. It may be conveniently administered in the form of infusion, which, in some parts of the country, is not unfrequently used at the tables as a substitute for common tea. The oil, however, is more used in regular practice than the leaves. Instances of death are on record, resulting from the taking of the oil, by mistake, in the quantity of about a fluidounce. On examination after death, strong marks of gastric inflammation were discovered. (*Journ. of Phil. Col. of Pharm.*, vi. 290.)

Off. Prep. Oleum Gaultheriæ. W.

GENTIANA. *U. S., Lond., Ed., Dub.*

Gentian.

The root of Gentiana lutea. *U. S., Lond., Ed., Dub.*

Gentiane jaune, *Fr.;* Rother Enzian, *Germ.;* Genziana, *Ital;* Genciana, *Span.*

GENTIANA. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Gentianaceæ.

Gen. Ch. Corolla one-petalled. *Capsule* two-valved, one-celled, with two longitudinal receptacles. *Willd.*

Gentiana lutea. Willd. *Sp. Plant.* i. 1331; Woodv. *Med. Bot.* p. 273, t. 95; Carson, *Illust. of Med. Bot.* ii. 12, pl. 60. Yellow gentian is among the most remarkable of the species which compose this genus, both for its beauty and great comparative size. From its thick, long, branching, perennial root, an erect, round stem rises to the height of three or four feet, bearing opposite, sessile, oval, acute, five-nerved leaves, of a bright-green colour, and somewhat glaucous. The lower leaves, which spring from the root, are narrowed at their base into the form of a petiole. The flowers are large and beautiful, of a yellow colour, peduncled, and placed in whorls at the axils of the upper leaves. The calyx is monophyllous, membranous, yellowish, and semi-transparent, splitting when the flower opens, and reflected when it is fully expanded; the corolla is rotate, and deeply divided into five or six lanceolate, acute segments; the stamens are five or six and shorter than the corolla. This plant grows among the Apennines, the Alps, the Pyrenees, and in other mountainous or elevated regions of Europe. The root is the only part used in medicine. It is imported into this country from Germany.

Several other species possess analogous medicinal properties, and are used for similar purposes. The roots of *G. purpurea* and *G. punctata*, growing in the same regions as G. lutea, and of *G. Pannonica*, growing in Austria, are said to be frequently mingled with the officinal gentian, from which they are scarcely distinguishable. The *G. macrophylla* of Pallas is used in Siberia; and one indigenous species, *G. Catesbæi*, has found a place in the secondary catalogue of the U. S. Pharmacopœia.

Properties. As found in the shops, gentian is in pieces of various dimensions and shape, usually of considerable length, consisting sometimes of longitudinal slices, sometimes of the root cut transversely, twisted, wrinkled externally, sometimes marked with close transverse rings, of a grayish-brown colour on the outside, yellowish or reddish within, and of a soft spongy texture. The odour is feeble, but decided and peculiar. The taste is slightly sweetish and intensely bitter, without being nauseous. The powder is of a yellowish colour. Water and alcohol extract the taste and medical virtues of the root. Examined by MM. Henry and Caventou, it was found to contain, 1. a peculiar crystallizable principle which they supposed to be the chief active ingredient of the root, and,

therefore, named *gentianin*, 2. a volatile odorous principle, 3. a substance identical with birdlime (*glu*), 4. a greenish fixed oil, 5. a free organic acid, 6. uncrystallizable sugar, 7. gum, 8. yellow colouring matter, and 9. lignin. Mr. Denis has since detected in the root the existence of pectic acid; and the gentianin of Henry and Caventou has been proved by Trommsdorff and by M. Leconte to be, when quite pure, wholly destitute both of bitterness and of medicinal power; so that it would appear no longer to merit the name given to it. M. Leconte proposes, accordingly, to call it *gentisin;* and, as it possesses the property of neutralizing the alkalies, it has received also the name of *gentisic acid.* It is obtained by treating the alcoholic extract of gentian, previously exhausted by water, with sulphuric ether, filtering the ethereal solution, and allowing it to evaporate spontaneously. It is in needle-shaped crystals, pale-yellow, insoluble in water, and soluble in alcohol. The same chemist believes that he has ascertained the *birdlime* or *glu* of Henry and Caventou to be a mixture of wax, oil, and caoutchouc. When distilled with water, gentian yields a minute proportion of a concrete oil, having a strong odour of the root. Professor Dulk, of Konigsberg, gives the following process for isolating the *bitter principle.* The alcoholic extract is macerated in water, and the solution, having been subjected to the vinous fermentation in order to separate the sugar, is treated first with acetate of lead, and then, after filtration, with subacetate of lead and a very little ammonia, in order to precipitate the combination of the vegetable principle with oxide of lead; care being taken not to use too much ammonia, lest by its stronger basic powers it should separate the vegetable principle from the oxide. The precipitate thus obtained is washed with a little water, then mixed with a large proportion of the same fluid, and decomposed by hydrosulphuric acid. The liquid, having been filtered, is evaporated with a gentle heat to dryness, and the residue treated with alcohol of 0·820. The alcoholic solution, being evaporated, yields the bitter principle, which is the proper *gentianin.* It is a brownish-yellow, uncrystallizable substance, having in a high degree the bitter taste of the root. It is almost insoluble in absolute alcohol, but soluble in ordinary alcohol, and very soluble in water. It reddens litmus, and appears to possess acid properties. (*Journ. de Pharm.*, xxiv. 638.) When gentian is macerated in cold water, it undergoes the vinous fermentation, in consequence of the sugar contained in it. From the fermented infusion a spirituous liquor is obtained by distillation, which, though bitter and unpleasant to the smell, is said to be relished by the Swiss and Tyrolese.

Medical Properties and Uses. Gentian possesses, in a high degree, the tonic powers which characterize the simple bitters. It excites the appetite, invigorates digestion, moderately increases the temperature of the body and the force of the circulation, and operates in fact as a general corroborant of the system. In very large doses, however, it is apt to load and oppress the stomach, to irritate the bowels and even to occasion nausea and vomiting. It has been known as a medicine from the highest antiquity, and is said to have derived its name from Gentius, a king of Illyria. Many of the complex preparations handed down from the Greeks and Arabians contain it among their ingredients; and it enters into most of the stomachic combinations employed in modern practice. It may be used in all cases of pure debility of the digestive organs, or requiring a general tonic impression. Dyspepsia, gout, amenorrhœa, hysteria, scrofula, intermittent fever, diarrhœa, and worms, are among the many forms of disease in which it has proved useful; but it is the condition of the stomach and of the system generally, not the name of the disease, which must be taken into consideration in prescribing it; and there is scarcely a single complaint in which it can be advantageously administered under all circumstances. Its powder has been applied externally to malignant and sloughing ulcers. It is usually given in the form of infusion

or tincture. A syrup may be prepared by forming a saturated infusion by means of percolation, and incorporating this at a boiling temperature with simple syrup; or, perhaps more eligibly, by dissolving first two drachms of the extract of gentian, and afterwards fifteen ounces of sugar in half a pint of water. The dose of the powder is from ten to forty grains.

Off. Prep. Extractum Gentianæ; Infusum Gentianæ Comp.; Tinctura Gentianæ Comp.; Tinct. Rhei et Gentianæ; Vinum Gentianæ. W.

GENTIANA CATESBÆI. *U. S. Secondary.*

Blue Gentian.

The root of Gentiana Catesbæi. *U. S.*

GENTIANA. See GENTIANA.

Several indigenous species of gentian approach more or less nearly to *Gentiana lutea* in the bitterness and medicinal virtues of their roots; but *G. Catesbæi*, which resembles it most closely in these respects, is the only one which has attracted the particular attention of the medical profession.

Gentiana Catesbæi. Walter, *Flor. Car.* 109; Bigelow, *Am. Med. Bot.* ii. 137. The blue gentian has a perennial, branching, somewhat fleshy root, and a simple, erect, rough stem, rising eight or ten inches in height, and bearing opposite leaves, which are ovate-lanceolate, acute, and rough on their margin. The flowers, which are of a palish-blue colour, are crowded, nearly sessile, axillary, and terminal. The divisions of the calyx are linear-lanceolate, and longer than the tube. The corolla is large, ventricose, plaited, and divided at its border into ten segments, of which the five outer are more or less acute, the five inner bifid and fringed. The number of stamens is five, and the two stigmas are seated on the germ. The capsule is oblong, acuminate, with two valves, and a single cell.

G. Catesbæi grows in the grassy swamps of North and South Carolina, where it flowers from September to December. It was named by Walter and Elliot in honour of Catesby, by whom it was delineated more than ninety years ago. Pursh confounds it with *G. Saponaria*, to which it is nearly allied.

Properties. By Dr. Bigelow we are told that the dried root of this plant has at first a mucilaginous and sweetish taste, which is soon succeeded by an intense bitterness, approaching nearly to that of the officinal gentian. Alcohol and boiling water extract its virtues, and the tincture and decoction are even more bitter than the root in substance.

Medical Properties. As a medicine it is little inferior to the European gentian, and may be employed for similar purposes. In the Northern and Middle States it is not used; but it is said to be occasionally prescribed by the practitioners of the South in dyspepsia, and other cases of stomachic and general debility. It may be given in powder in the dose of from fifteen to thirty grains, or in the form of extract, infusion, wine, or tincture, which may be prepared in the manner directed for the similar preparations of foreign gentian. W.

GERANIUM. *U. S.*

Cranesbill.

The rhizoma of Geranium maculatum. *U. S.*

GERANIUM. *Sex. Syst.* Monadelphia Decandria.—*Nat. Ord.* Geraniaceæ.

Gen. Ch. Calyx five-leaved. *Corolla* five-petalled, regular. *Nectary* five melliferous glands, united to the base of the longer filaments. *Arilli* five, one-seeded, awned, at the base of a beaked receptacle; awns simple, naked, neither spiral nor bearded. *Willd.*

Geranium maculatum. Willd. *Sp. Plant.* iii. 705; Bigelow, *Am. Med. Bot.* i. 84; Barton, *Med. Bot.* i. 149. This plant has a perennial, horizontal, fleshy root, which is furnished with short fibres, and sends up annually an herbaceous stem, with several radical leaves. The stem is erect, round, dichotomously branched, from one to two feet high, of a grayish-green colour, and thickly covered, in common with the petioles and peduncles, with reflexed hairs. The leaves are deeply divided into three, five, or seven lobes, which are variously incised at their extremities, hairy, and of a pale-green colour, mottled with still paler spots. Those which rise immediately from the root are supported on footstalks eight or ten inches long; those of the stem are opposite, the lower petiolate, the upper nearly sessile, with lanceolate or linear stipules. The flowers are large, and usually of a purple colour. The peduncles spring from the forks of the stem, and severally support two flowers upon short pedicels. The calyx is composed of five oblong, ribbed, cuspidate leaves; the petals are five, obovate, and entire; the stamens ten, with oblong, deciduous anthers, the five alternate filaments being longer than the others, and having glands at their base; the germ is ovate, supporting a straight style as long as the stamens, and surmounted by five stigmas. The fruit consists of five aggregate, one-seeded capsules, attached by a beak to the persistent style, curling up and scattering the seeds when ripe.

The cranesbill is indigenous, growing throughout the United States, in moist woods, thickets and hedges, and generally in low grounds. It flowers from May to July. The root should be collected in autumn.

This, when dried, is in pieces from one to three inches long, from a quarter to half an inch in thickness, somewhat flattened, contorted, wrinkled, tuberculated, and beset with slender fibres. It is externally of an umber-brown colour, internally reddish-gray, compact, inodorous, and of an astringent taste, without bitterness or other unpleasant flavour. Water and alcohol extract its virtues. Tannin is an abundant constituent.

Medical Properties and Uses. Geranium is one of our most powerful indigenous astringents, and may be employed for all the purposes to which these medicines are applicable. The absence of unpleasant taste, and of other offensive qualities, renders it peculiarly serviceable in the cases of infants, and of persons with very delicate stomachs. Diarrhœa, chronic dysentery, cholera infantum in the latter stages, and the various hemorrhages, are the forms of disease in which it is most commonly used, and with greatest advantage; but care should be taken, before it is administered, that the condition of the system and of the part affected is such as not to contra-indicate the use of astringents. As an application to indolent ulcers, an injection in gleet and leucorrhœa, a gargle in relaxation of the uvula and aphthous ulcerations of the throat, it answers the same purpose as kino, catechu, and other medicines of the same class. It is a popular domestic remedy in various parts of the United States, and is said to be employed by the Indians. It may be given in substance, decoction, tincture, or extract. The dose of the powder is twenty or thirty grains, that of a decoction, made by boiling an ounce of the root in a pint and a half of water to a pint, from one to two fluidounces. The medicine is sometimes given to children boiled in milk. W.

GEUM. *U. S. Secondary.*

Water Avens.

The root of Geum rivale. *U. S.*

Benoite aquatique, *Fr.;* Wiesen Benediktenwurzel, *Germ.*

GEUM. *Sex. Syst.* Icosandria Polygynia.—*Nat. Ord.* Rosaceæ.

Gen. Ch. Calyx ten-cleft. *Petals* five. *Seeds* with a bent awn. *Willd.*

Several species belonging to this genus have been medicinally employed; but

two only are deserving of particular notice—*Geum rivale*, which has a place in the secondary list of the United States Pharmacopœia, and *G. urbanum*, formerly recognised by the Dublin College.

Geum urbanum, or *avens*, is a native of Europe, where it grows wild in woods, and other shady places. The root, which is the part used, consists of a short oblong body or caudex, from a quarter to half an inch in thickness, externally brown, internally white towards the circumference and reddish at the centre, and furnished with numerous long descending fibres. When quite dry it is nearly inodorous; but in the recent state has a smell like that of cloves, whence it is sometimes called *radix caryophyllatæ*. The taste is bitterish and astringent. It imparts its medical virtues to water and alcohol, which it tinges red. Distilled with water it yields a thick, greenish-yellow volatile oil, and gives a pleasant flavour to the liquid. It contains, according to Trommsdorff, besides tannic acid, which is an abundant constituent, a tasteless resin, gum, bassorin, and lignin. It has been much used on the continent of Europe as a tonic and astringent, in chronic and passive hemorrhages, chronic dysentery and diarrhœa, leucorrhœa, abdominal congestion, intermittent fever, &c. The dose is from thirty grains to a drachm of the powdered root three or four times a day, or an equivalent quantity in decoction.

Geum rivale. Willd. *Sp. Plant.* ii. 1115; *Engl. Bot.* 106. *Water avens* has a perennial, horizontal, jointed, scaly, tapering root, about six inches long, of a reddish-brown colour externally, white internally, and furnished with numerous descending yellowish fibres. One or more stems rise from the same root, which also sends up numerous leaves. The stems are about a foot and a half high, simple, erect, pubescent, and of a purplish colour. The radical leaves are interruptedly pinnate, with large terminal leaflets, and long, hairy footstalks; those of the stem are petiolate, and divided into three serrate, pointed segments. The flowers are few, solitary, nodding, yellowish-purple, and supported on axillary and terminal peduncles. The colour of the stems and flowers gave rise to the name of *purple avens*, sometimes applied to the plant. The calyx is inferior, with ten lanceolate pointed segments, of which the five alternate are smaller than the others. The petals are five, and of the same length as the calyx. The seeds are oval, with plumose awns, minutely uncinate, and nearly naked at the summit.

This species of Geum is common to Europe and the United States; though the plant of this country has smaller flowers, with petals more rounded on the top, and leaves more deeply incised than the European. It delights in wet boggy meadows, and extends from Canada into New England, New York, and Pennsylvania. Its flowers appear in June and July. The dried root is hard, brittle, easily pulverized, of a reddish or purplish colour, without smell, and of an astringent, bitterish taste. Boiling water extracts its virtues.

Medical Properties and Uses. Water avens is tonic and powerfully astringent. It may be used with advantage in chronic or passive hemorrhages, leucorrhœa, and diarrhœa; and is said to be beneficially employed, in the Eastern States, as a popular remedy in the debility of phthisis pulmonalis, in simple dyspepsia, and in visceral diseases consequent on disorder of the stomach. In Europe it is sometimes substituted for the root of the *common avens*, or Geum urbanum, but is less esteemed. The dose of the powdered root is from a scruple to a drachm, to be repeated three times a day. The decoction, which is usually preferred, may be made by boiling an ounce of the root in a pint of water, and given in the quantity of one or two fluidounces. A weak decoction is sometimes used by invalids in New England as a substitute for tea and coffee. W.

GILLENIA. *U. S.*

Gillenia.

The root of Gillenia trifoliata and Gillenia stipulacea. *U. S.*
Indian physic, American ipecacuanha.

GILLENIA. *Sex. Syst.* Icosandria Pentagynia.—*Nat. Ord.* Rosaceæ.

Gen. Ch. Calyx tubular campanulate, border five-toothed. *Corolla* partly unequal. *Petals* five, lanceolate, attenuated at the base. *Stamens* few, included. *Styles* five. *Capsules* five, connate at the base, opening on the inner side, each two-seeded. *Torrey.*

This genus was separated by Moench from *Spiræa.* It is exclusively North American, and includes only two discovered species—*G. trifoliata* and *G. stipulacea*—both of which are recognised in our Pharmacopœia.

1 *Gillenia trifoliata.* Bigelow, *Am. Med. Bot.* iii. 10; Barton, *Med. Bot.* i. 65; Carson, *Illust. of Med. Bot.* i. 40, pl. 34. This is an herbaceous plant with a perennial root, consisting of numerous long, slender, brown branches, proceeding from a thick, tuber-like head. The stems, several of which usually rise from the same root, are two or three feet high, erect, slender, smooth, flexuose, branched, and commonly of a reddish colour. The leaves are ternate, with very short petioles, and small linear-lanceolate stipules. The leaflets are ovate-lanceolate, sharply serrate, and acuminate. The flowers grow in a loose terminal nodding panicle, with long peduncles. The calyx is tubular campanulate, ventricose, and terminates in five pointed segments. The corolla is composed of five linear-lanceolate, recurved petals, the two upper separated from the three lower, white, with a reddish tinge on their border, and of three times the length of the calyx. The stamens are twenty, the filaments short, the anthers small and yellow. Each flower is succeeded by five capsules, connate at their base, oblong, acuminate, gibbous without, acute within, two-valved, one-celled, opening inward, and containing each one or two oblong seeds.

This species of Gillenia grows throughout the United States, east of the Alleghany ridge, and in Pennsylvania may also be found abundantly west of these mountains. Pursh found it in Florida, and it extends as far north as Canada. It frequents light soils, in shady and moist situations, and flowers in June and July. The root should be gathered in September.

2. *G. stipulacea.* Barton, *Med. Bot.* i. 71. This species is also herbaceous and perennial, though much taller, and more bushy than the preceding. The stems are brownish and branched. The upper leaves are ternate, lanceolate, serrate; the lower more deeply incised, becoming towards the root pinnatifid, and of a reddish-brown colour at the margin. The stipules are ovate, acuminate, deeply serrate, resembling leaves, and marking the species at the first glance. The flowers are smaller than those of *G. trifoliata,* and grow on long slender peduncles in a lax corymb.

In the valley of the Mississippi, this plant occupies the place of G. trifoliata, which is not found beyond the Muskingum. It grows as far north as the State of New York, extends through Ohio, Indiana, Illinois, and Missouri, and probably into the States south of the Ohio, as it has been found in Western Virginia. Its root is precisely similar to that of the eastern species, and is reputed to possess the same properties.

The dried root of Gillenia is not thicker than a quill, wrinkled longitudinally, with occasional transverse fissures, and in the thicker pieces presenting in some places an irregular undulated somewhat knotty appearance, arising from indentations on one side corresponding with prominences on the other. It is externally

of a light-brown colour, and consists of a thick, somewhat reddish, brittle, cortical portion, with an interior slender, tougher, whitish ligneous cord. The bark, which is easily separable, has a bitter, not disagreeable taste; the wood is nearly insipid and comparatively inert, and should be rejected. The powder is of a light brownish colour, and possesses a feeble odour, which is scarcely perceptible in the root. The bitterness is extracted by boiling water, which acquires the red colour of wine.

Medical Properties and Uses. Gillenia is a mild and efficient emetic, and, like most other substances belonging to the same class, occasionally acts upon the bowels. In very small doses it has been thought to exert a tonic influence. It is much used by some practitioners in the country as a substitute for ipecacuanha, which it is said to resemble in its mode of operation. It was employed by the Indians, and became known as an emetic to the colonists at an early period. Linnæus was aware of its reputed virtues. The dose of the powdered root is from twenty to thirty grains, repeated at intervals of twenty minutes till it vomits. W.

GLYCYRRHIZA. *U. S., Lond., Dub.*

Liquorice Root.

The root of Glycyrrhiza glabra. *U. S., Dub.* Recent and dried root. *Lond.*

Off. Syn. GLYCYRRHIZÆ RADIX. Root of Glycyrrhiza glabra. *Ed.*

Bois de reglisse, *Fr.;* Süssholzwurzel, *Germ.;* Liquirizia, *Ital.;* Regaliza, *Span.*

GLYCYRRHIZA. *Sex. Syst.* Diadelphia Decandria.—*Nat. Ord.* Leguminosæ or Fabaceæ.

Gen. Ch. Calyx bilabiate; upper lip three-cleft, lower undivided. *Legume* ovate, compressed. *Willd.*

Glycyrrhiza glabra. Willd. *Sp. Plant.* iii. 1144; Woodv. *Med. Bot.* p. 420, t. 152; Carson, *Illust. of Med. Bot.* i. 38, pl. 32. The liquorice plant has a perennial root, which is round, succulent, tough and pliable, furnished with sparse fibres, rapid in its growth, and in a sandy soil penetrates deeply into the ground. The stems are herbaceous, erect, and usually four or five feet in height; have few branches; and are garnished with alternate, pinnate leaves, consisting of several pairs of ovate, blunt, petiolate leaflets, with a single leaflet at the end, of a pale-green colour, and clammy on their under surface. The flowers are violet or purple, formed like those of the pea, and arranged in axillary spikes supported on long peduncles. The calyx is tubular and persistent. The fruit is a compressed, smooth, acute, one-celled legume, containing from one to four small kidney-shaped seeds.

This plant is a native of the South of Europe, Barbary, Syria, and Persia; and is cultivated in England, the North of France, and Germany. Much of the root imported into this country comes from the ports of Messina and Palermo in Sicily. It is also largely produced in the northern provinces of Spain, where it forms an important article of commerce. It is not improbable that a portion of the liquorice root from Italy and Sicily is the product of *G. echinata*, which grows wild in Apulia. This species is also abundant in the South of Russia, where, according to Hayne, sufficient extract is prepared from it to supply the whole Russian empire.

A species of Glycyrrhiza, *G. lepidota*, grows abundantly about St. Louis, in the State of Missouri, and flourishes along the banks of the Missouri river to its source in the mountains. It is probably the same with the liquorice plant mentioned by Mackenzie as growing on the northern coast of this continent. Mr.

Nuttall states that its root possesses in no inconsiderable degree the taste of liquorice.

Properties. The liquorice root of the shops is in long pieces, varying in thickness from a few lines to more than an inch, fibrous, externally grayish-brown and wrinkled by desiccation, internally yellowish, without smell, and of a sweet mucilaginous taste, mingled with a slight degree of acrimony. It is often worm-eaten and more or less decayed. The best pieces are those which have the brightest yellow colour internally, and of which the layers are distinct. The powder is of a grayish-yellow colour, when the root is pulverized without being deprived of its epidermis, of a pale sulphur-yellow, when the epidermis has been removed. Robiquet found the following ingredients in liquorice root: 1. a peculiar transparent yellow substance, called *glycyrrhizin* or *glycion*, of a sweet saccharine taste, scarcely soluble in cold water, very soluble in boiling water with which it gelatinizes on cooling, thrown down from its aqueous solution by acids, readily soluble in cold alcohol, insusceptible of the vinous fermentation, yielding no oxalic acid by the action of the nitric, and therefore wholly distinct from sugar; 2. a crystallizable principle, named *ayedoïte* by Robiquet, but subsequently proved to be identical with *asparagin;* 3. starch; 4. albumen; 5. a brown acrid resin; 6. a brown azotized extractive matter; 7. lignin; 8. salts of lime and magnesia, with phosphoric, sulphuric, and malic acids. Robiquet prepared *glycyrrhizin* by subjecting a strong cold infusion of the root to ebullition, in order to separate the albumen; then filtering, precipitating with acetic acid, and washing the precipitate with cold water to remove any adhering acid. It may be still further purified by solution in absolute alcohol, and evaporation at a very gentle heat. According to Dr. T. Lade, glycyrrhizin, as it exists in the root, is rendered soluble in water by combination with inorganic bases, such as lime and ammonia, from which it is separated by the addition of an acid. From the observations of Dr. Lade, it is to be inferred that this principle has no affinity for the acids, but combines with salifiable bases, forming salts of various degrees of solubility. Its sweetness is retained in the compounds which it forms with the alkalies. It consists of carbon, hydrogen, and oxygen. (*Chem. Gazette*, No. 100, from *Liebig's Annalen*, Aug. 1846.)

An extract of liquorice root is brought from Spain and Italy, and much used under the name of liquorice. (See *Extractum Glycyrrhizæ.*)

Medical Properties and Uses. Liquorice root is an excellent demulcent, well adapted to catarrhal affections, and to irritations of the mucous membrane of the bowels and urinary passages. It is best given in the form of decoction, either alone, or combined with other demulcents. It is frequently employed as an addition to the decoctions of acrid or irritating vegetable substances, such, for example, as seneka and mezereon, the acrimony of which it covers and conceals, while it renders them more acceptable to the stomach. Before being used, it should be deprived of its cortical part, which is somewhat acrid, without possessing the peculiar virtues of the root. The decoction may be prepared by boiling an ounce of the bruised root, for a few minutes, in a pint of water. By long boiling, the acrid resinous principle is extracted. Perhaps, however, to this principle may in part be ascribed the therapeutical virtues of liquorice root in chronic bronchial diseases. The powder is used in the preparation of pills, either to give them due consistence, or to cover their surface and prevent them from adhering together.

Off. Prep. Confectio Piperis Nigri; Confectio Sennæ; Confectio Terebinthinæ; Decoctum Guaiaci; Decoctum Hordei Compositum; Decoctum Lini Comp.; Decoctum Mezerei; Decoctum Sarsaparillæ Comp.; Electuarium Piperis; Extractum Glycyrrhizæ; Extractum Sarsaparillæ Fluidum; Infusum Lini Compositum; Pilulæ Ferri Sulphatis; Pil. Hydrargyri; Pil. Saponis Comp.; Syrupus Sarsaparillæ Comp.; Tinctura Rhei Comp. W.

GOSSYPIUM. *U. S., Ed.*

Cotton.

A filamentous substance separated from the seeds of Gossypium herbaceum, and other species of Gossypium. *U. S., Ed.*

Coton *Fr.;* Baumwolle, *Germ.;* Cotone, *Ital.;* Algodon, *Span.*

GOSSYPIUM. *Sex. Syst.* Monadelphia Polyandria. — *Nat. Ord.* Malvaceæ.

Gen. Ch. Calyx cup-shaped, obtusely five-toothed, surrounded by a three-parted involucel, with dentate-incised, cordate leaflets, cohering at the base. *Stigmas* three to five. *Capsule* three to five-celled, many-seeded. *Seeds* surrounded by a tomentose wool. *De Cand.*

In consequence of changes produced in the plants of this genus by cultivation, botanists have found great difficulty in determining which are distinct species, and which merely varieties. De Candolle describes thirteen species in his Prodromus, and mentions six others; but considers them all uncertain. Royle describes eight and admits others. Swartz thinks they may all be referred to one original species. The plants inhabit different parts of tropical Asia and Africa, and many of them are cultivated for their cotton in climates adapted to their growth. The species from which most of the cotton of commerce is thought to be obtained, is the one indicated by the U. S. and Edinburgh Pharmacopœias.

Gossypium herbaceum. Linn. *Sp.* 975; De Cand. *Prodrom.* i. 456. This is a biennial or triennial plant, with a branching stem from two to six feet high, and palmate hoary leaves, the lobes of which are somewhat lanceolate and acute. The flowers are pretty, with yellow petals, having a purple spot near the claw. The leaves of the involucel or outer calyx are serrate. The capsule opens when ripe, and displays a loose white tuft of long slender filaments, which surround the seeds, and adhere firmly to the outer coating. The plant is a native of Asia, but is cultivated in most tropical countries. It requires a certain duration of warm weather to perfect its seeds, and in the United States cannot be cultivated advantageously north of Virginia.

The herbaceous part of the plant contains much mucilage, and has been used as a demulcent. The seeds yield by expression a fixed oil of the drying kind, which has been occasionally employed. The root has been supposed to possess medical virtues. But the only officinal portion, and that for which the plant is cultivated, is the filamentous substance surrounding the seeds. This when separated constitutes the cotton of commerce.

Cotton consists of filaments, which, under the microscope, appear to be flattened tubes, with occasional joints indicated by transverse lines. It is without smell or taste, insoluble in water, alcohol, ether, the oils, and vegetable acids, soluble in strong alkaline solutions, and decomposed by the concentrated mineral acids. In chemical character, it bears a close analogy to lignin. By nitric acid it is converted into that remarkable explosive substance denominated gun-cotton, for an account of which, as well as of a valuable adhesive preparation made by dissolving it in ether, the reader is referred to the article *Collodium* in the second part of this work. For medical use it should be carded into thin sheets; or the wadding of the milliners may be employed, consisting of sheets somewhat stiffened and glazed on the surface by starch. In the latter case, the sheets should be split open when applied.

Medical Properties, &c. Cotton has been used from time immemorial for the fabrication of cloth; but it is only recently that it has entered the catalogue of medicines. It is chiefly employed in the treatment of recent burns and scalds; an application of it adopted from popular practice. It is said to relieve the pain,

diminish the inflammation, prevent vesication, and very much to hasten the cure. Whatever advantages result from it are probably ascribable to the absorption of effused liquids, and the protection of the part affected from the air. It is applied in thin and successive layers; and benefit is said to result from the application of a bandage when the skin is not too much inflamed. We have, however, seen cotton do much harm in burns, by becoming consolidated over a vesicated surface, and acting as a mechanical irritant. Such a result may be prevented by first dressing the burn with a piece of fine linen spread with simple ointment. It is also recommended in erysipelas, and as a dressing for blisters; and we have found it useful, applied in a large batch over parts affected with rheumatism, especially in lumbago.

The root of the cotton plant has been employed by Dr. Bouchelle, of Mississippi, who believes it to be an excellent emmenagogue, and not inferior to ergot in promoting uterine contraction. He states that it is habitually and effectually resorted to by the slaves of the South for producing abortion; and thinks that it acts in this way, without injury to the general health. To assist labour, he employs a decoction made by boiling four ounces of the inner bark of the root in a quart of water to a pint, and gives a wineglassful every twenty or thirty minutes. (*West. Journ. of Med. and Surg.*, Aug. 1840.)

Cotton seeds have been employed in our Southern States with great asserted success in the treatment of intermittents. In a communication from Prof. H. R. Frost to the *Charleston Medical Journal* for May, 1850, it is stated, on the authority of Dr. W. K. Davis, of Monticello, that this application of the cotton seed originated with a planter in Newberry District, S. Carolina, who had often used the remedy in intermittents, and never failed to effect a cure. A pint of the seeds is boiled in a quart of water to a pint, and a teacupful of the decoction is given to the patient in bed, an hour or two before the expected return of the chill.

Off. Prep. Collodium. W.

GRANATI FRUCTÛS CORTEX. *U. S.*

Pomegranate Rind.

The rind of the fruit of Punica Granatum. *U. S.*

Off. Syn. GRANATUM. Punica Granatum. Rind of the fruit. *Lond.*

GRANATI RADICIS CORTEX. *U. S.*

Bark of Pomegranate Root.

The bark of the root of Punica Granatum. *U. S.*

Off. Syn. GRANATI RADIX. Punica Granatum. The bark of the root. *Lond., Ed.;* PUNICA GRANATUM. The bark of the root. *Dub.*

Ecorce de granade, *Fr.;* Granatäpfel-Echalin, *Germ.;* Malicorio, Scorza del melograna ti, *Ital.;* Corteza de granada, *Span.*

PUNICA. *Sex. Syst.* Icosandria Monogynia.—*Nat. Ord.* Myrtaceæ.

Gen. Ch. Calyx five-cleft, superior. *Petals* five. *Pome* many-celled, many-seeded. *Willd.*

Punica Granatum. Willd. *Sp. Plant.* ii. 981; Woodv. *Med. Bot.* p. 531, t. 190; Carson, *Illust. of Med. Bot.* i. 45, pl. 38. The pomegranate is a small shrubby tree, attaining in favourable situations the height of twenty feet, with a very unequal trunk, and numerous branches, which sometimes bear thorns. The leaves are opposite, entire, oblong or lance-shaped, pointed at each end, smooth, shining, of a bright green colour, and placed on short footstalks. The flowers are large,

of a rich scarlet colour, and stand at the end of the young branches. The petals are roundish and wrinkled, and are inserted into the upper part of the tube of the calyx, which is red, thick, and fleshy. The fruit is a globular berry, about the size of an orange, crowned with the calyx, covered with a reddish-yellow, thick, coriaceous rind, and divided internally into many cells, which contain an acidulous pulp, and numerous oblong, angular seeds.

This tree grows wild upon both shores of the Mediterranean, in Arabia, Persia, Bengal, China, and Japan, has been introduced into the East and West Indies, and is cultivated in all civilized countries, where the climate is sufficiently warm to allow the fruit to ripen. In higher latitudes, where it does not bear fruit, it is raised in gardens and hot-houses for the beauty of its flowers, which become double, and acquire increased splendour of colouring by cultivation. Doubts have been entertained as to its original country. The name of "Punicum malum," applied by the ancients to its fruit, implies that it was abundant at an early age in the neighbourhood of Carthage. The fruit of the pomegranate, for which the plant is cultivated in tropical climates, varies much in size and flavour. It is said to attain greater perfection, in both these respects, in the West Indies than in its native country. The pulp is red, succulent, pleasantly acid, and sweetish, and is used for the same purpose as the orange. The rind of the fruit, and the bark of the root are the parts indicated in the United States Pharmacopœia. The flowers also are recognised by the Dublin College, and the seeds are officinal in France.

Rind of the Fruit. This is presented in commerce under the form of irregular fragments, hard, dry, brittle, of a yellowish or reddish-brown colour externally, paler within, without smell, and of an astringent slightly bitter taste. It contains a large proportion of tannin, and in countries where the tree abounds has been employed for tanning leather.

Flowers. The flowers, sometimes called *balaustines*, are inodorous, have a bitterish astringent taste, and impart a violet-red colour to the saliva. They contain tannic and gallic acids, and were used by the ancients in dyeing.

Bark of the Root. The roots of the pomegranate are hard, heavy, knotty, ligneous, and covered with a bark which is yellowish-gray or ash-gray on the outer surface, and yellow on the inner. As found in the shops, the bark is in quills or fragments, breaks with a short fracture, has little or no smell, colours the saliva yellow when chewed, and leaves in the mouth an astringent taste without disagreeable bitterness. It contains, according to M. Latour de Trie, fatty matter, tannin, gallic acid, a saccharine substance having the properties of *mannite*, resin, wax, and chlorophylle, besides insoluble matters. The name of *punicin* has been given by Giovanni Righini to a peculiar principle which he extracted from the bark. It has the aspect of an oleo-resin, affects the nostrils somewhat like medicinal veratria, and is of an acrid taste. It may be obtained by rubbing a hydro-alcoholic extract of the bark with one-eighth of hydrate of potassa, heating the mixture with eight parts of pure water gradually added, and then dropping in dilute sulphuric acid to saturate the potassa. The punicin subsides, and may be separated by filtration. (*Journ. de Pharm.*, 3e *sér.*, v. 298.) The infusion of the bark yields a deep blue precipitate with the salts of iron, and a yellowish-white precipitate with a solution of gelatin. The inner surface of the bark, steeped in water and then rubbed on paper, produces a yellow stain, which by the contact of sulphate of iron, is rendered blue, and by that of nitric acid acquires a slight rose tint, which soon vanishes. (*Ibid.*, xvii. 438.) These properties serve to distinguish this bark from those of the box root and barberry, with which it is said to be sometimes adulterated. When used it should be separated from the ligneous portion of the root, as the latter is inert.

Medical Properties and Uses. The rind of the fruit is astringent, and in the

form of decoction is sometimes employed in diarrhœa and colliquative sweats, and, more frequently, as an injection in leucorrhœa, and as a gargle in sorethroat in the earliest stages, or after the inflammatory action has in some measure subsided. The powdered rind has also been recommended in intermittent fever. The flowers have the same medical properties, and are used for the same purposes as the rind. The bark of the root was used by the ancients as a vermifuge, and is recommended in the writings of Avicenna; but was unknown in modern practice till brought into notice by Dr. F. Buchanan, who learned its powers in India. The Mahometan physicians of Hindostan consider it a specific against tapeworm. One of these practitioners, having relieved an English gentleman in 1804, was induced to disclose his secret, which was then made public. Numerous cures were subsequently effected in Europe; and there can be no doubt of the occasional efficacy of the remedy. The French writers prefer the product of the wild pomegranate, growing on the borders of the Mediterranean, to that of the plant cultivated in gardens for ornamental purposes. The bark may be administered in powder or decoction; but the latter form is usually preferred. The decoction is prepared by macerating two ounces of the bruised bark in two pints of water for twenty-four hours, and then boiling to a pint. Of this a wineglassful may be given every half hour, hour, or two hours, until the whole is taken. It often occasions nausea and vomiting, and usually purges. Portions of the worm often come away a short time after the last dose. It is recommended to give a dose of castor oil, and to diet the patient strictly on the day preceding the administration of the remedy; and, if it should not operate on the bowels, to follow it by an enema, or a dose of castor oil. If it should not succeed on the first trial, it should be repeated every day for three or four days, until the worm is discharged. It appears to have been used by the negroes of St. Domingo before it was introduced into Europe.

The dose of the rind and flowers in powder is from twenty to thirty grains. A decoction may be prepared in the proportion of an ounce of the medicine to a pint of water, and given in the dose of a fluidounce. The seeds are demulcent.

Off. Prep. of the Rind. Decoctum Granati.

Off. Prep. of the Bark of the Root. Decoctum Granati Radicis. W.

GUAIACI LIGNUM. *U. S., Lond., Ed.*

Guaiacum Wood.

The wood of Guaiacum officinale. *U. S., Lond., Ed.*

Off. Syn. GUAIACUM OFFICINALE. The wood. *Dub.*

Bois de gayac, *Fr.;* Pockenholz, *Germ.;* Legno guaiaco, *Ital.;* Guayaco, *Span.*

GUAIACUM. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Zygophyllaceæ.

Gen. Ch. Calyx five-cleft, unequal. *Petals* five, inserted into the calyx. *Capsule* angular, three or five-celled. *Willd.*

Guaiacum officinale. Willd. *Sp. Plant.* ii. 538; Woodv. *Med. Bot.* p. 557, t. 200; Carson, *Illust. of Med. Bot.* i. 25, pl. 17. This is a large tree of very slow growth. When of full size it is from forty to sixty feet high, with a trunk four or five feet in circumference. The branches are knotted, and covered with an ash-coloured striated bark. That of the stem is of a dark-gray colour, variegated with greenish or purplish spots. The leaves are opposite, and abruptly pinnate, consisting of two, three, and sometimes four pairs of leaflets, which are obovate, veined, smooth, shining, dark-green, from an inch to an inch and a half long, and almost sessile. The flowers are of a rich blue colour, stand on long peduncles, and grow to the number of eight or ten at the axils of the upper leaves. The seeds are solitary, hard, and of an oblong shape.

G. officinale grows in the West Indies, particularly in Hayti and Jamaica, and is found also in the warmer parts of the neighbouring continent. All parts of the tree are possessed of medicinal properties, but the wood and the concrete juice only are officinal. The bark, though much more efficacious than the wood, is not kept in the shops. It is said that other species of Guaiacum contribute to the supplies brought into the market. The *G. sanctum* of Linnæus, and *G. arboreum* of De Candolle, are particularly specified. The former, however, is said by Woodville not to be sufficiently characterized as a distinct species from *G. officinale*. Fée states that the wood of *G. sanctum* is paler, and less heavy and hard than the officinal.

Guaiacum wood is imported from Hayti and other West India islands, in the shape of logs or billets, covered with a thick gray bark, which presents on its inner surface, and upon its edges when broken, numerous shining crystalline points. These are supposed by Guibourt to be benzoic acid, by others a resinous exudation from the vessels of the plant. The billets are used by the turners for the fabrication of various instruments and utensils, for which the wood is well adapted by its extreme hardness and density. It is kept by the druggists and apothecaries in the state of shavings or raspings, which they obtain from the turners. It is commonly called *lignum vitæ*, a name which obviously originated from the supposition that the wood was possessed of extraordinary remedial powers.

Properties. The colour of the sap-wood is yellow, that of the older and central layers greenish-brown, that of the shavings a mixture of the two. It is said that when the wood is brought into a state of minute division, its colour is rendered green by exposure to the air (*Richard*), and bluish-green by the action of nitric acid fumes; and the latter change may be considered as a test of its genuineness. (*Duncan.*) An easier test is a solution of corrosive sublimate, which, added to the shavings, and slightly heated, developes a bluish-green colour in the genuine wood. (*Chem. Gaz.*, No. 80, Feb. 1846.) Guaiacum wood is almost without smell unless rubbed or heated, when it becomes odorous. When burnt it emits an agreeable odour. It is bitterish and slightly pungent; but requires to be chewed for some time before the taste is developed. It contains, according to Trommsdorff, 26 per cent. of resin, and 0·8 of a bitter pungent extractive, upon both of which, probably, though chiefly on the former, its medical virtues depend. (See *Guaiaci Resina.*) It yields its virtues but partially to water. One pound of the wood afforded to Geiger two ounces of extract. In this extract M. Thierry discovered a volatilizable acid, which he supposed to be peculiar, and named *guaiacic acid* (*acide gayacique*). He obtained it by treating the extract with ether, evaporating the ethereal tincture, and carefully subliming the residue. The acid condenses in small, brilliant needles. If the heat be pushed too far, an oil is also produced which colours the crystals. He procured the same acid from the *guaiac* of the shops. (*Journ. de Pharm.*, xxvii. 381.) According to Jahn, however, this substance is nothing more than benzoic acid, rendered impure by obstinately adhering volatile oil and resin. (*Pharm. Central Blatt*, 1843, p. 309.)

Medical Properties and Uses. Guaiacum wood ranks among the stimulant diaphoretics. It is said to have been introduced to the notice of European practitioners by the natives of Hispaniola, soon after the discovery of America. It was used in Europe so early as 1508, and attained great celebrity as a remedy for lues venerea; but more extended experience has proved it to be wholly inadequate to the cure of that disease; and it is now employed simply to palliate the secondary symptoms, or to assist the operation of other and more efficient remedies. It is thought to be useful also in chronic rheumatism and gout, scrofulous affections, certain cutaneous eruptions, ozæna, and other protracted diseases dependent on a depraved or vitiated condition of the system. It is always exhibited in

decoction, and generally in combination with other medicines, as in the compound decoction of sarsaparilla. As but a small proportion of the guaiac which it contains is soluble in water, the probability is that its virtues have been greatly overrated; and that the good which has often followed its employment resulted rather from the more active medicines with which it was associated, or from the attendant regimen, than from the wood itself. The simple decoction may be prepared by boiling an ounce in a pint and a half of water down to a pint, the whole of which may be administered in divided doses during the twenty-four hours. An aqueous extract is directed by the French Codex.

Off. Prep. Decoctum Guaiaci; Decoctum Sarsaparillæ Compositum; Syrupus Sarsaparillæ Comp. W.

GUAIACI RESINA. *U. S.*

Guaiac.

The concrete juice of Guaiacum officinale. *U. S.*

Off. Syn. GUAIACUM. Resinoid substance prepared from the wood by heat. *Lond., Ed.* The resin. *Dub.*

Résine de gayac, *Fr.;* Guajakharz, *Germ.;* Resina de guajaco, *Ital.;* Resina de guayaco, *Span.*

For a description of *Guaiacum officinale*, see GUAIACI LIGNUM.

Guaiac is the concrete juice of this tree. It is obtained in several different modes. The most simple is by spontaneous exudation, or by incisions made into the trunk. Another method is by sawing the wood into billets about three feet long, boring them longitudinally with an auger, then placing one end of the billet on the fire, and receiving in a calabash the melted guaiac, which flows out through the hole at the opposite extremity. But the plan most frequently pursued is probably to boil the wood, in the state of chips or saw-dust, in a solution of common salt, and skim off the matter which rises to the surface. Guaiac is brought to this market from the West Indies. It is usually in large irregular pieces of various size, in which small fragments of bark, sand, and other earthy impurities are mixed with the genuine guaiac, so as to give to the mass a diversified appearance. Sometimes we find it in small roundish homogeneous portions, separate or agglutinated together; sometimes in homogeneous masses, prepared by melting and straining the drug in its impure state. It is probable that the guaiac, obtained from the billets of wood in the manner above described, is of uniform consistence.

Properties. The pieces are of a deep greenish-brown or dark-olive colour on their external surface, and internally wherever the air has been able to penetrate. The predominant hue of those parts not exposed to the air is reddish-brown or hyacinthine, diversified, however, with shades of various colours. The odour is feeble but fragrant, and is rendered stronger by heat. The taste, which is at first scarcely perceptible, becomes acrid after a short period, and a permanent sense of heat and pungency is left in the mouth and fauces. Guaiac is brittle, and when broken presents a shining glass-like surface, conchoidal or splintery, with the smaller fragments more or less translucent. It is readily pulverized; and the powder, at first of a light-gray colour, becomes green on exposure to the light. Its sp. gr. varies from 1·2 to 1·23. It softens in the mouth, and melts with a moderate heat. According to Mr. Brande, it consists of 91 per cent. of a peculiar substance analogous to the resins, and 9 per cent. of extractive. Buchner found 79·8 parts of pure resin, and 20·1 of bark consisting of 16·5 of lignin, 1·5 of gum, and 2·1 of extractive; but he must have operated on the unstrained guaiac. An acid discovered by M. Thierry is asserted by Jahn to

be benzoic acid. Water dissolves a small proportion of guaiac, not exceeding 9 parts in 100, forming an infusion of a greenish-brown colour and sweetish taste, which, upon evaporation, yields a brown substance soluble in hot water and alcohol, but scarcely so in ether. Alcohol takes up the whole with the exception of impurities. The tincture is of a deep-brown colour, is decomposed by water, and affords blue, green, and brown precipitates with the mineral acids. Guaiac is soluble also in ether, in alkaline solutions, and in sulphuric acid. The solution in sulphuric acid is of a rich claret colour, deposits, when diluted with water, a lilac precipitate, and, when heated, evolves charcoal. Exposed to air and light, guaiac absorbs oxygen and becomes green, and the change takes place rapidly in the sunshine. Either in substance or tincture, it imparts a blue colour to gluten and substances containing it, to mucilage of gum Arabic, to milk, and to various freshly cut roots, as the potato, carrot, and horseradish. The tincture is usually coloured blue by spirit of nitric ether, and a similar change of colour takes place when it is treated successively by dilute hydrocyanic acid, and solution of sulphate of copper.

Guaiacin is a name given to the pure resinoid principle of guaiac. It is insoluble in water, but is dissolved readily by alcohol, and less readily by ether. It combines with the alkalies, forming soluble compounds, which are decomposed by the mineral acids and by several salts. Hence it has been called *guaiacic acid*. It differs from most of the resins in being converted by nitric acid into oxalic acid instead of artificial tannin. It is also peculiar in the changes of colour which it undergoes under the influence of various reagents, and which have been already mentioned. By nitric acid and chlorine it is made to assume successively a green, blue, and brown colour. These changes are ascribed by Mr. Brande to the absorption of oxygen, which forms variously coloured compounds according to the quantity absorbed. According to Jahn, guaiac resin consists of three distinct bodies, viz: 1. a soft resin soluble in ether and ammonia, and constituting 18·7 per cent. of the guaiac; 2. another soft resin, soluble in ether, but with difficulty dissolved by ammonia, amounting to 58·3 per cent., and 3. a hard resin insoluble in ether, but soluble in ammonia, in the quantity of 11·3 per cent. The same chemist found in guaiac traces of benzoic acid, and 11·7 per cent. of impurities. (*Pharm. Cent. Blatt*, 1843, p. 317.)

It will be inferred, from what has been said, that the mineral acids are incompatible with the solutions of guaiac.

This drug is sometimes adulterated with the resin of the pine. The fraud may be detected by the terebinthinate odour exhaled when the sophisticated guaiac is thrown upon burning coals, as well as by its partial solubility in hot oil of turpentine. This liquid dissolves resin, but leaves pure guaiac untouched. Amber is said to be another adulteration. Nitric acid affords an excellent test of guaiac. If paper moistened with the tincture be exposed to the fumes of this acid, it speedily becomes blue.

Medical Properties and Uses. Guaiac is stimulant and alterative, producing, when swallowed, a sense of warmth in the stomach, with dryness of the mouth and thirst, and promoting various secretions. If given to a patient when covered warm in bed, especially if accompanied with opium and ipecacuanha or the antimonials, and assisted by warm drinks, it often excites profuse perspiration; and hence has been usually ranked among the diaphoretics. If the patient be kept cool during its administration, it is sometimes directed to the kidneys, the action of which it promotes. In large doses it purges; and it is thought by some practitioners to be possessed of emmenagogue powers. The complaint in which it has been found most beneficial is rheumatism. In the declining stages of the acute form of this disease, after due depletion, it is given in combination with opium, ipecacuanha, nitre, and the antimonials; and in the chronic form is fre-

quently useful without accompaniment. It is also advantageously prescribed in gouty affections, and is occasionally used in secondary syphilis, scrofulous diseases, and cutaneous eruptions; though the guaiacum wood is more frequently resorted to in these latter complaints. It was much relied upon by the late Dr. Dewees in the cure of amenorrhœa and dysmenorrhœa.

The medicine is given in substance or tincture. The dose of the powder is from ten to thirty grains, which may be exhibited in pill or bolus, or in the shape of an emulsion formed with gum Arabic, sugar and water. An objection to the form of powder is that it quickly aggregates. Guaiac is sometimes administered in combination with alkalies, with which it readily unites. Several of the European Pharmacopœias direct a *soap of guaiac*, under the name of *sapo guaiacinus*, to be prepared by diluting the Liquor Potassæ with twice its weight of water, boiling lightly, then adding guaiac gradually, with continued agitation, so long as it continues to be dissolved, and finally filtering, and evaporating to the pilular consistence. Of this preparation one scruple may be taken daily in divided doses.

Off. Prep. Mistura Guaiaci; Pilulæ Calomelanos Compositæ; Pulvis Aloës Comp.; Tinctura Guaiaci; Tinctura Guaiaci Ammoniata. W.

HÆMATOXYLON. *U. S., Ed.*

Logwood.

The wood of Hæmatoxylon Campechianum. *U. S., Ed.*

Off. Syn. HÆMATOXYLUM. Hæmatoxylon Campechianum. The wood. *Lond., Dub.*

Bois de Campêche, *Fr.;* Blutholz, Kampeschenholz, *Germ.;* Legno di Campeggio, *Ital.;* Palo de Campeche, *Span.*

HÆMATOXYLON. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Fabaceæ or Leguminosæ.

Gen. Ch. Calyx five-parted. *Petals* five. *Capsule* lanceolate, one-celled, two-valved, with the valves boat-form. *Willd.*

Hæmatoxylon Campechianum. Willd. *Sp. Plant.* ii. 547; Woodv. *Med. Bot.* p. 455, t. 163; Carson, *Illust. of Med. Bot.* i. 33, pl. 25. This is a tree of middle size, usually not more than twenty-four feet high, though, under favourable circumstances, it sometimes attains an elevation of forty or fifty feet. The trunk, which seldom exceeds twenty inches in diameter, is often very crooked, and is covered with a dark rough bark. The branches are also crooked, with numerous smaller ramifications, which are beset with sharp spines. The sap-wood is yellowish, but the interior layers are of a deep-red colour. The leaves are alternate, abruptly pinnate, and composed of three or four pairs of sessile, nearly obcordate, obliquely nerved leaflets. The flowers, which are in axillary spikes or racemes near the ends of the branches, have a brownish-purple calyx, and lemon-yellow petals. They exhale an agreeable odour, said to resemble that of the jonquil.

The tree is a native of Campeachy, the shores of Honduras Bay, and other parts of tropical America; and has been introduced into Jamaica, where it has become naturalized. The wood, which is the part used in medicine, is a valuable article of commerce, and largely employed in dyeing. It comes to us in logs, deprived of the sap-wood, and having a blackish-brown colour externally. For medical use it is cut into chips, or rasped into coarse powder, and in these states is kept in the shops.

Properties. Logwood is hard, compact, heavy, of a deep-red colour, becoming dark by exposure, of a slight peculiar odour, and a sweet, somewhat astringent taste. It imparts its colour to water and to alcohol. The infusion made with cold water, though red, is less so than that with boiling water. It affords pre-

cipitates with sulphuric, nitric, muriatic, and acetic acids, with alum, sulphate of copper, acetate of lead, and sulphate of iron, striking a bluish-black colour with the last-mentioned salt. (*Thomson's Dispensatory.*) Precipitates are also produced with it by lime-water and gelatin. Among the constituents of logwood, according to Chevreul, are a volatile oil, an oleaginous or resinous matter, a brown substance the solution of which is precipitated by gelatin (*tannin*), another brown substance soluble in alcohol but insoluble in water or ether, an azotized substance resembling gluten, free acetic acid, various saline matters, and a peculiar principle, called *hematoxylin* or *hematin*, on which the colouring properties of the wood depend. This is obtained by digesting the aqueous extract in alcohol, evaporating the tincture till it becomes thick, then adding a little water, and submitting the liquid to a new but gentle evaporation. Upon allowing it to rest, hematoxylin is deposited in the state of crystals, which may be purified by washing with alcohol and drying. Thus procured, the crystals are shining, of a yellowish-rose colour, bitterish, acrid, and slightly astringent to the taste, readily soluble in boiling water, forming an orange-red solution which becomes yellow on cooling, and soluble also in alcohol and ether. According to Erdman, who obtained hematoxylin by the process of Chevreul, substituting ether for alcohol, its crystals, when quite pure, are yellow without a tinge of redness; its taste is sweet like that of liquorice, without either bitterness or astringency; and of itself it is not a colouring substance, but affords beautiful red, blue, and purple colours, by the joint action of an alkaline base and the oxygen of the air. It consists of carbon, hydrogen, and oxygen. (*Journ. de Pharm.*, 3*e sér.*, ii. 293.) It is sometimes found in distinct crystals in the crevices of the wood.

Medical Properties and Uses. Logwood is a mild astringent, devoid of irritating properties, and well adapted to the treatment of that relaxed condition of bowels which is apt to succeed cholera infantum. It is also occasionally used with advantage in ordinary chronic diarrhœa and chronic dysentery. It may be given in decoction or extract.

Off. Prep. Decoctum Hæmatoxyli; Extractum Hæmatoxyli. W.

HEDEOMA. *U. S.*

Pennyroyal.

Herb of Hedeoma pulegioides. *U. S.*

This herb, first attached to the genus *Melissa*, and afterwards to *Cunila*, is at present universally considered by botanists as belonging to the *Hedeoma* of Persoon. It has been very erroneously confounded by some with *Mentha Pulegium*, or European pennyroyal.

Hedeoma. *Sex. Syst.* Diandria Monogynia. — *Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Calyx bilabiate, gibbous at the base, upper lip three-toothed, lower two; dentures all subulate. *Corolla* ringent. *Stamens* two, sterile; the two fertile stamens about the length of the corolla. *Nuttall.*

Hedeoma pulegioides. Barton, *Med. Bot.* ii. 165. — *Cunila pulegioides.* Willd. *Sp. Plant.* i. 122. This is an indigenous annual plant, from nine to fifteen inches high, with a small, branching, fibrous, yellowish root, and a pubescent stem, which sends off numerous slender erect branches. The leaves are opposite, oblong-lanceolate or oval, nearly acute, attenuated at the base, remotely serrate, rough or pubescent, and prominently veined on the under surface. The flowers are very small, of a pale-blue colour, supported on short peduncles, and arranged in axillary whorls, along the whole length of the branches. The plant is common in all parts of the United States, preferring dry grounds and pastures

and, where it is abundant, scenting the air for a considerable distance with its grateful odour.

Both in the recent and dried state it has a pleasant aromatic smell, and a warm, pungent, mint-like taste. It readily imparts its virtues to boiling water. The volatile oil upon which they depend may be separated by distillation, and employed instead of the herb itself.

Medical Properties and Uses. Pennyroyal is a gently stimulant aromatic, and may be given in flatulent colic and sick stomach, or to qualify the action of other medicines. Like most of the aromatic herbs, it possesses the property, when administered in warm infusion, of promoting perspiration, and of exciting the menstrual flux when the system is predisposed to the effort. Hence it is much used as an emmenagogue in popular practice, and frequently with success. A large draught of the warm tea is given at bed-time, in recent cases of suppression of the menses, the feet having been previously bathed in warm water.

Off. Prep. Oleum Hedeomæ. W.

HELIANTHEMUM. *U. S. Secondary.*

Frostwort.

The herb of Helianthemum Canadense. *U. S.*

HELIANTHEMUM. *Sex. Syst.* Polyandria Monogynia.—*Nat. Ord.* Cistaceæ.

Gen. Ch. Calyx five-leaved, the two exterior sepals bract-like, smaller, or wanting. *Petals* five, rarely three, sometimes abortive. *Stigma* capitate, sometimes subsessile. *Capsule* triangular, three-valved, with the dissepiments in the middle of the valves. *Seeds* angular.

Helianthemum Canadense. Michaux, *Flor.* i. 308; Torrey & Gray, *Flor. of N. Am.* i. 151.—*Cistus Canadensis.* Willd. *Sp. Plant.* ii. 1199. The *frostwort, frost weed,* or *rock rose,* as this plant is variously called, is a herbaceous perennial, from six to eighteen inches high, with a slender, rigid, pubescent stem, oblong, somewhat lanceolate leaves about an inch in length, and large yellow flowers, the calyx and peduncles of which, as well as the branches, are covered with a white down. The flowers which first appear are terminal, few or solitary, large, on short peduncles, with erosely emarginate petals about twice as long as the calyx. Later in the season, or on different plants, other flowers appear, very small, axillary, solitary or somewhat clustered, nearly sessile, sometimes destitute of petals, and usually wanting the two outer sepals of the calyx. The fruit is a capsule, smooth and shining, with brown, scabrous punctate seeds. Eaton states that, in the months of November and December, he has seen hundreds of these plants sending out, near the roots, broad, thin, curved ice crystals, about an inch in breadth, which melted in the day, and were renewed in the morning. (*Manual of Botany, 7th ed.,* p. 246.)

Frostwort grows in all parts of the United States, preferring dry sandy soils, and flowering in June in the Middle States.

Medical Properties and Uses. The herb has an astringent, slightly aromatic, and bitterish taste; and appears to possess tonic and astringent properties. Attention has only recently been attracted to it as a medicine. We have been told that it was first introduced into regular practice by Dr. Ives, of New Haven, Connecticut, who considers it a valuable remedy in scrofula. The late Dr. Isaac Parrish, of Philadelphia, informed us that he had employed it with much apparent benefit, as an internal remedy, in scrofulous affections of the eyes. In a pamphlet upon the frost-weed, by Dr. D. A. Tyler, published at New Haven, A. D. 1846, it is stated that *H. corymbosum* possesses similar properties, and is indiscriminately employed with *H. Canadense.* He found both useful in scrofula, diarrhœa, and

secondary syphilis, and locally as a gargle in scarlatina, and a wash in prurigo. The plant has been used in the forms of powder, decoction, tincture, and syrup; and may be given freely with impunity. Dr. Tyler, however, has known the strong decoction and the extract to produce vomiting. He considers two grains of the latter as a full dose for an adult. W.

HELLEBORUS. *U. S., Lond., Ed.*

Black Hellebore.

Root of Helleborus niger. *U. S., Ed.* Rhizoma and root. *Lond.*

Ellébore noire, *Fr.;* Schwarze Niesswurzel, *Germ.;* Elleboro nero, *Ital.;* Heleboro negro, *Span.*

Helleborus. *Sex. Syst.* Polyandria Polygynia.—*Nat. Ord.* Ranunculaceæ. *Gen. Ch. Calyx* none. *Petals* five or more. *Nectaries* bilabiate, tubular. *Capsules* many-seeded, nearly erect. *Willd.*

Helleborus niger. Willd. *Sp. Plant.* ii. 1336; Woodv. *Med. Bot.* p. 473, t. 169; Carson, *Illust. of Med. Bot.* i. 8, pl. 1. The root or rhizoma of the black hellebore is perennial, knotted, blackish on the outside, white within, and sends off numerous long, simple, depending fibres, which are brownish-yellow when fresh, but become dark-brown upon drying. The leaves are pedate, of a deep-green colour, and stand on long footstalks which spring immediately from the root. Each leaf is composed of five or more leaflets, one terminal, and two, three, or four on each side, supported on a single partial petiole. The leaflets are ovate-lanceolate, smooth, shining, coriaceous, and serrated in their upper portion. The flower-stem, which also rises from the root, is six or eight inches high, round, tapering, and reddish towards the base, and bears one or two large, pendent, rose-like flowers, accompanied with floral leaves, which supply the place of the calyx. The petals, five in number, are large, roundish, concave, spreading, and of a white or pale-rose colour, with occasionally a greenish tinge. There are two varieties of the plant—*humilifolius* and *altifolius*—in the former of which the leaves are shorter than the flower stem, in the latter longer. It is a native of the mountainous regions of southern and temperate Europe, and is found in Greece, Austria, Italy, Switzerland, France, and Spain. It is cultivated in gardens for the beauty of its flowers, which expand in the middle of winter, and have thus given it the name of *Christmas rose.*

Till the publication of Tournefort's travels in the Levant, this species of hellebore was regarded as identical with that so well known, under the same title, to the ancient Greeks and Romans. But in the island of Anticyra, and various parts of continental Greece, in which it appears from the testimony of ancient writers that the hellebore abounded, this traveller discovered a species entirely distinct from those before described, and particularly from *H. niger.* He called it *H. orientalis,* and reasonably inferred that it was the true hellebore of the ancients; and botanists at present generally coincide in this opinion. But as *H. niger* is also found in some parts of Greece, it is not impossible that the two were indiscriminately employed. It is, indeed, highly probable that they possess similar properties; and a third, *H. viridis,* which grows in the west of Europe, is said to be frequently substituted for *H. niger,* which it closely resembles, if it does not equal in medicinal power. The roots of various other plants not belonging to the same genus are said to be frequently substituted for the black hellebore. They may usually be readily distinguished by attending to the characters of the genuine root.*

* The following minute description of the root, which we translate from Geiger's *Handbuch der Pharmacie,* may, perhaps, be useful in enabling the druggist to distinguish this

The medicine of which we are treating is sometimes called *melampodium*, in honour of Melampus, an ancient shepherd or physician, who is said to have cured the daughters of King Prætus by giving them the milk of goats which had been fed on hellebore.

Properties. Though the whole root is kept in the shops, the fibres are the portion usually recommended. They are about as thick as a straw, when not broken from four inches to a foot in length, smooth, brittle, externally black or deep-brown, internally white or yellowish-white, with little smell, and a bitterish, nauseous, acrid taste. In their recent state they are extremely acrimonious, producing on the tongue a burning and benumbing impression, like that which results from taking hot liquids into the mouth. This acrimony is diminished by drying, and still further impaired by age. MM. Feneulle and Capron obtained from black hellebore, a volatile oil, an acrid fixed oil, a resinous substance, wax, a volatile acid, bitter extractive, gum, albumen, gallate of potassa, supergallate of lime, a salt of ammonia, and woody fibre. Mr. William Bastick has succeeded in separating from black hellebore a peculiar crystalline principle, which he proposes to call *helleborin*. It was obtained by diluting with water a strong tincture of the root, expelling the alcohol by heat, filtering to separate the resin, adding carbonate of potassa in excess, and agitating the mixture with three or four times its volume of ether. The ethereal solution thus formed was separated, and on evaporation yielded the helleborin, which was purified by solution in alcohol and crystallization. It is in white, translucent crystals, of a bitter taste with a tingling effect on the tongue, not volatilizable, slightly soluble in water, more so in ether and alcohol, and more readily in these liquids hot than cold. Though nitrogenous, it is neither acid nor alkaline. It probably exists uncombined in the root. (*Pharm. Journ. and Trans.*, xii. 274.) Water and alcohol extract the virtues of the root, which are impaired by long boiling.

Medical Properties and Uses. Black hellebore is a drastic hydragogue cathartic, possessed of emmenagogue powers, which by some are ascribed to a specific tendency to the uterus, by others are supposed to depend solely on the purgative

from other analogous roots mingled with or substituted for it in commerce. "It is usually a many-headed root, with a caudex or body half an inch thick or less, seldom thicker, and several inches long, horizontal, sometimes variously contorted, uneven, knotty, with transverse ridges, slightly striated longitudinally, presenting on its upper surface the short remains of the leaf and flower stalks, and thickly beset upon the sides and under surface with fibres of the thickness of a straw, and from six to twelve inches long. These are undivided above, but, at the distance of from two to six inches from their origin, are furnished with small, slender branches. The colour of the root is dark-brown, sometimes rather light-brown, dull, and for the most part exhibiting a gray, earthy tinge. Internally it is whitish, with a somewhat darker pith, which, when cut transversely, shows lighter converging rays. Sometimes it is porous. It has a medullary or fleshy, not a ligneous consistence. The fibres, when dried, are wrinkled, very brittle, sometimes grayish internally, horny, with a white point in the centre. The odour of the dried root is feeble, somewhat like that of seneka, but more nauseous; especially when the root is rubbed with water. The taste is at first sweetish, then nauseously acrid and biting, but not very durable, and slightly bitterish." (*Handbuch*, ii. *s.* 1181.)

A root said to be not unfrequently substituted for or mixed with the genuine, and often to be met with in the shops of this country, is thought to be that of the *Actæa spicata* of Europe. This has been particularly described by Dr. Carson in the *American Journal of Pharmacy* (xx. 163). The points of difference upon which that writer especially insists are the diffuse, jointed, stem-like character of the caudex of the false root, the straggling, separated, and horizontal arrangement of the fibres, and their dense, woody structure and reddish-brown colour, contrasted with the thickness, double-headed form, and sponginess of the genuine caudex, the close-set, perpendicular position of its fibres, and their wrinkled appearance, soft texture, and grayish-brown colour. The transverse section of the fibre of the Actæa presents the appearance of a cross, which is not obvious in that of the black hellebore, though the central point of this, if closely examined, will be found to present a somewhat stellate appearance.

property. In overdoses it produces inflammation of the gastric and intestinal mucous membrane, with violent vomiting, hypercatharsis, vertigo, cramp, and convulsions, which sometimes end in death. The fresh root applied to the skin produces inflammation and even vesication. The medicine was very highly esteemed by the ancients, who employed it in mania, melancholy, amenorrhœa, dropsy, epilepsy, various cutaneous affections, and verminose diseases. By the earlier modern physicians it was also much used. *Bacher's pills*, celebrated for the cure of dropsy, consisted chiefly of black hellebore. It is at present little employed, except as an emmenagogue, in which capacity it is highly esteemed by some practitioners. Dr. Mead considered it superior to all other medicines belonging to this class. It may be given in substance, extract, decoction, or tincture. The dose of the powdered root is from ten to twenty grains as a drastic purge, two or three grains as an alterative. The decoction is prepared by boiling two drachms in a pint of water, of which a fluidounce may be given every four hours till it operates. The extract and tincture are officinal.

Off. Prep. Extractum Hellebori; Tinctura Hellebori. W.

HEMIDESMUS. *Dub.*

Indian Sarsaparilla.

Hemidesmus Indicus. The root. *Dub.*

Hemidesmus. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Asclepiadaceæ. *Gen. Ch. Corolla* rotate. *Filaments* connate at the base, not united above, inserted into the tube of the corolla. *Anthers* cohering separate from the stigma, with twenty pollen-masses. *Stigma* flattish, pointless.

Hemidesmus Indicus. R. Brown, *Hort. Kew.* ii. 75; Lindley, *Flor. Med.* p. 543.—*Periploca Indica.* Willd. *Sp. Plant.* i. 1251. This is a climbing plant, with twining, woody, slender stems, and opposite petiolate leaves, which are entire, smooth, shining, and of a firm consistence. The leaves vary much in size and shape, some being linear and acute, others broad-lanceolate, and others again oval or ovate. The flowers are small, green on the outside, purple within, and disposed in axillary racemes. The calyx is five-parted, with acute divisions; the corolla flat, with oblong, pointed divisions. The fruit consists of two long, slender spreading follicles.

This plant is common over the whole peninsula of Hindostan. The officinal portion is the root, which has long been used in India as a substitute for sarsaparilla. It is long, slender, tortuous, cylindrical, and little branched, consisting of a ligneous centre, and a brownish, corky bark, which is marked with longitudinal furrows and transverse fissures. It has a peculiar aromatic odour, and a bitter taste. Mr. Garden obtained from it a peculiar volatilizable principle, with acid properties, which he named *smilasperic acid*, under the erroneous impression that the root was derived from *Smilax aspera*. Pereira proposed to call it *hemidesmic acid*.

Medical Properties and Uses. Indian sarsaparilla is said to be tonic, diuretic, and alterative. It was introduced into Great Britain from India, and was employed for some time under the name of *smilax aspera*. It is used for the same purposes as sarsaparilla. In some instances it is said to have proved successful in syphilis when that medicine had failed; but it cannot be relied on. The native practitioners in India are said to employ it in nephritic complaints, and in the sore mouth of children. It is used in the form of infusion or decoction, made in the proportion of two ounces of the root to a pint of water. A pint may be given, in wineglassful doses, in the course of the day. A syrup is directed by the Dublin College; but it is a weak preparation. (See *Syrupus Hemidesmi.*)

Off. Prep. Syrupus Hemidesmi. W.

HEPATICA. *U. S. Secondary.*

Liverwort.

The leaves of Hepatica Americana. *U. S.*

Hepatica. *Sex. Syst.* Polyandria Polygynia.—*Nat. Ord.* Ranunculaceæ.

Gen. Ch. Calyx three-leaved. *Petals* six to nine. *Seeds* naked. *Nuttall.*

Hepatica Americana. De Cand.; Eaton, *Manual of Botany*, p. 241.—*H. triloba.* Willd. *Enum.;* Figured in Rafinesque's *Med. Flor.* i. 238. Botanists generally admit but one species of Hepatica, *H. triloba*, and consider as accidental the difference of structure and colour observable in the plant. Pursh speaks of two varieties, one with the lobes of the leaf oval and acute, the other with the lobes rounded and obtuse. These are considered as distinct species by De Candolle, and the latter is the one which has been adopted by the Pharmacopœia, and is popularly employed as a medicine in this country, under the name of *liverwort.* Both have a perennial fibrous root, with three-lobed leaves, cordate at their base, coriaceous, nearly smooth, glaucous and purplish beneath, and supported upon hairy footstalks from four to eight inches long, which spring directly from the root. The scapes or flower-stems are several in number, of the same length with the petioles, round, hairy, and terminating in a single white, bluish, or purplish flower. The calyx is at a little distance below the corolla, and is considered by some an involucre, while the corolla takes the name of the calyx. In *H. acutiloba* the leaves are cordate, with from three to five entire, acute lobes; and the leaflets of the calyx are acute. In *H. Americana* the leaves are cordate-reniform, with three entire, roundish, obtuse lobes; and the leaflets of the calyx are obtuse. Both are indigenous, growing in woods upon the sides of hills and mountains; the former, according to Eaton, preferring the northern, the latter the southern exposure. The leaves resist the cold of the winter, and the flowers make their appearance early in spring. The whole plant is used.

It is without smell, and has a mucilaginous, somewhat astringent, slightly bitterish taste. Water extracts all its active properties.

Medical Properties and Uses. Liverwort is a very mild, demulcent tonic and astringent, supposed by some to possess diuretic and deobstruent virtues. It was formerly used in Europe in various complaints, especially chronic hepatic affections; but has fallen into entire neglect. In this country, some years since, it acquired considerable popular reputation, which, however, it has not sustained, as a remedy in hæmoptysis and chronic coughs. It may be used in infusion, and taken ad libitum. The term *liverwort* properly belongs to the cryptogamous genus *Marchantia.* W.

HERACLEUM. *U. S. Secondary.*

Masterwort.

The root of Heracleum lanatum. *U. S.*

Heracleum. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Apiaceæ or Umbelliferæ.

Gen. Ch. Fruit elliptical, emarginate, compressed, striated, margined. *Corolla* difform, inflexed, emarginate. *Involucre* caducous. *Willd.*

Heracleum lanatum. Michaux, *Flor. Boreal. Am.* i. 166. This is one of our largest indigenous umbelliferous plants. The root is perennial, sending up annually a hollow pubescent stem, from three to five feet high, and often more than an inch in thickness. The leaves are ternate, downy on their under surface, and supported on downy footstalks; the leaflets petiolate, roundish-cordate, and lobed. The flowers are white, in large umbels, and followed by orbicular seeds.

Like the European species this is sometimes called *cow-parsnep*. It grows in meadows and along fences or hedges, from Canada to Pennsylvania, and flowers in June.

The root, which is the officinal part, bears some resemblance to that of common parsley. It has a strong disagreeable odour, and a very acrid taste. Both the leaves and root excite redness and inflammation when applied to the skin. Dr. Bigelow considers the plant poisonous, and advises caution in its use, especially when it is gathered from a damp situation.

Medical Properties, &c. Masterwort appears to be somewhat stimulant and carminative, and was used successfully by Dr. Orne, of Salem, Massachusetts, in cases of epilepsy, attended with flatulence and gastric disorder. He directed two or three drachms of the pulverized root to be taken daily, for a long time, and a strong infusion of the leaves to be drunk at bed-time. W.

HEUCHERA. *U. S. Secondary.*

Alum-root.

The root of Heuchera Americana. *U. S.*

HEUCHERA. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Saxifragaceæ.

Gen. Ch. Calyx five-cleft. *Petals* five, small. *Capsule* bi-rostrate, bi-locular, many-seeded. *Nuttall.*

Heuchera Americana. Willd. *Sp. Plant.* i. 1328; Barton, *Med. Bot.* ii. 159. —*H. cortusa.* Michaux, *Flor. Boreal. Am.* i. 171.—*H. viscida.* Pursh, *Flor. Am. Sept.* p. 187. The *alum-root* or *American sanicle* is a perennial, herbaceous plant, the leaves of which are all radical, petiolate, cordate, with rounded lobes, furnished with obtuse mucronate teeth. There is no proper stem; but numerous scapes or flower-stems are sent up by the same root, from one to three feet in height, very hairy in their upper part, and terminating in long, loose, pyramidal, dichotomous panicles. The calyx is small, with obtuse segments; the petals lanceolate, rose-coloured, and of the same length with the calyx; the filaments much longer, yellowish, and surmounted by small, red, globose anthers. The whole plant is covered with a viscid pubescence.

It is found in shady, rocky situations, from New England to Carolina, and flowers in June and July. The root, which is the officinal portion, is horizontal, somewhat compressed, knotty, irregular, yellowish, and of a strongly styptic taste.

Medical Properties. Alum-root is powerfully astringent, and may be employed in similar cases with other medicines belonging to the same class. It has, hitherto, however, been little used. We are informed in Dr. Barton's "Collections," that it is applied by the Indians to wounds and obstinate ulcers, and that it is the basis of a powder which, when the author wrote, enjoyed some reputation as a cure for cancer. W.

HIRUDO. *Lond.*

The Leech.

Sanguisuga medicinalis, and S. officinalis. *Lond.*

Off. Syn. HIRUDO MEDICINALIS. *Dub.*

Sangsue, *Fr.;* Blutegel, *Germ.;* Mignatta, *Ital.;* Sauguijuela, *Span.*

HIRUDO. *Class* 1, Annelides. *Order* 3, Abranchiatæ. *Family* 2, Asetigeræ. *Cuvier.*

The leech belongs to that class of invertebrated articulated animals called *Annelides*. This class contains the worms with red blood, having soft retractile bodies composed of numerous segments or rings, breathing generally by means

of branchiæ, with a nervous system consisting in a double knotted cord, destitute of feet, and supplying their place by the contractile power of their segments or rings. The third order of this class—*Abranchiatæ*—comprehends those worms which have no apparent external organ of respiration. This order is again divided into two families, to the second of which—the *Asetigeræ*, or those not having setæ to enable them to crawl—the leech belongs.

It is an aquatic worm with a flattened body, tapering towards each end, and terminating in circular flattened disks, the hinder one being the larger of the two. It swims with a vertical undulating motion, and moves when out of the water by means of these disks or suckers, fastening itself first by one and then by the other, and alternately stretching out and contracting its body. The mouth is placed in the centre of the anterior disk, and is furnished with three cartilaginous lens-shaped jaws at the entrance of the alimentary canal. These jaws are lined at their edges with fine sharp teeth, and meet so as to make a triangular incision in the flesh. The head is furnished with small raised points, supposed by some to be eyes. Respiration is carried on through small apertures ranged along the inferior surface. The nervous system consists of a cord extending the whole length, furnished with numerous ganglions. The intestinal canal is straight and terminates in the anus, near the posterior disk. Although hermaphrodite, leeches mutually impregnate each other. They are oviparous, and the eggs, varying from six to fifteen, are contained in a sort of spongy, slimy cocoon, from half an inch to an inch in diameter. These are deposited near the edge of the water, and hatched by the heat of the sun. The leech is torpid during the winter, and casts off from time to time a thick slimy coating from its skin. It can live a considerable time in sphagnous moss, or in moistened earth, and is frequently transported in this manner to great distances by the dealers.

Savigny has divided the genus Hirudo of Linnæus into several genera. The true leech is the Sanguisuga of this author, and is characterized by its three lenticular jaws, each armed with two rows of teeth, and by having ten ocular points. Several species are used for medicinal purposes, of which the most common are the gray and the green leech of Europe, both of which are varieties of the *Hirudo medicinalis* of Linnæus; and the *Hirudo decora* of this country.

1. *Hirudo medicinalis.* Linn. *Ed. Gmel.* I. 3095.—*Sanguisuga officinalis.* Savigny, *Mon. Hir.* p. 112, t. 5, f. 1. *The green leech.*—*Sanguisuga medicinalis.* Savigny, *Mon. Hir.* p. 114, t. 5, f. 2. *The gray leech.* Many of the best zoologists regard the *Sanguisuga officinalis* and *S. medicinalis* of Savigny as mere varieties. They are both marked with six longitudinal dorsal ferruginous stripes, the four lateral ones being interrupted or tesselated with black spots. The colour of the back varies from a blackish to a grayish-green. The belly in the first variety is of a yellowish-green colour, free from spots, and bordered with longitudinal black stripes. In the second it is of a green colour, bordered and maculated with black. This leech varies from two to four inches in length. It inhabits marshes and running streams, and is abundant throughout Europe.*

The great use made of leeches in the modern practice of medicine has occasioned them to become a considerable article of commerce. They are collected in Spain, France, Italy, and Germany, and carried in large numbers to London and Paris. They are also frequently brought to this country; as the practitioners in some of our large cities use only the foreign leech, although our own waters furnish an inexhaustible supply of this useful worm.

* A variety of the leeches has recently come into use in Europe called in commerce *African leeches.* They are of a beautiful light-green colour, varying to a deep-green, and often inclining to red, with black points on the back, and broad streaks of a bright orange-yellow, which are black towards the abdomen. They correspond perfectly with the *Sanguisuga interrupta* of Moquin Tandon. These leeches draw very well. (*Pharm. Journ. and Trans.*, x. i., from *Buchner's Repertorium*, A.D. 1850, p. 376.)—*Note to the ninth edition.* W.

2. *Hirudo decora.* Say, *Colonel Long's Second Expedition*, ii. 268. The medicinal leech of America has been described by Say under the name of *Hirudo decora*, in the Appendix to the Second Expedition of Colonel Long. Its back is of a deep pistachio-green colour, with three longitudinal rows of square spots. These spots are placed on every fifth ring, and are twenty-two in number. The lateral rows of spots are black, and the middle range of a light brownish-orange colour. The belly is of the same colour, variously and irregularly spotted with black. The American leech sometimes attains the length of four or five inches, although its usual length is from two to three. It does not make so large and deep an incision as the European leech, and draws less blood.

The indigenous leech is much used in the city of Philadelphia. The practitioners of New York and Boston are supplied chiefly from abroad. The leeches employed in Philadelphia are generally brought from Bucks and Berks county in Pennsylvania, and occasionally from other parts of the State.

The proper preservation of leeches is an object of importance to the practitioner, as they are liable to great and sudden mortality. They are usually kept in jars, in clear, soft water, which should be changed twice a week in winter, and every other day in summer. The jar must be covered with a linen cloth, and placed in a situation not liable to sudden changes of temperature. They will live a long time and continue active and healthy, without any other attention than that of frequently changing the water in which they are kept. M. Derheims has proposed the following excellent method of preserving them. In the bottom of a large basin or trough of marble he places a bed, six or seven inches deep, of a mixture of moss, turf, and fragments of wood. He strews pebbles above, so as to retain them in their place without compressing them too much, or preventing the water from freely penetrating them. At one end of the trough and about midway of its height, is placed a thin slab of marble or earthenware, pierced with numerous holes, and covered with a bed of moss which is compressed by a thick layer of pebbles. The reservoir being thus disposed is half-filled with water, so that the moss and pebbles on the shelf shall be kept constantly moist. The basin is protected from the light by a linen cover stretched over it. By this arrangement the natural habits of the leech are not counteracted. One of these habits, essential to its health, is that of drawing itself through the moss and roots to clear its body from the slimy coat which forms on its skin, and is a principal cause of its disease and death. Mr. James Banes recommends that, when kept in jars, they should be cleansed by means of a whisk of very fine broom or willow, when the water is changed.*

Medical Uses.—Leeches afford the least painful, and in many instances the most effectual means for the local abstraction of blood. They are often applicable to parts which, either from their situation or their great tenderness when inflamed, do not admit of the use of cups; and, in the cases of infants, are under

* M. Soubeiran considers it important that they should be kept in running water, and has figured an apparatus for this purpose in the second edition of his Treatise on Pharmacy. The addition of a solution of chlorine to the water, in the proportion of one or two drops to the pint, or of a little muriatic or sulphuric acid to neutralize the ammonia which forms, has sometimes been found a preservative against diseases to which leeches are liable. (*Journ. de Pharm.*, 3e *sér.*, x. 186, from *Repert. für die Pharm.*, xlii. 367.)

M. Domine has found the following plan of preserving leeches most successful. He selects the greenest moss he can find, washes it perfectly clean, and puts it and the leeches, also well washed, alternately into a glass vessel of convenient size, taking care to fill the vessel completely with the loosened moss, and then to cover it with a piece of linen. In winter, it is sufficient merely to introduce the leeches and moss moistened; but, as soon as warm weather approaches, a little water should be put at the bottom of the vessel. It is not necessary to change often in winter; but in summer, the moss should be renewed nearly every other day, and the vessel should be kept in the cellar. (*Journ. de Pharm. et de Chim.*, xvi. 110.)—*Note to the ninth edition.* W.

all circumstances preferable to that instrument. They are indeed a powerful therapeutic agent, and give to the physician, in many instances, a control over disease which he could obtain in no other way. Their use is in great measure restricted to the treatment of local inflammations; and, as a general rule, they should not be resorted to until the force of the circulation has been diminished by bleeding from the arm, or in the natural progress of the complaint.

In applying leeches to the skin, care should be taken to shave off the hair, if there be any, and to have the part well cleansed with soap and water, and afterwards with pure water. If the leech does not bite readily, the skin should be moistened with a little blood, or milk and water. Sometimes the leech is put into a large quill open at both ends, and applied with the head to the skin until it fastens itself, when the quill is withdrawn. If it be desirable that the leech shall bite in a particular spot, this end may be attained by cutting a small hole in a piece of blotting paper, and then applying this moistened to the skin, so that the hole shall be immediately over the spot from which the blood is to be taken. Leeches continue to draw blood until they are gorged, when they drop off.* The quantity of blood which they draw varies according to the part to which they are applied, and the degree of inflammation existing in it. In the loose and vascular textures they will abstract more than in those which are firm and compact, and more from an inflamed than a healthy part. As a general rule our leechers apply six for every fluidounce of blood. A single European leech will draw from half an ounce to an ounce. The quantity may often be much increased by bathing the wound with warm water. Leeches will continue to suck after their tails are cut off, which is sometimes done, although it is a barbarous practice. It is said that they will draw better if put into cold beer, or diluted wine, and allowed to remain until they become very lively. They may be separated from the skin at any time by sprinkling a little salt upon them. After they drop off, the same application will make them disgorge the blood they have swallowed. Some leechers draw the leeches from the tail to the head through their fingers, and thus squeeze out the blood, after which all that is necessary is to put them in clean water, and change it frequently.† Leeches which are gorged with blood should be kept in a vessel by themselves, as they are more subject to disease, and often occasion a great mortality among the others. They should not be again used until they have recovered their activity. In cases where the bleeding from leech-bites continues longer than is desirable, it may be stopped by con-

* As a very efficient mode of applying leeches, it is recommended, after having moistened the skin with pure warm water, to put the leeches into a tumbler half full of cold water, and by an adroit movement invert it upon the part. If it is desired to confine the leeches to a single point, the object may be effected by covering the part previously with a piece of paper, having a hole of the required size in the middle. The leeches are said to attach themselves so rapidly that it seems to the patient as though they made but a single bite. When they are all attached, the glass is to be carefully removed, the water being absorbed as it runs off on one side by a sponge or linen cloths.

Another method of increasing the efficiency of leeches, recommended by Dr. C. R. Sloan, of Ayr, Scotland, is to cover them with a cupping glass, and, by means of an air-pump, moderately exhaust the air over them. An extraordinary increase in their activity is immediately observable. (*Ed. Monthly Journ. of Med. Sci.*, Aug. 1852, p. 126.) W.

† MM. Soubeiran and Bouchardat, after numerous experiments upon the different modes of fitting the gorged leeches for use again, came to the conclusion, that a carefully managed pressure is the best. Two conditions, however, are necessary to success; one that they should be disposed to disgorge the blood, and the other that they should be immersed in warm water previously to the stripping. The first object is effected by common salt. The following plan is recommended. The leeches are to be thrown into a solution of 16 parts of common salt in 100 of water, from which they are to be taken out one by one, and, being held by the tail, are to be dipped into water which feels hot to the hand, but yet can be borne by it, and then passed lightly between the fingers. Thus treated, they easily give up the blood. After being stripped, they should be placed in vessels containing fresh water,

tinued pressure, with the application of lint, or by touching the wounds with lunar caustic.* It may sometimes be necessary, in the case of a deep bite, to sew the wound, which is readily done with a single stitch of the needle, that need not penetrate deeper than the cutis.† D. B. S.

HORDEUM. *U. S., Lond., Ed., Dub.*

Barley.

The decorticated seeds of Hordeum distichon. *U. S., Lond., Ed., Dub.*
Orge, *Fr.;* Gerstengraupen, *Germ.;* Orzo, *Ital.;* Cebada, *Span.*

Hordeum. *Sex. Syst.* Triandria Digynia.—*Nat. Ord.* Graminaceæ.

Gen. Ch. Calyx lateral, two-valved, one-flowered, three-fold. *Willd.*

Several species of Hordeum are cultivated in different parts of the world. The most common are the *H. vulgare*, and *H. distichon*, both of which have been introduced into the United States.

1. *Hordeum vulgare.* Willd. *Sp. Plant.* i. 472; Loudon's *Encyc. of Plants*, p. 73. The culm or stalk of common barley is from two to four feet in height, fistular, and furnished with alternate, sheathing, lanceolate, roughish, and pointed leaves. The flowers are all perfect, and arranged in a close terminal spike, the axis of which is dentate, and on each tooth supports three sessile flowers. The calyx or outer chaff has two valves. The corolla or inner chaff is also composed of two valves, of which the exterior is larger than the other, and terminates in a long, rough, serrated awn or beard. The seeds are arranged in four rows.

2. *H. distichon.* Willd. *Sp. Plant.* i. 473; Loudon's *Encyc. of Plants*, p. 73. This species is distinguished by its flat spike or ear, which on each flat side has a double row of imperfect or male florets without beards, and on each edge, a single row of bearded perfect or hermaphrodite florets. The seeds therefore are in two rows, as indicated by the specific name of the plant.

which should be renewed once a day. At the end of eight or ten days, they are fit for reapplication. (*Journ. de Pharm.*, 3e *sér.*, xi. 343 and 350.)

It has been stated that, if the leeches, after being stripped, be put into water sweetened with a little white sugar, and the solution be renewed several times, at intervals of six or twelve hours, they will speedily recover their activity, and may be reapplied two or three times in the course of a few days. Immersion in camphor water, for a few moments, is said by Mr. Boyce to cause them to vomit the blood. They should afterwards be put into clean water, to be changed in half an hour. (*Pharm. Journ.*, Jan. 1845.)

M. Granat, a French military pharmaceutist, has found the natural process of disgorging preferable to all others. He placed some gorged leeches in wooden tubs containing at bottom a little clay and water, and renewed the water every forty-eight hours. After eight days, the leeches, now in good health, were transferred to a pond prepared for the purpose, where they propagated. He put 1000 leeches in the pond, and at the end of a year had taken out 850 fit for service, without interfering with the reproduction. (*Journ. de Pharm.*, 3e *sér.*, xx. 186.) The propagation of the leech has begun to attract considerable attention in France. When the authors were in Paris, in the summer of 1853, there was a large leech-pond in operation at the *Central Pharmacy of the Hospitals.* W.

* A little cotton, impregnated with a saturated solution of alum in boiling-hot water, and, after it has become sufficiently cool, and before the alum has begun to crystallize, pressed upon the wound, will often prove effectual. Another mode of repressing the hemorrhage is to press upon the bite a piece of thin caoutchouc, previously softened upon one side by heat, so as to become adhesive. If lunar caustic be applied, the stick must first be brought to a fine point, which is to be inserted in the wound. Some have even recommended the use of a fine wire made red-hot. When the part wounded is without a bony basis, pressure may be made by pinching the wound between the fingers. W.

† An instrument has been invented called the *mechanical leech*, by which the attempt has been made to imitate the action of the leech in drawing blood. It consists essentially of two parts, one for making the puncture, and the other for abstracting blood through the agency of atmospheric pressure. In other words, it is a minute cupping instrument. Practically, however, it has not been found so convenient as to supersede the use of the living leech. For an account of the instrument, see the *Am. Journ. of the Med. Sciences*, xvi. 207. W.

The original country of the cultivated barley is unknown. The plant has been found growing wild in Sicily, and various parts of the interior of Asia. *H. v ulgare* is said by Pursh to grow in some parts of the United States, apparently in a wild state. The seeds are used in various forms.

1. In their natural state they are oval, oblong, pointed at one end, obtuse at the other, marked with a longitudinal furrow, of a yellowish colour externally, white within, having a faint odour when in mass, and a mild sweetish taste. They contain, according to Proust, in 100 parts, 32 of starch, 3 of gluten, 5 of sugar, 4 of gum, 1 of yellow resin, and 55 of *hordein*, a principle closely analogous to lignin. Berzelius suggests that hordein may be an intimate mixture of vegetable fibre with gluten and starch, which are very difficultly separable as they exist in this grain. Einhoff found in 100 parts 67·18 of starch, 5·21 of uncrystallizable sugar, 4·62 of gum, 3·52 of gluten, 1·15 of albumen, 0·24 of phosphate of lime, and 7·29 of vegetable fibre; the remainder being water and loss.

2. *Malt* consists of the seeds made to germinate by warmth and moisture, and then baked so as to deprive them of vitality. By this process the sugar, starch, and gum are increased at the expense of the *hordein*, as shown by the analysis of Proust, who found in 100 parts of malt, 56 of starch, 1 of gluten, 15 of sugar, 15 of gum, 1 of yellow resin, and only 12 of *hordein*. Berzelius attributes the diminution of the hordein to the separation, during germination, of the gluten or starch from the fibrous matter with which he supposes them to be associated in that substance. It is in the form of malt that barley is so largely consumed in the manufacture of malt liquors.

An interesting substance, called *diastase*, was discovered by MM. Payen and Persoz in the seeds of barley, oats, and wheat, and in the potato. It is found, however, only after germination, of which process the production of it appears to be the first step. Germinated barley seldom contains it in larger proportion than two parts in a thousand. It is obtained by bruising freshly germinated barley, adding about half its weight of water, expressing strongly, treating the viscid liquid thus obtained with sufficient alcohol to destroy its viscidity, then separating the coagulated albumen, and adding a fresh portion of alcohol, which precipitates the diastase in an impure state. To render it pure, it must be redissolved as often as three times in water, and precipitated by alcohol. It is solid, white, tasteless, soluble in water and weak alcohol, but insoluble in the latter fluid in a concentrated state. Though without action upon gum and sugar, it has the extraordinary property, when mixed, in the proportion of only one part to 2000, with starch suspended in water, and maintained at a temperature of about 160°, of converting that principle into dextrine and the sugar of grapes. The whole of the starch undergoes this change, with the exception of the teguments of the granules, amounting to about 4 parts in 1000. The change which barley undergoes during germination, and in the process of malting, is of a similar character.

3. *Hulled barley* is merely the grain deprived of its husk, which, according to Einhoff, amounts to 18·75 parts in the hundred.

4. *Barley meal* is formed by grinding the seeds, previously deprived of their husk. It has a grayish-white colour, and contains, according to Fourcroy and Vauquelin, an oleaginous substance, sugar, starch, azotized matter, acetic acid, phosphate of lime and magnesia, silica, and iron. It may be made into a coarse, heavy, hard bread, which in some countries is much used for food.

5. *Pearl barley—hordeum perlatum*—is the seed deprived of all its investments, and afterwards rounded and polished in a mill. It is in small round or oval grains, having the remains of the longitudinal furrow of the seeds, and of a pearly whiteness. It is wholly destitute of hordein, and abounds in starch, with some gluten, sugar, and gum. This is the proper officinal form of barley, and is kept in the shops almost to the exclusion of the others.

Medical Properties. Barley is one of the mildest and least irritating of farinaceous substances; and, though not medically used in its solid state, forms by decoction with water a drink admirably adapted to febrile and inflammatory complaints, and much employed from the times of Hippocrates and Galen to the present. Pearl barley is the form usually preferred for the preparation of the decoction, though the hulled grain is sometimes used, and malt affords a liquor more demulcent and nutritious. (See *Decoctum Hordei.*) The decoction of malt may be prepared by boiling from two to four ounces in a quart of water and straining the liquor. When hops are added, the decoction takes the name of wort, and acquires tonic properties, which render it useful in debility, especially when attended with suppuration.

Off. Prep. Decoctum Hordei; Decoctum Hordei Compositum. W.

HUMULUS. *U. S.*

Hops.

The strobiles of Humulus Lupulus. *U. S.*

Off. Syn. LUPULUS. Humulus Lupulus. The Amentum. *Lond.* The Catkin. *Ed.* HUMULUS LUPULUS. The dried strobiles. *Dub.*

Houblon, *Fr.;* Hopfen, *Germ.;* Luppolo, *Ital.;* Lupulo Hombrecillo, *Span.*

HUMULUS. *Sex. Syst.* Diœcia Pentandria.—*Nat. Ord.* Urticaceæ.

Gen. Ch. MALE. *Calyx* five-leaved. *Corolla* none. FEMALE. *Calyx* one-leafed, obliquely spreading, entire. *Corolla* none. *Styles* two. *Seed* one, within a leafy calyx. *Willd.*

Humulus Lupulus. Willd. *Sp. Plant.* iv. 769; Bigelow, *Am. Med. Bot.* iii. 163. The root of the hop is perennial, and sends up numerous annual, angular, rough, flexible stems, which twine around neighbouring objects in a spiral direction, from left to right, and climb to a great height. The leaves are opposite, and stand upon long footstalks. The smaller are sometimes cordate; the larger have three or five lobes; all are serrate, of a deep-green colour on the upper surface, and, together with the petioles, extremely rough, with minute prickles. At the base of the footstalks are two or four smooth, ovate, reflexed stipules. The flowers are numerous, axillary, and furnished with bractes. The male flowers are yellowish-white, and arranged in panicles; the female, which grow on a separate plant, are pale-green, and disposed in solitary, peduncled aments, composed of membranous scales, ovate, acute, and tubular at the base. Each scale bears near its base, on its inner surface, two flowers, consisting of a roundish compressed germ, and two styles, with long filiform stigmas. The aments are converted into ovate membranous cones or strobiles, the scales of which contain each at their base two small seeds, surrounded by a yellow, granular, resinous powder.

The hop is a native of North America and Europe. It is occasionally found growing wild in the Eastern States, and, according to Mr. Nuttall, is abundant on the banks of the Mississippi and Missouri. In parts of New England and New York it is extensively cultivated, and most of the hops consumed in the United States are supplied by those districts. The part of the plant used, as well in the preparation of malt liquors as in medicine, is the fruit or strobiles. These when fully ripe are picked from the plant, dried by artificial heat, packed in bales, and sent into the market under the name of hops.

They consist of numerous thin, translucent, veined, leaf-like scales, which are of a pale greenish-yellow colour, and contain near the base two small, round, black seeds. Though brittle when quite dry, they are pulverized with great difficulty. Their odour is strong, peculiar, somewhat narcotic, and fragrant; their taste very bitter, aromatic, and slightly astringent. Their aroma, bitterness, and

astringency are imparted to water by decoction; but the first-mentioned property is dissipated by long boiling. The most active part of hops is a substance secreted by the scales, and in the dried fruit existing upon their surface in the state of very small granules. This substance was called *lupulin* by the late Dr. A. W. Ives, of New York, by whom its properties were first investigated and made generally known; though it appears to have been previously noticed by Sir J. E. Smith, of England, and M. Planche, of France. The scales themselves, however, are not destitute of virtues, and contain, as shown by MM. Payen and Chevalier, the same active principles as the lupulin, though in less proportion.

Lupulina. *Lupulin. U. S., Dub.* This is obtained separate by rubbing or threshing and sifting the strobiles, of which it constitutes from one-sixth to one-tenth by weight. It is in the state of a yellowish powder, mixed with minute particles of the scales, from which it cannot be entirely freed when procured by a mechanical process. It has the peculiar flavour of hops, and appeared to MM. Lebaillif and Raspail, when examined by the microscope, to consist of globules filled with a yellow matter, resembling in this respect the pollen of vegetables. It is inflammable, and when moderately heated becomes somewhat adhesive. MM. Chevalier and Payen obtained from 200 parts, 105 of resin, and 25 of a peculiar bitter principle, besides volatile oil, gum, traces of fixed oil, a small quantity of an azotized substance, and various salts. Dr. Ives found in 120 grains, 5 of tannin, 10 of extractive, 11 of bitter principle, 12 of wax, 36 of resin, and 46 of lignin. The virtues of the powder probably reside in the volatile oil and bitter principle, and are readily imparted to alcohol. By boiling in water the bitterness is extracted, but the aroma is partially driven off. The *volatile oil*, which may be obtained by distillation with water, is yellowish, of the odour of hops, of an acrid taste, and lighter than water. It was formerly supposed to be narcotic, but this is denied by Dr. Wagner, who gave twenty drops of it to a rabbit, with no observable effect. (*Chem. Gaz.*, July 15, 1853.)

The bitter principle, which has been named *lupulite* or *lupuline*, but ought to be called *humulin*, may be procured by treating with alcohol the aqueous extract of lupulin previously mixed with a little lime, evaporating the tincture thus formed, treating the resulting extract with water, evaporating the solution, and washing the residue with ether. When pure it is yellowish or orange-yellow, inodorous at common temperatures, but of the smell of hops when heated, of the peculiar bitter taste of hops, slightly soluble in water which takes up five per cent. of its weight, readily soluble in alcohol, almost insoluble in ether, neither acid nor alkaline in its reaction, and destitute of nitrogen. It is scarcely affected by the weak acids or alkaline solutions, or by the metallic salts. It is probably the tonic principle of the medicine.

Medical Properties and Uses. Hops are tonic and moderately narcotic, and have been highly recommended in diseases of general or local debility, associated with morbid vigilance, or other nervous derangement. They have some tendency to produce sleep and relieve pain, and may be used for these purposes in cases where opiates, from their tendency to constipate, or other cause, are inadmissible. Diuretic properties have also been ascribed to them, but are by no means very obvious. The complaints in which they have been found most useful are dyspepsia, and the nervous tremors, wakefulness, and delirium of drunkards. Dr. Maton found the extract advantageous in allaying the pain of articular rheumatism. Dr. W. Y. Godberry, of Benton, Miss., has found hops efficacious in intermittents, and considers them inferior in antiperiodic powers only to quinia. (*West. Journ. Med. and Surg.*, March, 1853.)

The medicine may be given in substance, infusion, tincture, or extract. From three to twenty grains are mentioned as the dose of the powder; but the quantity is too small to produce any decided effect; and this mode of administration

is in fact scarcely ever resorted to. An infusion prepared with half an ounce of hops and a pint of boiling water, may be given in the dose of two fluidounces three or four times a day. In intermittents Dr. Godberry gives, in the interval, a pint of the infusion made with an ounce of the hops. The extract and tincture are officinal. (See *Extractum Lupuli* and *Tinctura Humuli.*) A pillow of hops has been found useful in allaying restlessness and producing sleep in nervous disorders. They should be moistened with some spirituous liquor, previously to being placed under the head of the patient, in order to prevent their rustling noise. Fomentations with hops, and cataplasms made by mixing them with some emollient substance, are often beneficial in local pains and tumefactions. An ointment of the powder with lard is recommended by Mr. Freake as an anodyne application to cancerous sores.

All the effects of the preparations of hops may be obtained, with greater certainty and convenience, by the use of *lupulin.* Dr. Wm. Byrd Page, of Philadelphia, has found this substance very effectual as an antaphrodisiac, in the treatment of gonorrhœa, and other irritated conditions of the urinary passages. The dose of lupulin in substance is from six to twelve grains, given in the form of pills, which may be made by simply rubbing the powder in a warm mortar till it acquires the consistence of a ductile mass, and then moulding it into the proper shape. There is an officinal tincture. (See *Tinctura Lupulinæ.*) Mr. Livermore proposes an alcoholic extract of lupulin, prepared by exhausting commercial lupulin with alcohol by the process of percolation, and exposing the tincture thus formed to spontaneous evaporation. The dose will be about one-third less than that of lupulin itself. (*Am. Journ. of Pharm.*, xxv. 294.) Lupulin may be incorporated with poultices, or formed into an ointment with lard, and used externally for the same purposes as hops.

Off. Prep. of Hops. Extractum Lupuli; Infusum Humuli; Tinctura Humuli.

Off. Prep. of Lupulin. Tinctura Lupulinæ. W.

HYDRARGYRUM. *U. S., Lond., Ed., Dub.*

Mercury.

Quicksilver; Mercurius, *Lat.;* Mercure, Vif argent, *Fr.;* Quecksilber, *Germ.;* Mercurio, *Ital.;* Azógue, *Span.* and *Port.*

This metal is found pure, combined with sulphur, united with silver, and in the form of protochloride (native calomel); but, of all its combinations, the most abundant is the bisulphuret, or native cinnabar. Its most important mines are found at Almaden in Spain, at Idria in Carniola, in the Duchy of Deux-ponts, at Durasno in Mexico, near Azogue in New Granada, and near Huancavelica in Peru. A rich mine of cinnabar was discovered in 1844, at New Almaden, in Upper California, about midway between San Francisco and Monterey; but the working of it only commenced in 1848, when it proved very productive, although the apparatus employed was extremely defective. (*Silliman's Journ.*, Sept. 1848.) From analyses made of the cinnabar from this mine, it appears to be much richer in mercury than that of Almaden in Spain, by reason of its containing less impurity. In 1852, the product of the mine was 75,000 pounds of mercury per month. A mine of cinnabar, nearly pure, was discovered in Corsica in 1850. (*Journ. de Pharm.*, 3e *sér.*, xix. 216.) Mercury also occurs in the Philippine Islands and China. The most ancient and productive mine is that of Almaden.

Extraction. Nearly all the mercury consumed in medicine and the arts is obtained from the bisulphuret, or native cinnabar. It is extracted by two principal processes. According to one process, the mineral is picked, pounded, and mixed with lime. The mixture is then introduced into cast-iron retorts, which are placed in rows, one above the other, in an oblong furnace, and connected

with earthenware receivers, one-third full of water. Heat being applied, the lime combines with the sulphur, so as to form sulphuret of calcium and sulphate of lime; while the mercury distils over, and is condensed in the receivers. The other process is practised at Almaden in Spain. Here a square furnace is employed, the floor of which is pierced with many holes, for the passage of the flame from the fireplace beneath. In the upper and lateral part of the furnace, holes are made, communicating with several rows of *aludels*, which terminate in a small chamber that serves both as condenser and receiver. The mineral, having been picked by hand and pulverized, is kneaded with clay, and formed into small masses, which are placed on the floor of the furnace. The heat being applied, the sulphur undergoes combustion; while the mercury, being volatilized, passes through the aludels to be condensed in the chamber.

Commercial History. Mercury is imported into this country generally in cylindrical wrought-iron bottles, called flasks, each containing 76½ pounds, and comes principally from the Atlantic ports of Spain, particularly Cadiz. A portion also is received from the Austrian port of Trieste, from which it generally comes tied up in whole skins of white leather, forming bags, each containing 31 pounds, and four of which are usually packed together with straw in a rough flattened keg. In both Spain and Austria, the produce of the quicksilver mines is a government monopoly. In Spain all the metal is brought from the mines to Seville, whence, after paying an export duty, it is carried by small vessels down the river Guadalquiver to Cadiz and Gibraltar, which are the chief places of its depot for foreign commerce. The quantity imported into the United States varies in different years. Its chief consumption is in the extraction of silver and gold from their ores, in the preparation of vermilion, in making thermometers and barometers, in silvering looking-glasses, and in preparing various pharmaceutical compounds.

Properties. Mercury is a very brilliant liquid, of a silver-white colour, and without taste or smell. When perfectly pure it undergoes no alteration by the action of air or water, but in its ordinary state suffers a slight tarnish. When heated to near the boiling point, it gradually combines with oxygen, and becomes converted into deutoxide; but at the temperature of ebullition it parts with the oxygen which it had absorbed, and is reduced again to the metallic state. Its sp. gr. is 13·5, and its equivalent 202. It boils at 662°, and freezes at 39° below zero, forming when frozen a malleable solid resembling lead. It is a good conductor of caloric, and its specific heat is small. It is not attacked by muriatic acid, nor by cold sulphuric acid; but boiling sulphuric acid, or cold nitric acid dissolves it, generating a bisulphate or binitrate of the deutoxide, with the extrication, in the former case, of sulphurous acid, in the latter, of nitric oxide becoming nitrous acid red fumes. Its combinations are numerous, and several of them constitute important medicines. It forms two oxides, two regular sulphurets, two chlorides, three iodides, and one cyanuret, all of which, excepting the protosulphuret and sesquiodide, are officinal, and will be noticed elsewhere under separate heads. Both the oxides are capable of uniting with acids so as to form salts, of which the binitrate, sulphate, and bisulphate of the deutoxide are officinal, or enter into officinal combinations.

Mercury, as it occurs in commerce, is in general sufficiently pure for pharmaceutical purposes. Occasionally it contains foreign metals, such as lead, bismuth, and tin. Mr. Brande informs us that, in examining large quantities of this metal in the London market, he found it only in one instance intentionally adulterated. When impure, the metal has a dull appearance, leaves a trace on white paper, is deficient in due fluidity and mobility, as shown by its not forming perfect globules, is not totally dissipated by heat, and, when shaken in a glass bottle, coats its sides with a pellicle, or, if very impure, deposits a black powder. If agitated with strong sulphuric acid, the adulterating metals become oxidized and

dissolved, and in this manner the mercury may in part be purified. Lead is detected by shaking the suspected metal with equal parts of acetic acid and water, and then testing the acid by sulphate of soda, or iodide of potassium. The former will produce a white, the latter a yellow precipitate, if lead be present. Bismuth is discovered by dropping a nitric solution of the mercury, prepared without heat, into distilled water, when the subnitrate of bismuth will precipitate. The solubility of the metal in nitric acid shows that tin is not present; and if sulphuretted hydrogen does not act upon muriatic acid previously boiled upon the metal, the absence of the usual contaminating metals is shown.

Mercury may be purified, according to Berzelius, by digesting it with a small portion of weak nitric acid, or with a solution of bichloride of mercury (corrosive sublimate); whereby all the ordinary contaminating metals will be removed. M. Ulex recommends its purification by triturating, for ten minutes, a pound of the metal with an ounce of the solution of sesquichloride of iron (sp. gr. 1·48), diluted with an equal measure of water. The mercury is thus divided to a very great extent, and the contaminating metals are separated as chlorides; the sesquichloride of iron being, in the meantime, reduced to protochloride. After decanting the iron solution, and washing with water, the mercury is dried by a gentle heat, and subjected to trituration, when the greater portion of it runs together. Mercury, however, is usually purified by distillation. (See *Hydrargyrum Purum.*)

Medical Properties. Mercury, in its uncombined state, is deemed inert; but in a state of combination, it acts as a peculiar and universal stimulant. When exhibited in a state of minute division, as it exists in several preparations, it produces its peculiar effects; but this does not prove that the uncombined metal is active, but only that the condition of minute division is favourable to its entering into combination in the stomach. Its combinations exhibit certain general medical properties and effects, which belong to the whole as a class; while each individual preparation is characterized by some peculiarity in its operation. Our business, in the present place, is to consider generally the physiological action of mercury, and the principles by which its administration should be regulated; while its effects, as modified in its different combinations, will be more properly noticed under the head of each preparation individually.

Of the modus operandi of mercury we know nothing, except that it probably acts through the medium of the circulation, and that it possesses a peculiar alterative power over the vital functions, which enables it in many cases to subvert diseased actions by substituting its own in their stead. This alterative power is sometimes exerted, without being attended with any other vital phenomenon than the removal of disease; while at other times it is attended with certain obvious effects, indicative of the agency of a potent stimulus. In the latter case, its operation is marked by a quickened circulation, by a frequent, jerking pulse, by an increased activity imparted to all the secretory functions, particularly those of the salivary glands and the liver, by an exaltation of nervous sensibility, and, in short, by a general excitation of the organic actions of the system.

When mercury acts insensibly as an alterative, there is not the least apparent disturbance of the circulation. When it operates decidedly and obviously, it is very prone to let the brunt of its action fall upon the salivary glands, causing, in many instances, an immoderate flow of saliva, and constituting the condition denominated ptyalism or salivation. Under these circumstances, to the alterative effects of the mineral are added those of depletion and revulsion. In the saliva discharged as a consequence of its action, mercury has been detected by chemical tests. Occasionally its depletory action is exhibited in an increased secretion of urine, or an immoderate flow of the bile; and, where ptyalism cannot be induced, and either of these secretions becomes considerably augmented, the circumstance may be held equally conclusive of the constitutional impres-

sion of the mercury, as if the mouth had been affected. Mercury has been found in the urine of those under the influence of corrosive sublimate, by M. Audouard. It has, indeed, been detected in most of the solids and fluids of the body, including the blood. When in the blood it cannot be detected by the ordinary tests, on account of its intimate union with the organic matter of that liquid. To discover it the blood must be subjected to destructive distillation. The liver is the organ which retains mercury the longest. It has been detected in that viscus, though absent in the lungs, heart, bile, and spinal marrow, in the body of a person who had long worked in mercury, but had desisted from the occupation for a year before death, on account of the occurrence of mercurial cachexy.

Mercury has been used in almost every disease, but too often empirically, and without the guidance of any recognised therapeutic principle. Nevertheless, its efficacy in certain classes of diseases is universally acknowledged. In functional derangement of the digestive organs, mercurials in minute doses often exert a salutary operation, subverting the morbid action, and that too by their insensible alterative effect, without affecting the mouth. In these cases no decided disturbance of the vital functions takes place; but the alvine discharges, if clay-coloured, are generally restored to their natural hue, a certain proof that the remedy is stimulating the liver, and promoting the secretion of the bile. Indeed, there is no fact better established in medicine than that of the influence of the mercurial preparations over the hepatic system; and, whether the liver be torpid and obstructed as in jaundice, or pouring out a redundancy of morbid bile as in melæna, its judicious use seems equally efficacious in unloading the viscus, and restoring its secretion to a healthy state. In the acute and chronic hepatitis of India it is considered almost a specific; but here its use must be generally preceded by bleeding, and carried to the extent of exciting ptyalism. In chronic inflammation of the mucous and serous membranes, the alterative effects of mercury are sometimes attended with much benefit. In many of these cases effusion has taken place; and under these circumstances the mercury often proves useful, as well by promoting the absorption of the effused fluid, as by removing the chronic inflammation on which the effusion depends. Hence it is that this metal is often given with advantage in chronic forms of meningitis, bronchitis, pleuritis, pneumonia, dysentery, rheumatism, &c., and in hydrocephalus, hydrothorax, ascites, and general dropsy.

Mercury may also be advantageously resorted to in certain states of febrile disease. In some forms of the remittent fever of our own country, a particular stage of its course is marked by a parched tongue, torpor of the bowels, scanty urine, and dryness of the surface. Here depletion by the lancet or leeches is often inadmissible, and the measure most to be relied on is the judicious employment of mercury. It acts in such cases by increasing the secretions and stimulating the exhalant capillaries, and, perhaps, by producing a new impression, incompatible with the disease.

In syphilitic affections, mercury, until of late years, was held to be an indispensable specific. Of its mode of action in these affections we know nothing, except that it operates by substituting its own peculiar impression for that of the disease. Without entering into the question of the necessity or non-necessity of mercury in venereal complaints, as out of place in this work, we are free to admit that the discussion which has grown out of it has shown that this remedy has sometimes been unnecessarily resorted to in affections resembling syphilis, though of a different character; and that the disease in question ought to be treated less empirically, and more in accordance with the general principles of combating morbid action in other parts. Mercury exerts a peculiar control over the deleterious effects of lead; and hence, in colica pictonum, it is accounted by some writers to act almost as a specific.

For inducing the specific effects of mercury on the constitution, blue pill or calomel is generally resorted to. In order to produce what we have called the insensible alterative effects of the metal, from half a grain to a grain of blue pill may be given in the twenty-four hours, or from a sixth to a fourth of a grain of calomel; or if a gentle ptyalism be our object, two or three grains of the former, or a grain of the latter, two or three times a day. Where the bowels are peculiarly irritable, it is often necessary to introduce the metal by means of frictions with mercurial ointment; and where a speedy effect is desired, the internal and external use of the remedy may be simultaneously resorted to.

The first observable effects of mercury in inducing ptyalism are a coppery taste in the mouth, a slight soreness of the gums, and an unpleasant sensation in the sockets of the teeth, when the jaws are firmly closed. Shortly afterwards the gums begin to swell, a line of whitish matter is seen along their edges, and the breath is infected with a peculiar and very disagreeable smell, called the mercurial fetor. The saliva at the same time begins to flow; and, if the affection proceeds, the gums, tongue, throat, and face are much swollen; ulcerations attack the lining membrane of the mouth and fauces; the jaws become excessively painful; the tongue is coated with a thick whitish fur; and the saliva flows in streams from the mouth. It occasionally happens that the affection thus induced in the mouth proceeds to a dangerous extent, inducing extensive ulceration, gangrene, and even hemorrhage. The best remedies are the various astringent and detergent gargles, used weak at first, as the parts are extremely tender. In cases attended with swelling and protrusion of the tongue, the wash is best applied by injection, by means of a large syringe. We have found lead-water among the best local applications in these cases; and dilute solutions of chlorinated soda or of chlorinated lime, while they correct the fetor, will be found to exert a curative influence on the ulcerated surfaces.

While the system is under the action of mercury, the blood is more watery than in health, less charged with albumen, fibrin, and red globules, and loaded with a fetid fatty matter. (*Dr. S. Wright*, quoted by *Christison.*) When drawn from a vein, it exhibits the same appearance as in inflammation.

In the foregoing observations we have described the ordinary effects of mercury; but occasionally, in peculiar constitutions, its operation is quite different, being productive of a dangerous disturbance of the vital functions. The late Mr. Pearson has given a detailed account of this occasional peculiarity in the operation of mercury, in his work on the venereal disease. The symptoms which characterize it are a small frequent pulse, anxiety about the præcordia, pale and contracted countenance, great nervous agitation, and alarming general debility. Their appearance is the signal for discontinuing the mercury; as a further perseverance with it might be attended with fatal consequences. Mercury also produces a peculiar eruption of the skin, which is described by systematic writers under the various names of *hydrargyria*, *eczema mercuriale*, and *lepra mercurialis.*

Those who work in mercury, and are therefore exposed to its vapours, such as water-gilders, looking-glass silverers, and quicksilver miners, are injured seriously in their health, and not unfrequently affected with shaking palsy, attended with vertigo and other cerebral disorders.

Mercury is sometimes given in the metallic state, in the quantity of a pound or two, in obstruction of the bowels, to act by its weight: but the practice is of doubtful advantage.

Mercury in solution is detected with great delicacy by the use of Smithson's battery, which consists of a plate of tin, lined with one of gold, in the form of a spiral. When immersed in a mercurial solution, this galvanic combination causes the precipitation of the mercury on the gold, which consequently contracts a white stain. In order to be sure that the stain is caused by mercury, the metal is volatilized in a small tube, so as to obtain a characteristic globule. MM. Danger and

Flandin have improved on Smithson's process. (See *Chem. Gaz.*, No. 61, p. 191.) A minute portion of any of the preparations of mercury, either in the solid state or in concentrated solution, being placed on a bright plate of copper, and a drop of a strong solution of iodide of potassium added, a silvery characteristic stain will immediately appear on the copper. (*Arthur Morgan*, of Dublin.)

Pharmaceutical Preparations. Mercury is officinal:—

I. In the metallic state.

Hydrargyrum, *U. S.*, *Lond.*, *Ed.*, *Dub.*

Hydrargyrum Purum, *Dub.*

Emplastrum Hydrargyri, *U. S.*, *Lond.*, *Ed.*, *Dub.*

Emplastrum Ammoniaci cum Hydrargyro, *U. S.*, *Lond.*, *Dub.*; Emplastrum Ammoniaci et Hydrargyri, *Ed.*

Hydrargyrum cum Cretâ, *U. S.*, *Lond.*, *Ed.*, *Dub.*

Hydrargyrum cum Magnesiâ, *Dub.*

Pilulæ Hydrargyri, *U. S.*, *Ed.*, *Dub.*; Pilula Hydrargyri, *Lond.* Anglicè, *Blue pill.*

Unguentum Hydrargyri, *U. S.*, *Lond.*, *Ed.*, *Dub.* Anglicè, *Mercurial ointment.*

Ceratum Hydrargyri Compositum, *Lond.*

Linimentum Hydrargyri, *Lond.*; Linimentum Hydrargyri Compositum, *Dub.*

II. Protoxidized.

Hydrargyri Oxidum Nigrum, *U. S.*

III. Deutoxidized.

Hydrargyri Oxidum Rubrum, *U. S.*, *Ed.*; Hydrargyri Nitrico-Oxidum, *Lond.*; Hydrargyri Oxydum Rubrum, *Dub.* Anglicè, *Red precipitate.*

Unguentum Hydrargyri Oxidi Rubri, *U. S.*; Unguentum Hydrargyri Nitrico-Oxidi, *Lond.*; Unguentum Oxidi Hydrargyri, *Ed*; Unguentum Hydrargyri Oxydi Rubri, *Dub.*

IV. Sulphuretted.

Hydrargyri Sulphuretum Nigrum, *U. S.* Anglicè, *Ethiops mineral.*

Hydrargyri Sulphuretum Rubrum, *U. S*; Hydrargyri Bisulphuretum, *Lond.*; Cinnabaris, *Ed.* Anglicè, *Cinnabar.*

V. As a protochloride.

Hydrargyri Chloridum Mite, *U. S.*; Hydrargyri Chloridum, *Lond.*; Calomelas, *Ed.*, *Dub.* Anglicè, *Calomel.*

Pilulæ Calomelanos Compositæ, *Ed.*, *Dub.*; Pilula Hydrargyri Chloridi Composita, *Lond.*

Pilulæ Calomelanos et Opii, *Ed.*

Pilulæ Catharticæ Compositæ, *U. S.*

Pilulæ Hydrargyri Chloridi Mitis, *U. S.*

VI. As a bichloride.

Hydrargyri Chloridum Corrosivum, *U. S.*; Hydrargyri Bichloridum, *Lond.*; Sublimatus Corrosivus, *Ed.*; Sublimatum Corrosivum, *Dub.* Anglicè, *Corrosive sublimate.*

Liquor Hydrargyri Bichloridi, *Lond.*

Hydrargyrum Ammoniatum, *U. S.*; Hydrargyri Ammonio-Chloridum, *Lond.*, *Dub.*; Hydrargyri Precipitatum Album, *Ed.* Anglicè, *White precipitate.*

Unguentum Hydrargyri Ammoniati, *U. S.*; Unguentum Hydrargyri Ammonio-Chloridi, *Lond.*; Unguentum Precipitati Albi, *Ed.*

Unguentum Sulphuris Compositum, *U. S.*

VII. COMBINED WITH IODINE.

Hydrargyri Iodidum, *U. S., Lond.;* Hydrargyri Iodidum Viride, *Dub.*

Unguentum Hydrargyri Iodidi, *Lond.*

Hydrargyri Iodidum Rubrum, *U. S., Dub.* Hydrargyri Biniodidum, *Ed.*

Liquor Arsenici et Hydrargyri Iodidi, *U. S.;* Arsenici et Hydrargyri Hydriodatis Liquor, *Dub.* Anglicè, *Donovan's solution.*

Unguentum Hydrargyri Iodidi Rubri, *Dub.*

VIII. COMBINED WITH CYANOGEN.

Hydrargyri Cyanuretum, *U. S.*

IX. OXIDIZED AND COMBINED WITH ACIDS.

Hydrargyri Pernitratis Liquor, *Dub.*

Unguentum Hydrargyri Nitratis, *U. S., Lond.;* Unguentum Citrinum, *Ed.;* Unguentum Hydrargyri Nitratis, vel Unguentum Citrinum, *Dub.* Anglicè, *Citrine ointment.*

Unguentum Hydrargyri Nitratis Mitius, *Lond.*

Hydrargyri Sulphas, *Dub.*

Hydrargyri Sulphas Flavus, *U. S.* Anglicè, *Turpeth mineral.*

B.

HYOSCYAMI FOLIA. *U. S.*

Henbane Leaves.

The leaves of Hyoscyamus niger. *U. S.*

Off. Syn. HYOSCYAMUS. The recent and dried cauline leaves of the biennial herb. *Lond.* The leaves. *Ed., Dub.*

HYOSCYAMI SEMEN. *U. S.*

Henbane Seed.

The seeds of Hyoscyamus niger. *U. S.*

Jusquiame noire, *Fr.;* Schwarzes Bilsenkraut, *Germ.;* Giusquiamo nero, *Ital.;* Beleno, *Span.*

HYOSCYAMUS. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Solanaceæ.

Gen. Ch. Corolla funnel-form, obtuse. *Stamens* inclined. *Capsules* covered with a lid, two-celled. *Willd.*

Hyoscyamus niger. Willd. *Sp. Plant.* i. 1010; Woodv. *Med. Bot.* p. 204, t. 76; Bigelow, *Am. Med. Bot.* i. 161; Carson, *Illust. of Med. Bot.* ii. 19, pl. 66. Henbane is usually a biennial plant, with a long, tapering, whitish, fleshy, somewhat branching root, bearing considerable resemblance to that of parsley, for which it has been eaten by mistake. The stem, which rises in the second year, is erect, round, branching, from one to four feet in height, and thickly furnished with leaves. These are large, oblong-ovate, deeply sinuated, with pointed segments, undulated, soft to the touch, and at their base embrace the stem. The upper leaves are generally entire. Both the stem and leaves are hairy, viscid, and of a sea-green colour. The flowers form long, one-sided leafy spikes, which terminate the branches, and hang downwards. They are composed of a calyx with five pointed divisions, a funnel-shaped corolla, with five unequal, obtuse segments at the border, five stamens inserted into the tube of the corolla, and a pistil with a blunt, round stigma. Their colour is an obscure yellow, beautifully variegated with purple veins. The fruit is a globular two-celled capsule, covered with a lid, invested with the persistent calyx, and containing nume-

rous small seeds, which are discharged by the horizontal separation of the lid. The whole plant has a rank offensive smell.

The *H. niger* is susceptible of considerable diversity of character, causing varieties which have by some been considered as distinct species. Thus, the plant is sometimes annual, the stem simple, smaller, and less downy than in the biennial plant, the leaves more deeply incised and less hairy and viscid, and the flowers often yellow without the purple streaks. It is not known whether any difference of medical properties is connected with these diversities of character; but the London College directs the biennial variety.

The plant is found in the northern and eastern sections of the United States, occupying waste grounds in the older settlements, particularly graveyards, old gardens, and the foundations of ruined houses. It grows in great abundance about Detroit, and we have seen a specimen brought from the ruins of Ticonderoga. It is rare, however, in this country, of which it is not a native, having been introduced from Europe. In Great Britain, and on the continent of Europe, it grows abundantly along the roads, around villages, amidst rubbish, and in uncultivated places. Both varieties are cultivated in England. The annual plant flowers in July or August, the biennial in May or June.

The *H. albus*, so named from the whiteness of its flowers, is used in France indiscriminately with the former species, which it resembles exactly in medicinal properties.

All parts of *Hyoscyamus niger* are active. The leaves are usually employed, but both these and the seeds are recognised in the U. S. Pharmacopœia. Much of the efficacy of henbane depends upon the time at which it is gathered. The leaves should be collected soon after the plant has flowered. In the biennial plant, those of the second year are said to be greatly preferable to those of the first. The latter, according to Dr. Houlton, are less clammy and fetid, yield less extractive, and are medicinally much less efficient. It is said that the plant is sometimes destroyed by severe winters in England, and that no leaves of the second year's growth are obtainable. This is, perhaps, one of the causes of the great inequality of strength and uncertainty of the medicine as found in the shops. The root also is said to be much more poisonous in the second year than in the first.

Properties. The recent leaves have, when bruised, a strong, disagreeable, narcotic odour, somewhat like that of tobacco. Their taste is mucilaginous and very slightly acrid. When dried, they have little smell or taste. Thrown upon the fire they burn with a crackling noise, as if they contained a nitrate, and at the same time emit a strong odour. Their virtues are completely extracted by diluted alcohol. The watery infusion is of a pale-yellow colour, insipid, with the narcotic odour of the plant. The leaves were analyzed by Lindbergsen, who obtained from them a narcotic principle. The seeds are very small, roundish, compressed, somewhat kidney-shaped, a little wrinkled, of a gray or yellowish-gray colour, of the odour of the plant, and an oleaginous bitterish taste. Analyzed by Brandes, they yielded 24·2 per cent. of fixed oil, 1·4 of a solid fatty substance, traces of sugar, 1·2 of gum, 2·4 of bassorin, 1·5 of starch, 3·4 of a substance soluble in water, insoluble in alcohol, and precipitated by infusion of galls (phyteumacolla, *Brandes*), 4·5 of albumen, 26·0 of vegetable fibre, 24·1 of water, and 9·7 of salts, including the malate of an alkaline principle called *hyoscyamin* or *hyoscyamia*. But the process employed by Brandes for separating this principle has not succeeded in other hands; and it is doubtful whether the substance obtained by him was really what he supposed it to be. Geiger and Hesse were the first to demonstrate the existence of an organic alkali in hyoscyamus. Its extraction from the plant is somewhat difficult, in consequence of its tendency to undergo change by the contact of alkaline solutions, which render it very soluble in water.

The following is the process of these chemists. The seeds are macerated in alcohol; the tincture obtained is evaporated by a very gentle heat, decolorized by repeated additions of lime and sulphuric acid, with filtration after each addition, and then still further concentrated by evaporation; an excess of powdered carbonate of soda is added, and the precipitate produced is separated, as speedily as possible, from the alkaline carbonate by expressing and treating it with absolute alcohol, while the mother waters are at the same time treated with ether; the alcoholic and ethereal liquors are united, again treated with lime, filtered, decolorized with animal charcoal, and evaporated by a very gentle heat. If the hyoscyamia now deposited should still be coloured, it will be necessary to combine it anew with an acid, and to treat as before, in order to obtain it quite pure. The product is very small.

Hyoscyamia crystallizes in colourless, transparent, silky needles, which are without odour, of an acrid disagreeable taste, slightly soluble in water, very soluble in alcohol and ether, and volatilizable with little change if carefully distilled. It is quickly altered by contact with water and an alkali, and when heated with potassa or soda is completely decomposed, with the disengagement of ammonia. It neutralizes the acids, forming with them crystallizable salts, and is precipitated by the infusion of galls. Both the alkali and its salts are very poisonous; and the smallest quantity, introduced into the eye, produces a dilatation of the pupil, which continues a long time.

Henbane leaves yield, by destructive distillation, a very poisonous empyreumatic oil.

Medical Properties and Uses. Hyoscyamus ranks among the narcotics. In moderate quantities it gently accelerates the circulation, increases the general warmth, occasions a sense of heat in the throat, and after a short period induces sleep. This action is sometimes attended with vertigo, pain in the head, and dilated pupils; and the medicine occasionally acts as a diaphoretic or diuretic, and even produces a pustular eruption. It does not constipate like opium, but, on the contrary, often proves laxative. In over-doses it powerfully irritates the brain and alimentary canal, causing dilatation of the pupil, disordered vision, loss of speech, delirium or stupor, convulsions, paralysis, pain in the bowels, diarrhœa, great arterial prostration, petechiæ, and other alarming symptoms, which sometimes end in death. Dissection exhibits marks of inflammation of the stomach and bowels. The poisonous effects are to be counteracted in the same manner as those of opium. Numerous instances might be adduced from authors to prove the deleterious influence of all parts of *H. niger*, when largely taken. The seeds are said to be most powerful. Upon inferior animals its effects are not always the same. Though fatal to birds and dogs, the leaves are eaten with entire impunity by horses, cows, sheep, goats, and swine. It is not impossible that injury has in some cases resulted from the use of milk, derived from cows or goats which had been feeding on henbane.

The remedial operation of hyoscyamus is anodyne and soporific. The medicine was known to the ancients, and was employed by some of the earlier modern practitioners; but had fallen into disuse, and was almost forgotten, when Baron Störck again introduced it into notice. By this celebrated physician and some of his successors it was prescribed in numerous diseases, and, if we may credit their testimony, with the happiest effects; but subsequent experience of its operation has been such as very much to narrow the extent of its application. It is at present used almost exclusively to relieve pain, procure sleep, or quiet irregular nervous action; and is not supposed to exercise any specific curative influence over particular diseases. Even for the purposes which it is calculated to answer, it is infinitely inferior to opium or its preparations; and is generally resorted to only in cases in which the latter remedy is from peculiar circumstances deemed

inadmissible. Hyoscyamus has one great advantage over opium in certain cases, that it has no tendency to produce constipation. The diseases to which it is applicable it would be useless to enumerate, as there are few complaints in which circumstances might not be such as to call for its employment. Neuralgic and spasmodic affections, rheumatism, gout, hysteria, and various pectoral diseases, as catarrh, pertussis, asthma, phthisis, &c., are among those in which it is most frequently prescribed. It is also much used in connexion with griping purgative medicines, the disagreeable effects of which it is thought to counteract. The Edinburgh *pills of colocynth and henbane* are formed upon this principle. In Europe, where the fresh leaves are readily obtained, it is often applied externally in the shape of lotion, cataplasm, or fomentation, to allay pain and irritation, in scrofulous or cancerous ulcers, scirrhous, hemorrhoidal, or other painful tumours, gouty and rheumatic swellings, and nervous headache. The smoke of the leaves or seeds has also been used in toothache; but the practice is deemed hazardous. Henbane is used by European oculists for dilating the pupil, previously to the operation for cataract. For this purpose an infusion of the leaves, or a solution of the extract, is dropped into the eye. The effect is usually greatest at the end of four hours from the time of application, and in twelve hours ceases entirely. Vision is not impaired during its continuance. Reisinger recommends a solution of hyoscyamia in the proportion of one grain to twenty-four of water, of which one drop is to be applied to the eye.

Henbane may be given in substance, extract, or tincture. The dose of the powdered leaves is from five to ten grains; that of the seeds somewhat smaller. The common extract, or inspissated juice of the fresh leaves (*Extractum Hyosciami, U. S.*), is exceedingly variable and precarious in its operation, being sometimes active, sometimes almost inert. The usual dose is two or three grains, repeated and gradually increased till the desired effect is obtained. Cullen rarely procured the anodyne operation of the medicine till he had carried the dose to eight, ten, or even fifteen or twenty grains. Collins pushed it to thirty-six grains; and Professor Fouquier, who experimented largely with hyoscyamus in the Hôpital de la Charité, gave two hundred and fifty grains of the extract during twenty-four hours, without any specific or curative impression. (Richard, *Elem. Hist. Nat. Méd.*) The alcoholic extract prepared from the recently dried leaves (*Extractum Hyoscyami Alcoholicum, U. S.*) is said to be more certain and effectual. The dose of this to begin with is one or two grains, which may be increased gradually to twenty or thirty grains. The dose of the tincture is one or two fluidrachms. A fluid extract is recommended by Mr. C. A. Smith, of Cincinnati, prepared in the usual method with alcohol and sugar, and of such strength that a fluidrachm shall represent from four to six grains of the extract. (*Am. Journ. of Pharm.*, xxv. 410.) A good plan in administering any of the preparations is to repeat the dose every hour or two till its influence is felt.

Off. Prep. Extractum Hyoscyami; Extractum Hyoscyami Alcoholicum; Tinctura Hyoscyami. W.

ICHTHYOCOLLA. *U. S.*

Isinglass.

The swimming bladder of Acipenser Huso, and other species of Acipenser. *U. S.*

Fish-glue; Ichthyocolle, colle de poisson, *Fr.;* Hausenblase, Fischleim, *Germ.;* Colla di pesce, *Ital.;* Cola de pescado, *Span.*

Isinglass is a gelatinous substance, prepared chiefly from the sounds or swimming bladders of fishes, especially those of different species of sturgeon. Though no longer retained by the British Colleges in their officinal catalogues, it still

has a place in the U. S. Pharmacopœia, and, being universally kept in the shops, claims a brief notice in the present work.

In most fishes there is a membranous bag, placed in the anterior part of the abdomen, communicating frequently, though not always, by means of a duct, with the œsophagus or stomach, and containing usually a mixture of oxygen and nitrogen gases in various proportions. From the supposition that it was intended by its expansion or contraction to enable the fish to rise or sink in the water, it has been denominated *swimming bladder.* It is of different shape in different fishes, and consists of three coats, of which the two interior are thin and delicate, the outer tough and of a silvery whiteness.

The *Acipenser Huso*, or *beluga* of the Russians, is particularly designated by the Pharmacopœia as the species of sturgeon from which isinglass is procured; but three others, the *A. Ruthenus*, or sterlet, *A. sturio*, or common sturgeon, and *A. stellatus*, or starred sturgeon, also furnish large quantities to commerce. All these fish inhabit the interior waters of Russia, especially the Wolga, and other streams which empty into the Caspian Sea. Immense quantities are annually taken and consumed as food by the Russians. The air-bags are removed from the fish, and, having been split open and washed in water in order to separate the blood, fat, and adhering extraneous membranes, are spread out, and when sufficiently stiffened are formed into cylindrical rolls, the ends of which are brought together and secured by pegs. The shape given to the roll is that of a staple, or more accurately that of a lyre, which it firmly retains when dried. Thus prepared it is known in commerce by the name of *staple isinglass*, and is distinguished into the *long* and *short staple.* Sometimes the membranes are dried in a flat state, or simply folded, and then receive the name of *leaf* or *book isinglass.* The scraps or fragments of these varieties, with various other parts of the fish, are boiled in water, which dissolves the gelatin, and upon evaporation leaves it in a solid state. This is called *cake isinglass*, from the shape which it is made to assume. It is sometimes, however, in globular masses. Of these varieties, the *long staple* is said to be the best; but the finest *book isinglass* is not surpassed by any brought to this country. It is remarkable for its beautiful iridescence by transmitted light. One hundred grains of this isinglass dissolve in ten ounces of water, forming a tremulous jelly when cold, and yield but two grains of membranous insoluble residuum. That in *cakes* is brownish, of an unpleasant odour, and employed only in the arts. Inferior kinds, with the same commercial titles, are said to be prepared from the peritoneum and intestines of the fish. An inferior Russian product, known in English commerce by the name of *Samovey isinglass*, is procured, according to Pereira, from the *Silurus Glanis.* It comes, like the better kind, in the shape of *leaf*, *book*, and *short staple.* (*Am. Journ. of Pharm.*, xviii. 54.)

Isinglass, little inferior to the Russian, is made in Iceland from the sounds of the cod and ling.

We receive from Brazil the air-bladders of a large fish, prepared by drying them in their distended state. They are oblong, tapering, and pointed at one end, bifid with the remains of their pneumatic duct at the other, and of a firm consistence. The Brazilian isinglass is inferior to the Russian.

Considerable quantities are manufactured in New England from the intestines of the cod, and of some of its allied fishes. This sort is in the form of thin ribbons several feet in length, and from an inch and a half to two inches in width. One hundred grains dissolve almost entirely in water, leaving but two grains of insoluble membrane, and form a tremulous jelly when cold with eight ounces of water. It is, therefore, as pure and nearly as strong a gelatin as the Russian isinglass, but retains a fishy taste and odour, which render it unfit for culinary or medicinal purposes.

Isinglass of a good quality has also been made in New York, from the sounds of the weak fish — *Otolithus regalis* of Cuvier (Storer, *Rep. on Fishes of Mass.*, p. 33) — and perhaps of other fishes caught in the neighbourhood. The sounds are dried whole, or merely split open, and vary much in size and texture, weighing from a drachm up to an ounce.

An article called "*refined or transparent isinglass*," is made by dissolving the New England isinglass in hot water, and spreading the solution to dry on oiled muslin. It is in very thin transparent plates, and is an excellent glue, but retains a strong fishy odour.

A preparation called *Cooper's gelatin* has been introduced as a substitute for isinglass in making jellies. It appears to be the dried froth of a solution of pure bone glue.

Most of the above facts, in relation to American isinglass, were derived from papers by D. B. Smith, in the *Journ. of the Phil. Col. of Pharm.* (iii. 17 and 92).

Isinglass is sometimes kept in the shops cut into fine shreds, and is thus more easily acted on by boiling water.

Properties. In its purest form it is whitish, semi-transparent, of a shining, pearly appearance, and destitute of smell and taste. The inferior kinds are yellowish and more opaque. In cold water it softens, swells up, and becomes opalescent. Boiling water entirely dissolves it, with the exception of a minute proportion of impurities, amounting, according to Mr. Hatchet, to less than two per cent. The solution on cooling assumes the form of a jelly, which consists of pure gelatin and water. Isinglass is in fact the purest form of *gelatin* with which we are acquainted, and may be used whenever this principle is required as a test. It is insoluble in alcohol, but is dissolved readily by most of the diluted acids, and by alkaline solutions. It has a strong affinity for tannin, with which it forms an insoluble compound. Boiled with concentrated sulphuric acid, it is converted into a peculiar saccharine matter, called *glycocoll*, or *sugar of gelatin*. Its aqueous solution speedily putrefies.

An ingenious adulteration of isinglass has been practised in London, apparently by rolling a layer of gelatin between two layers of the genuine substance. This may be detected by the disagreeable odour and taste of the adulterated drug, and by the effects of water upon it. Genuine isinglass, cut into shreds and treated with water, becomes opalescent and more opaque than before; while the shreds, though they soften and swell, remain unbroken, and, when examined by the microscope, are seen to be decidedly fibrous. Gelatin, on the contrary, when similarly treated, becomes more transparent than before, the shreds are disintegrated, and the structure appears amorphous under the microscope. In the adulterated article, both these characters are presented in layers more or less distinct. (*Pharm. Journ. and Trans.*, ix. 505.)

A *false isinglass* has been imported into England from Para, in Brazil, consisting of the dried ovary of a large fish. It has somewhat the form of a bunch of grapes, consisting of ovoid or roundish masses, attached by a footstalk to a central axis. It is not gelatinous, and is unfit for the purposes to which isinglass is applied. (See *Am. Journ. of Pharm.*, xxv. 144.)

Medical Properties and Uses. Isinglass has no peculiar medical properties. It may be given internally, in the form of jelly, as a highly nutritious article of diet; but it has no advantages over the jelly prepared from calves-feet. Three drachms impart sufficient consistency to a pint of water. It is employed for clarifying liquors, and imparting lustre to various woven fabrics. Added in small quantities to vegetable jellies, it gives them a tremulous appearance, which they want when unmixed. As a test of tannin it is used in solution, in the proportion of a drachm to ten fluidounces of distilled water. It forms the basis of the *English court-plaster*. W.

INULA. *U. S. Secondary, Lond.*

Elecampane.

The root of Inula Helenium. *U. S., Lond.*

Aunée, *Fr.;* Alantwurzel, *Germ.;* Enula campana, *Ital., Span.*

INULA. *Sex. Syst.* Syngenesia Superflua. — *Nat. Ord.* Compositæ-Asteroideæ, *De Cand.* Asteraceæ, *Lindley.*

Gen. Ch. Receptacle naked. *Seed-down* simple. *Anthers* ending in two bristles at the base. *Willd.*

Inula Helenium. Willd. *Sp. Plant.* iii. 2089; Woodv. *Med. Bot.* p. 64, t. 26. Elecampane has a perennial root, and an annual stem, which is round, furrowed, villous, leafy, from three to six feet high, and branched near the top. The leaves are large, ovate, serrate, crowded with reticular veins, smooth and deep-green upon the upper surface, downy on the under, and furnished with a fleshy midrib. Those which spring directly from the root are petiolate, those of the stem sessile and embracing. The flowers are large, of a golden-yellow colour, and stand singly at the ends of the stem and branches. The calyx exhibits several rows of imbricated ovate scales. The florets of the ray are numerous, spreading, linear, and tridentate at the apex. The seeds are striated, quadrangular, and furnished with a simple somewhat chaffy pappus.

This large and handsome plant is a native of Europe, where it is also cultivated for medical use. It has been introduced into our gardens, and has become naturalized in some parts of the country, growing in low meadows, and on the roadsides, from New England to Pennsylvania. It flowers in July and August. The roots, which are the officinal part, should be dug up in autumn, and in the second year of their growth. When older they are apt to be stringy and woody.

The fresh root of elecampane is very thick and branched, having whitish cylindrical ramifications, which are furnished with thread-like fibres. It is externally brown, internally whitish and fleshy; and the transverse sections present radiating lines. The dried root, as found in the shops, is usually in longitudinal or transverse slices, and of a grayish colour internally. The smell is slightly camphorous, and, especially in the dried root, agreeably aromatic. The taste, at first glutinous and said to resemble that of rancid soap, becomes, upon chewing, warm, aromatic, and bitter. Its medical virtues are extracted by alcohol and water, the former becoming most strongly impregnated with its bitterness and pungency. A peculiar principle, resembling starch, was discovered in elecampane by Valentine Rose, of Berlin, who named it *alantin;* but the title *inulin*, proposed by Dr. Thomson, has been generally adopted. It differs from starch in being deposited unchanged from its solution in boiling water when the liquor cools, and in giving a yellowish instead of a blue colour with iodine. It has been found in the roots of several other plants. Besides this principle, elecampane contains, according to John, a white, concrete substance, called *helenin*, intermediate in its properties between the essential oils and camphor, and separable by distillation with water; a bitter extractive, soluble in water and alcohol; a soft, acrid, bitter resin, having an aromatic odour when heated; gum; albumen; lignin; traces of volatile oil; a little wax; and various saline substances. If water be added to a tincture made by boiling the fresh root in alcohol, the liquid becomes turbid, and, in twenty-four hours, long white crystals of pure helenin are formed, leaving very little in solution. (*Archiv. der Pharm.*, lx. 30.)

Medical Properties and Uses. Elecampane is tonic and gently stimulant, and has been supposed to possess diaphoretic, diuretic, expectorant, and emmenagogue properties. By the ancients it was much employed, especially in the com-

plaints peculiar to females; and it is still occasionally resorted to in amenorrhœa. In this country it is chiefly used in chronic diseases of the lungs, and is sometimes beneficial when the affection of the chest is attended with weakness of the digestive organs, or with general debility. From a belief in its deobstruent and diuretic virtues, it was formerly prescribed in chronic engorgements of the abdominal viscera, and the dropsy to which they so often give rise. It has also been highly recommended both as an internal and external remedy in tetter, psora, and other diseases of the skin. The usual modes of administration are in powder and decoction. The dose of the former is from a scruple to a drachm. The decoction may be prepared by boiling half an ounce of the root in a pint of water, and given in the dose of one or two fluidounces.

Off. Prep. Confectio Piperis. W.

IODINIUM. *U. S., Lond., Dub.*

Iodine.

Off. Syn. IODINEUM. *Ed.*

Iode, *Fr.;* Jod, *Germ.;* Iodina, *Ital., Span.*

Iodine is a non-metallic element, discovered in 1812 by Courtois, a soda manufacturer of Paris. It exists in certain marine vegetables, particularly the fuci or common sea-weeds, and in some fresh-water plants, among which are the water-cress, brooklime, and fine-leaved water-hemlock. (*Chatin.*) It has also been detected in the beet-root of the Grand Duchy of Baden. (*Lamy.*) M. Chatin announced the presence of iodine in the atmosphere and in rain-water; but the negative results of Mr. S. Macadam, obtained in some carefully conducted experiments, disprove the assertion of M. Chatin, who was misled by the use of fixed alkalies containing iodine. Similar negative results have been obtained by Dr. Lohmeyer, of Göttingen. Iodine is also found in the animal kingdom, as in the sponge, the oyster, various polypi, and cod-liver oil; and in the mineral kingdom, in sea-water in minute quantity, in certain salt springs, united with silver in a rare Mexican mineral, and in a zinc ore of Silesia. It has been detected by M. Genteles in the aluminous schists of Sweden, by Prof. Sigwart in bituminous slate, by M. Lembert in limestones, rich in fossil remains, and by M. Bussy and M. Duflos in coal. M. Bussy has recently obtained iodine, in the proportion of one part in five thousand, from the coal-gas liquor of the gas works of Paris. It was first discovered in the United States in the water of the Congress Spring, at Saratoga, by Dr. William Usher. It was detected in the Kenhawa saline waters, by the late Professor Emmet; and it exists in the bittern of the salt-works of western Pennsylvania, in the amount of about eight grains to the gallon. In sea-weeds, the iodine probably exists in the state of iodide of sodium. In different countries, sea-weeds are burned for the sake of their ashes; the product being a dark-coloured fused mass called *kelp*. This substance, besides carbonate of soda and iodide of sodium, contains more or less common salt, chloride of potassium, sulphate of soda, &c. The deep-sea fuci contain the most iodine; and, when these are burned at a low temperature for fuel, as is the case in the island of Guernsey, their ashes furnish more iodine than ordinary kelp. (*Graham.*) The *Fucus palmatus* of Linnæus (*Rhodymenia palmata*, Greville) is particularly rich in iodine. According to Dr. Geo. Kemp, the laminarian species, especially the Laminaria digitata, L, saccharina, and L. bulbosa, which are deep-water sea-weeds and contain more potassium than sodium, are particularly rich in iodine. In a paper on the extraction of iodine from sea-weeds, Dr. Kemp makes many useful suggestions, having chiefly in view the

prevention of the waste of the element, which takes place in the ordinary kelp process. (See his paper in the *Chem. Gaz.*, July 1, 1850.)

Preparation. It is from kelp that iodine is obtained, and that procured in Great Britain is chiefly manufactured in Glasgow. The kelp, which on an average contains a 224th part of iodine, is lixiviated in water, in which about half dissolves. The solution is concentrated to a pellicle, and allowed to cool, whereby nearly all the salts, except the iodide of sodium, are separated, they being less soluble than the iodide. The remaining liquor, which is dense and dark-coloured, is rendered sour by sulphuric acid, whereby carbonic acid, sulphuretted hydrogen and sulphurous acid are evolved, and sulphur is deposited. The liquor is now introduced into a leaden still, and distilled with deutoxide of manganese into a series of glass receivers, inserted into one another, in which the iodine is condensed. In this process the iodide of sodium is decomposed, and the iodine evolved; and the sulphuric acid, deutoxide of manganese, and sodium unite, so as to form the sulphate of protoxide of manganese, and sulphate of soda.

M. Emile Bechi has proposed the following method of extracting iodine from springs which contain it in small quantity. The water contained in a large vat is acidulated with a mixture of one part of sulphuric and two of nitric acid, to set free the iodine, and then passed through a large wooden filter, containing calcined lampblack, which absorbs the iodine, and allows all other matters to pass through. The iodurettted lampblack is then mixed into a paste with freshly precipitated hydrated protoxide of iron, and exhausted by water in a displacement apparatus. A solution of iodide of iron is thus obtained, which is treated with sulphate of copper, to precipitate iodide of copper. This is then heated, in the usual manner, with sulphuric acid and deutoxide of manganese, with the effect of disengaging the iodine. The lampblack, after having been used, is washed with weak muriatic acid, to separate any remains of iron, and, thus purified, is fit for a new operation. (*Journ. de Pharm.*, 3*e sér.*, xx. 5.)

Properties. Iodine is a soft, friable, opaque substance, in the form of crystalline scales, having a bluish-black colour and metallic lustre. It possesses a peculiar odour, somewhat resembling that of chlorine, and a hot acrid taste. Applied to the skin, it produces an evanescent yellow stain. Its sp. gr. is 4·9. It is a volatile substance, and evaporates even at common temperatures. When heated it evaporates more rapidly, and when the temperature reaches 225°, it melts and rises in a rich purple vapour, a property which suggested its name. Its vapour has the sp. gr. 8·7, and is the heaviest aëriform substance known. If inhaled mixed with air, it excites cough and irritates the nostrils. When it comes in contact with cool surfaces, it condenses in brilliant steel-gray crystals. Iodine is freely soluble in alcohol and ether, but requires 7000 times its weight of water to dissolve it. Its solution in water has no taste, a feeble odour, and a light-brown colour; in alcohol or ether, a nearly black hue. Its solubility in water is very much increased by the addition of certain salts, as the chloride of sodium, nitrate of ammonia, or iodide of potassium; and the same effect is produced, to some extent, by tannic acid. In chemical habitudes iodine resembles chlorine, but its affinities are weaker. Its equivalent number is 126·3. It combines with most of the non-metallic, and nearly all the metallic elements, forming the class of compounds called *iodides*. Some of these are officinal, as the iodides of iron, mercury, lead, potassium, and sulphur. It forms with oxygen one oxide, *oxide of iodine*, and three acids, the *iodous*, *iodic*, and *hyperiodic acids*, and with hydrogen, a gaseous acid, called *hydriodic acid*.

Iodine, in most cases, may be recognised by its characteristic purple vapour; but where this cannot be made evident, it is detected unerringly by starch, which produces with it a deep-blue colour. This test was discovered by Colin and Gaultier de Claubry, and is so delicate, that it will indicate the presence of iodine

in 450,000 times its weight of water. In order that the test may succeed, the iodine must be free and the solutions cold. To render it free when in combination, a little nitric acid must be added to the solution suspected to contain it. Thus, in testing urine for iodine, the secretion is mixed with starch, and acidulated with a drop or two of nitric acid, when, if iodine be present, the colour produced will vary from a light purple to a deep indigo blue, according to the amount of the element present. As a test for iodine, M. Rabourdin has proposed chloroform; by the use of which he supposes that the element may not only be detected in organic substances, but approximatively estimated. Thus, if 150 grains of a solution, containing one part in one hundred thousand of its weight of iodide of potassium, be treated with 2 drops of nitric and 15 or 20 drops of sulphuric acid, and afterwards shaken with 15 grains of chloroform, the latter acquires a distinct violet tint. M. Rabourdin applies his test to the detection of iodine in the several varieties of cod-liver oil. For this purpose he incinerates in an iron spoon 50 parts of the specimen of oil with 5 of *pure* caustic potassa, dissolved in 15 of water, and exhausts the cinder with the smallest possible quantity of water. The solution is filtered, and acidulated with nitric and sulphuric acids, and agitated with 4 parts of chloroform. After a time the chloroform subsides, having a violet colour more or less deep according to the proportion of iodine present. M. Lassaigne considers the starch test more delicate than that of chloroform. For detecting iodine in the iodides of the metals of the alkalies, he considers the bichloride of palladium as extremely delicate, producing brownish flocks of biniodides of palladium. According to M. Moride, benzine is a good test for free iodine, which it readily dissolves, forming a solution of a bright red colour, which is deeper in proportion to the amount of the iodine dissolved. As benzine does not dissolve either chlorine or bromine, it furnishes the means of separating iodine from these elements. Mr. D. S. Price has pointed out the nitrites as exceedingly sensitive tests of iodine, when in combination as an iodide. The suspected liquid is mixed with starch paste, acidulated with muriatic acid, and treated with a solution of nitrite of potassa. The iodine is set free, and a blue colour appears, more or less deep, according to the proportion of the iodine present. By this test iodine, forming the 1-400,000th part of an aqueous solution, may be detected. A similar test had been previously proposed by M. Grange.

Adulterations. Iodine is said to be occasionally adulterated with mineral coal, charcoal, plumbago, and black oxide of manganese. They are easily detected by their fixed nature, while pure iodine is wholly vaporizable. Herberger found native sulphuret of antimony in one sample, and plumbago in another; and Righini has detected as much as twenty-five per cent. of chloride of calcium. The presence of iodide of cyanogen has been noticed by F. Meyer and by T. Klobach. (See *Iodinium Purum.*) When present it rises at the commencement of the sublimation of the iodine in the form of white crystals, having a pungent odour. An impurity which is frequently present in commercial iodine is water. Before 1840, Dr. Christison had not met with any British iodine which did not contain from fifteen to twenty per cent. of moisture. If considerable, it is easily detected by the iodine adhering to the inside of the bottle. The Edinburgh College has given a test which detects all impurity beyond two per cent. It is founded upon the fact that pure iodine, diffused in water, forms a colourless solution of iodide of calcium and iodate of lime with a certain proportion of quicklime. Accordingly, an amount of quicklime is directed which is not quite sufficient to form a *colourless* solution with iodine, containing only two per cent. of impurity; and, hence, if the sample contain more impurity, the lime is competent to produce a solution without colour. With this explanation, the Edinburgh directions for applying the test will be understood. "Thirty-nine grains [of iodine] with nine grains of quicklime and three ounces of water, when heated short of ebullition,

slowly form a perfect solution, which is yellowish or brownish if the iodine be pure, but colourless if there be above two per cent. of water or other impurity."

Medical Properties. Iodine was first employed as a medicine in 1820, for the cure of goitre, by Dr. Coindet, Senior, of Geneva. It operates as a general excitant of the vital actions, but particularly of the absorbent and glandular systems. Its special effects are varied by its degree of concentration, state of combination, dose, &c.; and hence, under different circumstances of the remedy and of the system, it is deemed capable of acting as a corrosive, irritant, desiccant, tonic, diuretic, diaphoretic, and emmenagogue. It probably acts by passing into the circulation; at least it has been proved by Dr. A. Buchanan, of Glasgow, and other observers, that it enters into a number of the secretions, particularly the urine and saliva, not, however, in an uncombined state, but in that of hydriodic acid. Cantu detected it not only in the urine and saliva, but also in the sweat, milk, and blood, and always as hydriodic acid or an iodide. According to Dr. John C. Dalton, Jr., of Boston, iodine, taken in a single moderate dose, appears in the urine in thirty minutes, and may be detected for nearly twenty-four hours. In two cases in which large doses of iodide of potassium had been taken for six or eight weeks, and the medicine intermitted, all trace of iodine disappeared from the urine in eighty-four hours. From the latter observation, Dr. Dalton infers, as Becquerel had previously done, that iodine does not accumulate in the system, and that the constitutional effect of moderate doses is probably equal to that of large ones, the excess of the remedy constantly passing off by the kidneys.

The tonic operation of iodine is evinced by its increasing the appetite, which is the most constant effect of its use. Salivation is occasionally produced by it, and sometimes soreness of the mouth only. In some cases, pustular eruptions and coryza have been produced; effects most apt to occur when the remedy is given in the form of iodide of potassium. When taken in an over-dose it acts as an irritant poison. In doses of two drachms, administered to dogs, it produced irritation of the stomach, and death in seven days; and the stomach was found studded with numerous little ulcers of a yellow colour. In the dose of from four to six grains in man, it produces a sense of constriction in the throat, sickness and pain at the stomach, and at length vomiting and colic. Even when given in medicinal doses, it sometimes produces alarming symptoms; such as restlessness, palpitation, a sense of burning along the gullet, excessive thirst, acute pain in the stomach, vomiting and purging, violent cramps, and frequent pulse. The condition of the system, in which the poisonous effects of iodine are developed, is called *iodism.* Though this condition may be produced by incautious doses of the medicine, too long continued; still it sometimes arises, under other circumstances, from causes not well explained. On the other hand, large doses have been given for a long time with perfect impunity. This variable operation of iodine may in some measure be accounted for by the variable condition of the stomach, and by the more or less amylaceous character of the food; starch having the power of uniting with iodine and rendering it mild. Upon the appearance of the first symptoms of fever or general nervous disturbance, the remedy should be laid aside. Dr. Lugol, of Paris, has never observed these alarming effects to arise from the remedy, given in the doses and in the state of dilution in which he prescribed it. He has not found it to cause emaciation, hæmoptysis, pulmonary tubercles, or other bad effects. On the contrary, many of his patients gained flesh and improved in general health.

Notwithstanding this testimony, we have evidence that emaciation is sometimes produced by iodine; and that a long course of the remedy has in some instances occasioned absorption of the mammæ, and wasting of the testicles. In a case of obesity in a woman, reported by Dr. Betz, in which the mammæ were enormously enlarged, a cure was effected, in two months, under the daily use of

twenty drops of tincture of iodine. On the other hand, Dr. T. H. Silvester, who had the opportunity of making extensive observations in St. Thomas's Hospital, London, on the effects of iodine in the form of iodide of potassium, did not meet with a single instance of atrophy or absorption of the glands. Numerous cases of syphilitic peritonitis were successfully treated, enlarged testicles from a syphilitic cause were reduced, and chronic induration of the inguinal glands was removed; but in no case was atrophy or absorption of the breast or testicle observed. It would thus appear that iodine, as a general rule, does not affect the healthy glands, but acts upon morbid material, such as tumours, enlargements, and thickenings.

Iodine has been principally employed in diseases of the absorbent and glandular systems. In ascites it has been used with success by Dr. Baron. It is said not to act efficaciously while the abdomen is tense, and the absorbents consequently compressed, but operates after this condition is removed by tapping. Dr. Bardsley recommends it in that form of ascites which is connected with diseased liver. It has been used successfully by some British practitioners in ovarian tumours, but failed in the hands of others. In glandular enlargements and morbid growths, its use has proved more efficacious than, perhaps, in any other class of diseases. Dr. Coindet discovered its extraordinary power in promoting the absorption of the thyroid gland in bronchocele; and it has been used with more or less success in enlargements of the liver, spleen, mammæ, testes, and uterus. In induration and enlargement of the liver, where mercury has failed or is inadmissible, iodine forms our best resource. In chronic diseases of the uterus, attended with induration and enlargement, and in hard tumours of the cervix, and indurated puckerings of the edges of the os tincæ, iodine has occasionally effected cures, administered internally, and rubbed into the cervix in the form of ointment for ten or twelve minutes every night. The emmenagogue power of iodine has been noticed by several practitioners; and Dr. Lugol mentions instances, among his scrofulous patients, in which it cured obstructed and painful menstruation. It has been recommended in gleet, and also in gonorrhœa and leucorrhœa, after the inflammatory symptoms have subsided. In pseudo-syphilis, and in cachexy arising from the abuse of mercury, it is one of our best remedies, given in the form of iodide of potassium. In chronic rheumatism it is a favourite remedy with some, particularly in the form of iodide of potassium; and by Gendrin it has been employed in the acute forms of gout, with the effect, as he supposed, of cutting short the fits. Dr. Manson, as early as 1825, recorded cases of its efficacy in several nervous diseases, such as chorea and paralysis. In various scaly eruptions, the internal and external use of the preparations of iodine is very much relied on.

It is in scrofulous diseases that the most interesting results have been obtained by the use of iodine. Dr. Coindet first directed public attention to its effects in scrofula, and Dr. Manson reported a number of cases of this complaint in the form of enlarged glands, ulcers, and ophthalmia, in a large proportion of which the disease was either cured or meliorated. But we are indebted to Dr. Lugol for the most extended researches in relation to the use of iodine in the different forms of scrofula. This physician began his trials in the hospital Saint Louis in 1827, and made known his results in three memoirs published in 1829, 1830, and 1831. These memoirs give the detail of a success which would stagger belief, were not the results substantiated by committees of distinguished physicians of the French Academy of Sciences. The scrofulous affections in the cure of which Dr. Lugol succeeded by the administration of iodine were glandular tubercles, ophthalmia, ozæna, noli me tangere (dartre rongeante scrophuleuse), and fistulous and carious ulcers. In connexion with Dr. Lugol's results, it may be proper to mention that Dr. Manson derived benefit from the use of iodine in white

swelling, hip-joint disease, and distortions of the spine, diseases generally admitted to be more or less connected with the scrofulous taint.

Iodine is employed both internally and externally. Internally it is sometimes used in the form of tincture; but Dr. Lugol objects to this preparation on account of its unequal strength, and of its being liable to have the iodine precipitated by water; and, when swallowed with the solid iodine diffused through it, injurious irritation of the stomach is apt to occur. It has been found, however, by Guibourt that the latter objection to the tincture applies in its full force, only when it is freshly prepared. (See *Tinctura Iodinii.*) Dr. Lugol prefers to the tincture, a mixed solution of iodine and iodide of potassium in distilled water. He employs three strengths, namely, three-fourths of a grain, one grain, and a grain and a quarter of iodine to half a pint of distilled water; the quantity of iodide of potassium in each solution being double that of the iodine. These solutions are permanent, perfectly transparent, and of an orange colour. The London College has imitated this combination in an officinal formula. (See *Liquor Potassii Iodidi Compositus.*) The mode of administration, employed by Dr. Lugol for his solutions, is to give two-thirds of the weakest solution, or half a grain of iodine daily, for the first fortnight; the weakest solution entire for the second and third fortnight; the medium solution during the fourth and fifth fortnight; and lastly, in some cases, the strongest solution for the remainder of the treatment. He gives half the daily quantity in the morning fasting, and the other half, an hour before dinner; each portion being slightly sweetened at the moment of taking it. For the convenience of making the weak iodine solution, or of administering the remedy by drops, Dr. Lugol prepares a concentrated solution, consisting of a scruple of iodine and two scruples of iodide of potassium dissolved in seven fluidrachms of water.* Of this solution the dose is six drops twice a day, given in the morning fasting, and an hour before dinner, in a glass of sweetened water, gradually increasing weekly by two drops at a time, until the dose reaches thirty or thirty-six drops. For children under seven years, the dose is two drops twice a day, gradually increased to five. This solution is officinal in the United States Pharmacopœia. (See *Liquor Iodinii Compositus.*)

The external treatment by iodine may be divided into local and general. By its use in this way it does not merely create a topical effect on the skin; but by its absorption produces its peculiar constitutional impression. Dr. Lugol has given the following formulæ for preparations for the local use of iodine. His *iodine ointment* varies in strength from six to twelve grains of iodine, mixed with from two to four scruples of iodide of potassium, to the ounce of lard. (See *Unguentum Iodinii Compositum.*) It has a mahogany colour, and is employed in frictions to scrofulous tumours, and as a dressing to scrofulous ulcers. The *ointment of protiodide of mercury* which he recommends consists of from one to two scruples of the mercurial iodide to an ounce of lard. (See *Unguentum Hydrargyri Iodidi.*) Its proper colour is canary yellow; but occasionally it has a decided greenish tint, derived from the presence of protoxide of mercury, or an orange colour, when it contains the biniodide. This ointment, which has the advantage of producing very little pain, is used by Dr. Lugol in noli me tangere, and in scrofulous ulcers which have a syphilitic aspect. The *ointment of biniodide of mercury*, which is much more powerful, has also been used with advantage in similar cases. (See *Unguentum Hydrargyri Iodidi Rubri.*) Dr. Lugol's *iodine lotion* consists of from two to four grains of iodine to a pint of distilled water, the solution being rendered complete by the addition of double the quantity of iodide of potassium. This is used, as a wash or injection, in scrofulous oph-

* In the original it is *seven ounces;* but from the context of the author, this is evidently a misprint for *seven drachms.*

thalmia, ozæna, and fistulous ulcers. His *rubefacient solution* is formed by dissolving half an ounce of iodine and an ounce of iodide of potassium in six fluidounces of distilled water. This is useful for exciting scrofulous ulcers, for touching the eyelids, and as an application to recent scrofulous cicatrices, to render them smooth. A certain quantity of the rubefacient solution, added to warm water, makes a convenient local bath for the arms, legs, feet, or hands; and, mixed with linseed meal or some similar substance, it forms a cataplasm, useful in particular cases, especially where the object is to promote the falling off of scabs. The only remaining preparation for local use is what Dr. Lugol calls *iodine caustic*. It consists of iodine and iodide of potassium, each an ounce, dissolved in two ounces of distilled water, and is used to stimulate or destroy soft and fungous granulations. Its employment in this way has been attended with decided benefit in noli me tangere.

Iodine injections of appropriate strength have been repeatedly used by Velpeau in hydrarthrosis with success; and where the operation failed no bad consequences followed to the joint. The abdomen also has been injected with iodine, after tapping, for the radical cure of ascites, and several cases are reported of success by French surgeons.

The external application of iodine, when general, consists in the use of *iodine baths*, a mode of applying the remedy which originated with Dr. Lugol. This mode is considered very valuable by that physician, on account of the great extent of the skin, which furnishes the means of introducing a considerable quantity of iodine into the circulation without deranging the digestive functions, an object of great importance, where the medicine disagrees with the stomach. The iodine bath for adults should contain from two to four drachms of iodine, with double that quantity of iodide of potassium, dissolved in water, in a *wooden* bath tub, the proportion of the water being about a gallon for every three grains of iodine employed. The quantity of ingredients for the baths of children is one-third as much as for adults, but dissolved in about the same proportional quantity of water. The quantity of iodine and iodide for a bath having been determined on, it is best to dissolve them in a small quantity of water (half a pint for example), before they are added to the water of the bath; as this mode of proceeding facilitates their thorough diffusion.

The iodine baths, which may be directed three or four times a week, usually produce a slight rubefacient effect; but, occasionally, a stronger impression, causing the epidermis to peel off, particularly of the arms and legs. The skin at the same time acquires a deep-yellow tinge, which usually disappears in the interval between the baths.

Iodine is much used as a local application in erysipelas and chilblains. In these cases the tincture is brushed over and a little beyond the seat of inflammation, by means of a camel's hair pencil. In cutaneous scrofula, the tincture has been found beneficial by Dr. Pereira, applied in the same way, having the effect of drying up the discharge and promoting cicatrization. The same topical application has been found useful in various scaly cutaneous diseases, such as lepra, psoriasis, &c.

Iodine, when externally applied, is freely absorbed, and passes out of the system principally in the urine. According to M. Bonnet, when iodine is applied to ulcers or blistered surfaces, or injected into the cavities of abscesses, it is largely absorbed, and quickly eliminated; and during its elimination it carries with it morbid deposits, such as effused lymph, &c. &c. In illustration of his views, M. Bonnet states that scrofulous ophthalmia may be cured by dressing a blister, applied at a distance from the eyes, with an ointment of iodine. A suitable ointment for a dressing may be made of one part of iodine, two of iodide of potassium, and thirty of lard.

Sir Charles Scudamore, Sir James Murray, and Dr. Corrigan have recommended the inhalation of iodine vapour in phthisis. The plan of Sir Charles is to inhale, from a glass inhaler for ten minutes, two or three times a day, a small portion of a solution of ioduretted iodide of potassium, mixed with a saturated tincture of conium. The ioduretted solution is made by dissolving six grains, each, of iodine and iodide of potassium, in five ounces and three-quarters of distilled water and a quarter of an ounce of alcohol. The dose for each inhalation is from half a drachm to a drachm of the iodine solution, gradually increased, with half a drachm of the tincture, added to a portion of water of the temperature of 120°, nearly sufficient to half fill the inhaler. M. Huett has used the inhalation of iodine, in the form of hydriodic ether, in phthisis, and reports the cure of one case with cavities at the top of the left lung.

Since the publication of Dr. Lugol's memoirs, his practice has been imitated and extended by several practitioners. Dr. Bermond, of Bordeaux, has succeeded with the iodine treatment in enlarged testicle from a venereal cause, scrofulous ophthalmia of six years' duration, and scrofulous ulcers and abscesses of the cervical and submaxillary glands. In numerous other cases of scrofula under his care, the iodine treatment proved beneficial; though, before its commencement, the cases underwent no improvement. The only peculiarity in Dr. Bermond's treatment, was that, in some cases, he associated opiate preparations with the iodine. In the case of ophthalmia which he treated, the collyrium employed consisted of tincture of iodine thirty drops, laudanum thirty-six drops, to four fluidounces of distilled water. When the local application of the iodine created much pain or rubefaction, he found advantage from combining extract of opium with it. A plaster which proved efficacious as an application to an enlarged parotid, in one of his cases, consisted of lead plaster (diachylon) and iodide of potassium, each, four parts; iodine and extract of opium, each, three parts. In confirmation of Dr. Bermond's views, M. Lemasson, one of the house pupils of the hospital St. Louis, has published a number of cases, proving the efficacy of a combination of iodine and opium in the local treatment of scrofulous ulcerations. One of the combinations which he employed consisted of *fifteen grains* of iodine, *a drachm* of iodide of potassium, and *two drachms* of Rousseau's laudanum, made up into an ointment with *two ounces* of fresh lard.

The results obtained by Dr. Lugol and others in the treatment of scrofulous diseases by the iodine preparations are so diversified, as to leave no doubt of their great efficacy in these affections. To judge fairly, however, of Dr. Lugol's results, it is not sufficient to give iodine; but it should be given in the manner, and with the observance of all the rules, which are laid down by that physician. We can readily conceive that a dilute aqueous solution of iodine may act differently from the tincture; and that a therapeutical agent may in one form be introduced gradually into the current of the circulation, and thus produce important alterative effects; while in another, it may create irritation of the stomach without being absorbed, and thus prove mischievous. A case in point is furnished by natural mineral waters, which, though generally containing a minute proportion of saline matter, often produce remedial effects which cannot be obtained by their constituents given in larger doses.

The views here presented are supported and extended by the observations of Dr. A. Buchanan, of Glasgow, who contends that iodine is divested of its irritant qualities in certain states of combination, in which it may be given in large doses without risk, and with the effect of pervading nearly all the secretions. The combinations which he prefers, are iodide of starch, which is the best, hydriodic acid, and iodide of potassium; the first and last of which he supposes to act as hydriodic acid, the iodine in them being, agreeably to his view, converted into that acid in the stomach and bowels. (See *Potassii Iodidum* in Part II., and *Hydriodic Acid* and *Iodide of Starch* in the Appendix.)

M. Marchal (de Calvi), acting under the impression that cod-liver oil owed its chief virtue to the presence of iodine, proposed, in 1848, to prepare an *ioduretted oil*, formed of one part of iodine to fifteen of sweet almond oil, and incorporated with an almond emulsion. Following out this proposal, M. Personne devised the following formula for making an ioduretted oil. Five parts of iodine are mixed with a thousand parts of sweet almond oil, and the mixture is subjected to the action of a jet of steam, until it is decolorized. The same operation is repeated with five additional parts of iodine. The oil is then washed with a weak alkaline solution, to remove hydriodic acid which is developed in the process. By this mode of proceeding, it may be presumed that the iodine is intimately united with the oil, thus finding easier entrance into the system; and that, while a part of the iodine is lost as hydriodic acid, the remainder takes the place of the hydrogen eliminated from the oil. In 1851, the French Academy appointed MM. Guibourt, Soubeiran, Gibert, and Ricord, to report upon the therapeutic value of a definite combination of iodine and oil. The reporter (Guibourt) approves of M. Personne's process; and MM. Gibert and Ricord report favourably of the therapeutic effects of the ioduretted oil. M. Gibert deems it to possess considerable resolvent power in certain chronic eruptions and glandular enlargements; and M. Ricord, after trial for a year, obtained satisfactory results in a variety of scrofulous affections, the ioduretted oil acting more promptly than the cod-liver oil. M. Personne's ioduretted oil differs little in appearance and taste from almond oil, and may be easily taken either alone or in emulsion. The usual dose is about two fluidounces daily, which may be increased to three fluidounces or more. (See *Am. Journ. of Med. Sci.*, N. S. xxiii. 502.)

In cases of poisoning by iodine, the stomach must be first evacuated, and afterwards drinks administered, containing an amylaceous substance, such as flour, starch, or arrow-root.

Iodine is officinal:—

I. In the purified state.
Iodinium Purum, *Dub.*

II. In solution in alcohol.
Tinctura Iodinii, *U.S.*; Tinctura Iodinei, *Ed.*

III. In solution in alcohol with iodide of potassium.
Tinctura Iodinii Composita, *U.S.*, *Lond.*, *Dub.*

IV. In the form of ointment.
Unguentum Iodinii, *U.S.*

V. In the form of ointment with iodide of potassium.
Unguentum Iodinii Compositum, *U.S.*, *Lond.*, *Dub.*; Unguentum Iodinei, *Ed.*

VI. In solution in water with iodide of potassium.
Liquor Iodinii Compositus, *U.S.*; Iodinei Liquor Compositus, *Ed.*
Liquor Potassii Iodidi Compositus, *Lond.*; Potassii Iodidi Liquor Compositus, *Dub.*

VII. Combined with sulphur.
Sulphuris Iodidum, *U.S.*, *Lond.*; Sulphur Iodatum, *Dub.*
Unguentum Sulphuris Iodidi, *U.S.*, *Lond.*

VIII. Combined with metals.
Arsenici Iodidum, *U.S.*
Liquor Arsenici et Hydrargyri Iodidi, *U.S.*; Arsenici et Hydrargyri Hydriodatis Liquor, *Dub.*
Ferri Iodidum, *U.S.*, *Ed.*, *Dub.*
Liquor Ferri Iodidi, *U.S.*
Syrupus Ferri Iodidi, *Lond.*, *Dub.*; Ferri Iodidi Syrupus, *Ed.*
Pilulæ Ferri Iodidi, *U.S.*

Hydrargyri Iodidum, *U. S., Lond.;* Hydrargyri Iodidum Viride, *Dub.*
Unguentum Hydrargyri Iodidi, *Lond.*
Hydrargyri Iodidum Rubrum, *U. S., Dub.;* Hydrargyri Biniodidum, *Ed.*
Unguentum Hydrargyri Iodidi Rubri, *Dub.*
Plumbi Iodidum, *U. S., Lond., Ed., Dub.*
Unguentum Plumbi Iodidi, *Lond., Dub.*
Potassii Iodidum, *U. S., Lond., Ed., Dub.*
Emplastrum Potassii Iodidi, *Lond.*
Unguentum Potassii Iodidi, *U. S., Lond., Dub.* B.

IPECACUANHA. *U. S., Lond., Ed., Dub.*

Ipecacuanha.

The root of Cephaëlis Ipecacuanha. *U. S., Lond., Ed., Dub.*
Ipecacuanha, *Fr.;* Brechwurzel, Ipecacuanha, *Germ.;* Ipecacuana, *Ital., Span.*

The term *ipecacuanha*, derived from the language of the aborigines of Brazil, has been applied to various emetic roots of South American origin.* The British Colleges and our national Pharmacopœia recognise only that of the *Cephaëlis Ipecacuanha;* and no other is known by the name in the shops of this country. Our chief attention will, therefore, be confined to this root, and the plant which yields it; but as others are employed in South America, are occasionally exported, and may possibly reach our markets mingled with the genuine drug, we shall, in a note, give a succinct account of those which have attracted most attention.

The botanical character of the genuine ipecacuanha was long unknown. Pison and Marcgrav, who were the first to treat of this medicine, in their work on the natural history of Brazil, published at Amsterdam, A. D. 1648, described in general terms two plants; one producing a whitish root, distinguished by the name of white ipecacuanha, the other, a brown root which answers in their description precisely to the officinal drug. But their account was not sufficiently definite to enable botanists to decide upon the character of the plants. The medicine was generally thought to be derived from a species of *Viola*, which Linnæus designated by the title of *V. Ipecacuanha.* Opinion afterwards turned in favour of a plant sent to Linnæus by the celebrated Mutis from New Granada, as affording the ipecacuanha of that country and of Peru. This was described in the *Supplementum* of the younger Linnæus, A. D. 1781, under the name of *Psychotria emetica*, and was long erroneously considered as the source of the true ipecacuanha. Dr. Gomez, of Lisbon, was the first who accurately described and figured the genuine plant, which he had seen in Brazil, and specimens of which he took with him to Portugal; but Brotero, professor of Botany at Coimbra, with whom he had left specimens, having drawn up a description, and had it inserted with a figure in the Linnæan Transactions without acknowledgment, enjoyed for a time the credit due to his fellow countryman. In the paper of Brotero the plant is named *Callicocca Ipecacuanha;* but the term *Callicocca*, having been applied by Schreber, without sufficient reason, to the genus already established and named, has been universally abandoned by botanists for the *Cephaëlis* of Swartz; though this, also, it appears, is a usurpation upon the previous rights of Aublet.

Cephaelis. *Sex. Syst.* Pentandria Monogynia. — *Nat. Ord.* Rubiaceæ, *Juss.* Cinchonaceæ, *Lindley.*

* M. Weddell states that the word ipecacuanha is nowhere in Brazil used to designate the Cephaëlis, which is generally called *poaya.* (*Journ. de Pharm., 3e sér.*, xvi. 34.)

Gen. Ch. Flowers in an involucred head. *Corolla* tubular. *Stigma* two-parted. *Berry* two-seeded. *Receptacle* chaffy. *Willd.*

Cephaëlis Ipecacuanha. Richard, *Hist. Ipecac.* p. 21, t. i.; Martius, *Spec. Mat. Med. Brazil.* p. 4, t. i.; *Curtis's Bot. Mag.* N. S. vol. xvii. pl. 4063, A. D. 1844.—*Callicocca Ipecacuanha.* Brotero, *Linn. Trans.* vi. 137. This is a small shrubby plant, with a root from four to six inches long, about as thick as a goose-quill, marked with annular rugæ, simple or somewhat branched, descending obliquely into the ground, and here and there sending forth slender fibrils. The stem is two or three feet long; but, being partly under ground, and often procumbent at the base, usually rises less than a foot in height. It is slender; in the lower portion leafless, smooth, brown or ash-coloured, and knotted, with radicles frequently proceeding from the knots; near the summit, pubescent, green, and furnished with leaves seldom exceeding six in number. These are opposite, petiolate, oblong-obovate, acute, entire, from three to four inches long, from one to two broad, obscurely green and somewhat rough on their upper surface, pale, downy, and veined on the under. At the insertion of each pair of leaves are deciduous stipules, embracing the stem, membranous at the base, and separated above into numerous bristle-like divisions. The flowers are very small, white, and collected to the number of eight, twelve, or more, each accompanied with a green bracte, into a semi-globular head, supported upon a round, solitary, axillary footstalk, and embraced by a monophyllous involucre, deeply divided into four, sometimes five or six obovate pointed segments. The fruit is an ovate, obtuse berry, which is at first purple, but becomes almost black when ripe, and contains two small plano-convex seeds.

The plant is a native of Brazil, flourishing in moist, thick, and shady woods, and abounding most within the limits of the eighth and twentieth degrees of south latitude. According to Humboldt, it grows also in New Granada. It flowers in January and February, and ripens its fruit in May. The root is usually collected during the period of flowering, though equally good at other seasons. By this practice the plant is speedily extirpated in places where it is most eagerly sought. Were the seeds allowed to ripen, it would propagate itself rapidly and thus maintain a constant supply. Weddell, however, states that the remains of the root, often left in the ground when it is collected, serve the purpose of propagation, each fragment giving rise to a new plant. The root is collected chiefly by the Indians, who prepare it by separating it from the stem, cleaning it, and hanging it up in bundles to dry in the sun. The Brazilian merchants carry on a very brisk trade in this drug. According to Weddell, most of it was, at the time he wrote, A. D. 1851, collected in the interior province of Matto-Grosso, upon the upper waters of the Paraguay, where it was first discovered in the year 1824. The chief places of export are Rio Janeiro, Bahia, and Pernambuco. It is brought to the United States in large bags or bales.

Genuine ipecacuanha is in pieces two or three lines in thickness, variously bent and contorted, simple or branched, consisting of an interior slender, light straw-coloured, ligneous cord, with a thick cortical covering, which presents on its surface a succession of circular, unequal, prominent rings or rugæ, separated by very narrow fissures, frequently extending nearly down to the central fibre. This appearance of the surface has given rise to the term *annelé* or *annulated*, by which the true ipecacuanha is designated in the French works on Pharmacy. The cortical part is hard, horny, and semi-transparent, breaks with a resinous fracture, and easily separates from the tougher ligneous fibre, which possesses the medicinal virtues of the root in a much inferior degree. Attached to the root is frequently a smoother and more slender portion, which is the base of the stem, and should be separated before pulverization. Pereira has met, in the English market, with distinct bales composed of these fragments of stems, with

occasionally portions of the root attached. Much stress has been laid in works on the materia medica upon the colour of the external surface of the ipecacuanha root; and diversity in this respect has even led to the formation of distinct varieties. Thus, the epidermis is sometimes deep-brown or even blackish, sometimes reddish-brown or reddish-gray, and sometimes light-gray or ash-coloured. Hence the distinction into *brown*, *red*, and *gray ipecacuanha*. But these are all derived from the same plant, are essentially the same in properties and composition, and probably differ only in consequence of difference in age, or place of growth, or mode of desiccation. The colours in fact are often so intermingled, that it would be impossible to decide in which variety a particular specimen should be placed. The *brown* is the most abundant in the packages which reach our market. The *red*, besides the colour of its epidermis, presents a rosy tint when broken, and is said to be somewhat more bitter than the preceding variety. The *gray* is much lighter coloured externally, usually rather larger, with less prominent rings and wider fissures, and is still more decidedly bitter. Many years since we saw in this market bales of gray ipecacuanha, with very imperfectly developed rings, which were said to have come from Caracas. This commercial variety afterwards quite disappeared; but, under the name of *Carthagena ipecacuanha*, it would seem to have been of late imported into New York. (*Am. Journ. of Pharm.*, xxv. 474.) When the bark in either variety is opaque, with a dull amylaceous aspect, the root is less active as a medicine. As the woody part is nearly inert, and much more difficult of pulverization than the cortical, it often happens that, when a particular parcel of the root is powdered, the portion which remains last in the mortar possesses scarcely any emetic power; and care should be taken to provide against any defect from this cause. The colour of the powder is a light grayish-fawn.

Ipecacuanha has little smell in the aggregate state, but when powdered has a peculiar nauseous odour, which in some persons excites violent sneezing, in others dyspnœa resembling an attack of asthma. The taste is bitter, acrid, and very nauseous. Water and alcohol extract its virtues, which are injured by decoction. Its emetic property resides in a peculiar alkaline principle called *emetia*, discovered by Pelletier in the year 1817. The cortical portion of the brown ipecacuanha, analyzed by this chemist under the erroneous name of *Psychotria emetica*, yielded in the hundred parts, 16 of an impure salt of emetia, which was at first considered the pure emetic principle, 2 of an odorous fatty matter, 6 of wax, 10 of gum, 42 of starch, 20 of lignin, with 4 parts loss. The woody fibre was found to contain only 1·15 per cent. of the impure emetia. M. A. Richard detected in the cortical part traces of gallic acid. The bark of red ipecacuanha was found by Pelletier to contain but 14 per cent. of impure emetia. In addition to these principles, Bucholz has found extractive, sugar, and resin; and Erwin Willigk, more recently, traces of a disagreeably smelling volatile oil, phosphatic salts, and a peculiar acid which he named *ipecacuanhic acid*, and which had previously been mistaken for the gallic. It would seem to belong to the tannic acid group. (See *Am. Journ. of Pharm.*, xxiii. 352.) Good ipecacuanha contains about 80 per cent. of cortical and 20 of ligneous matter.

Emetia when perfectly pure is whitish, inodorous, slightly bitter, pulverulent, unalterable in the air, very fusible, sparingly soluble in cold water and ether, more soluble in hot water, and very soluble in alcohol; it is not reddened by nitric acid; forms crystallizable salts with the mineral acids and acetic acid; is precipitated by gallic and tannic acids from its solutions; and contains nitrogen. It is, however, very difficult to procure it in this state of purity, and the proportion afforded by the root is exceedingly small. As originally obtained it was very impure, probably in the condition of a salt, and in this state is directed by the French Codex. *Impure emetia* is in transparent scales of a brownish-red

colour, almost inodorous, of a bitterish acrid taste, deliquescent, very soluble in water and alcohol, insoluble in ether, precipitated from its solutions by gallic acid and the acetates of lead, but not by tartar emetic or the salts of iron. The Codex directs it to be prepared by evaporating a filtered aqueous solution of an alcoholic extract of ipecacuanha. According to the original method, it was obtained by treating powdered ipecacuanha with ether to remove the fatty matter, exhausting the residue with alcohol, evaporating the alcoholic solution to dryness, and subjecting the extract to the action of cold water, which dissolves the emetia with some free acid, and leaves the wax and other matters. To separate the acid, the watery solution is treated with carbonate of magnesia, filtered, and then evaporated. If pure *emetia* is required, magnesia is used instead of the carbonate. The salt is thus decomposed, and the organic alkali, being insoluble, is precipitated with the excess of the earth. The precipitate is washed with cold water, and digested in alcohol, which dissolves the *emetia;* the alcoholic solution is then evaporated, the residue redissolved in a dilute acid, and the alkali again precipitated by a salifiable base. To deprive it of colour it is necessary to employ animal charcoal. Berzelius has obtained emetia by treating the powdered root with very dilute sulphuric acid, precipitating with magnesia, and treating the precipitate in the manner above directed. Pure emetia has at least three times the strength of the impure.*

* Non-officinal Ipecacuanhas.—When ipecacuanha began to be popular in Europe, the roots of several other plants were imported and confounded with the genuine; and the name came at length to be applied to almost all emetic roots derived from America. Several of these are still occasionally met with, and retain the name originally applied to them. The two most worthy of notice are the ipecacuanha of New Grenada and Peru, and the white ipecacuanha of Brazil. On each of these we shall offer a few remarks.

1. *Peruvian Ipecacuanha. Striated Ipecacuanha. Black Ipecacuanha.* This is the root of *Psychotria emetica*, formerly supposed to produce the genuine Brazilian ipecacuanha. This plant, like the Cephaëlis, belongs to the class and order Pentandria Monogynia, and to the natural order Rubiaceæ of Jussieu. A description of it sent by Mutis was published by Linnæus the younger in his supplement. It has since been described in the *Plant. Æquin.* of Humb. and Bonpl.; and has been figured by A. Richard in his History of the Ipecacuanhas, and by Hayne in the eighth volume of his Medical Botany published at Berlin. It is a small shrub, with a stem twelve or eighteen inches high, simple, erect, round, slightly pubescent, and furnished with opposite, oblong-lanceolate, pointed leaves, narrowed at their base into a short petiole, and accompanied with pointed stipules. The flowers are small, white, and supported in small clusters towards the end of an axillary peduncle. The plant flourishes in Peru and New Grenada, and was seen by Humboldt and Bonpland growing in abundance near the river Magdalena. The dried root is said to have been exported from Carthagena.

It is cylindrical, somewhat thicker than the root of the Cephaëlis, usually simple, but sometimes branched, not much contorted, wrinkled longitudinally, presenting here and there deep circular intersections, but without the annular rugæ of the true ipecacuanha. The longitudinal direction of the wrinkles has given it the name of *striated ipecacuanha.* It consists of an internal woody cord, and an external cortical portion; but the former is usually larger in proportion to the latter than in the root of the Cephaëlis. The bark is soft and easily cut with a knife, and when broken exhibits a brown slightly resinous fracture. The epidermis is of a dull reddish-gray colour, which darkens with age and exposure, and ultimately becomes almost black. Hence the root has sometimes been called *black ipecacuanha.* The ligneous portion is yellowish, and perforated with numerous small holes visible by the microscope. The Peruvian ipecacuanha is nearly inodorous, and has a flat taste, neither bitter nor acrid. Out of 100 parts Pelletier obtained 9 of impure emetia, 12 of fatty matter, with an abundance of starch, besides gum and lignin. The dose as an emetic, is from two scruples to a drachm.

2. *White Ipecacuanha. Amylaceous Ipecacuanha. Undulated Ipecacuanha.* This variety was noticed in the work of Pison; but the vegetable which produced it was not satisfactorily ascertained till a recent date. Gomez, indeed, in the memoir which he published at Lisbon, A. D. 1801, gave a figure and description of the plant; but the memoir was not generally known, and botanists remained uncertain upon the subject. By the travels of M. Saint Hilaire and Dr. Martius in Brazil, more precise information has been obtained; and the white ipecacuanha is now confidently referred to different species of *Richardsonia*, the *Richardia*

Medical Properties and Uses. Ipecacuanha is in large doses emetic, in smaller, diaphoretic and expectorant, and in still smaller, stimulant to the stomach, exciting appetite and facilitating digestion. In quantities not quite sufficient to vomit, it produces nausea, and frequently acts upon the bowels. As an emetic it is mild but tolerably certain in its operation, and, being usually thrown from the stomach by one or two efforts, is less apt to produce dangerous effects when taken in an overdose than some other substances of the same class. It is also recommended by the absence of corrosive and narcotic properties.

It was employed as an emetic by the natives of Brazil, when that country was first settled by the Portuguese; but, though described in the work of Pison, it was not known in Europe till the year 1672, and did not come into use till some years afterwards. John Helvetius, grandfather of the celebrated author of that name, having been associated with a merchant who had imported a large quantity of ipecacuanha into Paris, employed it as a secret remedy, and with so much success in dysentery and other bowel affections, that general attention was attracted to it; and the fortunate physician received from Louis XIV. a large sum of money and public honours, on the sole condition that he should make the remedy public.

As an emetic it is peculiarly adapted by its mildness and efficiency to cases in which the object is merely to evacuate the stomach, or a gentle impression only is desired; and, in most other cases in which emetics are indicated, it may be advantageously combined with the more energetic medicines, which it renders safer by insuring their discharge. It is especially useful where narcotic poisons have been swallowed; as, under these circumstances, it may be given in almost indefinite doses, with little comparative risk of injury to the patient. In dysentery it has been supposed to exercise peculiar powers. As a nauseating remedy it is used in asthma, hooping-cough, and the hemorrhages; as a diaphoretic,

of Linnæus. The *R. scabra*, or *R. Braziliensis* of Gomez, and the *R. emetica* are particularly indicated by Martius. For the root usually called *white ipecacuanha*, Guibourt has proposed the name of *undulated ipecacuanha*, derived from the peculiar character of the surface, which presents indentations or concavities on one side, corresponding with prominences or convexities on the other, so as to give a wavy appearance to the root. It differs little in size from the genuine; is of a whitish-gray colour externally; and when broken presents a dull white farinaceous fracture, offering by the light of the sun shining points, which are nothing more than small grains of fecula. Like the other varieties it has a woody centre. It is inodorous and insipid, and contains, according to Pelletier, a very large proportion of starch, with only six per cent. of impure emetia, and two of fatty matter. Richard found only 3·5 parts of emetia in the hundred. It is said to be sometimes mixed with the genuine ipecacuanha; but we have discovered none in the bales which we have examined.

According to Martius, different species of *Ionidium* (Viola, Linn.) produce also what is called *white ipecacuanha*. The roots of all the species of Ionidium possess emetic or purgative properties, and some of them have been reported to be equal to the genuine ipecacuanha. The root of *I. Ipecacuanha* is described by Guibourt as being six or seven inches long, as thick as a quill, somewhat tortuous, and exhibiting at the points of flexion semicircular fissures, which give it some resemblance to the root of the Cephaëlis. It is often bifurcated at both extremities, and terminates at top in a great number of small ligneous stalks. It is wrinkled longitudinally, and of a light yellowish-gray colour. The bark is thin, and the interior ligneous portion very thick. The root has little taste or smell. According to Pelletier, it contains, in 100 parts, 5 of an emetic substance, 35 of gum, 1 of azotized matter, and 37 of lignin. (*Hist. Abreg. des Drogues Simples*, i. 514.)

The root of a species of Ionidium growing in Quito has attracted some attention as a remedy in elephantiasis, under the South American name of *cuichunchulli*. The plant, being considered an undescribed species by Dr. Bancroft, was named by him *I. Marcucci;* but Sir W. Hooker found the specimen, received from Dr. Bancroft, to be identical with the *I. parviflorum* of Ventenat. Lindley thinks a specimen he received under the same name from Quito, to be the *I. microphyllum* of Humboldt. If useful in elephantiasis, it is so probably by its emeto-purgative action. (See *Am. Journ. of Pharm.*, vii. 186.)*

* See a paper on ipecacuanha by R. E. Griffith, M. D., in the Journ. of the Phil. Col. of Pharm., vol. 3, p. 181, for a more extended account of the roots which have been used under the name of ipecacuanha.

combined with opium, in a wide circle of diseases. (See *Pulvis Ipecacuanhæ et Opii.*) Its expectorant properties render it beneficial in catarrhal and other pulmonary affections. It has been given, also, with supposed advantage, in very minute doses, in dyspeptic cases, and in chronic disease of the gastro-intestinal mucous membrane.

Ipecacuanha is most conveniently administered, as an emetic, in the form of powder suspended in water. The dose is about twenty grains, repeated, if necessary, at intervals of twenty minutes till it operates. In some individuals much smaller quantities prove emetic, and we know one person who is generally vomited by the fraction of a grain. The operation of the medicine may be facilitated, and rendered milder, by copious draughts of warm water, or warm chamomile tea. An infusion in boiling water, in the proportion of two drachms of the powder to six fluidounces of menstruum, may be given in the dose of a fluidounce repeated as in the former case. With a view to the production of nausea, the dose in substance may be two grains, repeated more or less frequently according to circumstances. As a diaphoretic it may be given in the quantity of a grain; as an alterative, in diseases of the stomach and bowels, in that of a quarter or half a grain two or three times a day.

Emetia has been used on the continent of Europe as a substitute, but with no great advantage. Its operation on the stomach is apt to be more violent and continued than that of ipecacuanha; and, if given in over-doses, it may produce dangerous and even fatal consequences. From the experiments of Magendie, it appears to have a peculiar direction to the mucous membranes of the alimentary canal and the bronchial tubes. Ten grains of the impure alkali, administered to dogs, were generally found to destroy life in twenty-four hours, and the mucous membranes mentioned were observed to be inflamed throughout their whole extent. The same result took place when emetia was injected into the veins, or absorbed from any part of the body. The dose of impure emetia is about a grain and a half, of the pure not more than half a grain, repeated at proper intervals till it vomits. In proportional doses, it may be applied to the other purposes for which ipecacuanha is used. It will excite vomiting when applied to a blistered surface after the removal of the cuticle. Magendie found that dogs slept much after being vomited with emetia, and concluded that the medicine was narcotic; but other emetic medicines produce the same effect, which is to be ascribed rather to exhaustion than to any direct operation on the brain.

Dr. Turnbull recommends the external use of ipecacuanha as a counter-irritant. An ointment made with one part of the powder, one of olive oil, and two of lard, rubbed once or twice a day for a few minutes upon the skin, produces a copious eruption, which continues out for many days, without pain or ulceration. (*London Lancet*, May, 1842.) It has, however, been found by others of little efficacy in the great majority of cases.

Off. Prep. Pilula Conii Composita; Pulvis Ipecacuanhæ et Opii; Syrupus Ipecacuanhæ; Trochisci Ipecacuanhæ; Trochisci Morphiæ et Ipecacuanhæ; Vinum Ipecacuanhæ. W.

IRIS FLORENTINA. *U. S. Secondary.*

Florentine Orris.

The rhizoma of Iris Florentina. *U. S.*

Iris de Florence, *Fr.;* Florentinische Violenwurzel, *Germ.;* Ireos, *Ital.;* Lirio Florentina, *Span.*

Iris. *Sex. Syst.* Triandria Monogynia.—*Nat. Ord.* Iridaceæ.

Gen. Ch. Corolla six-parted; the alternate segment reflected. *Stigmas* petal-shaped. *Willd.*

In all the species belonging to this genus, so far as examined, the roots are more or less acrid, and possessed of cathartic and emetic properties. In Europe, *Iris fœtidissima*, *I. Florentina*, *I. Germanica*, *I. pseudo-acorus*, and *I. tuberosa* have at various times been admitted into use. Of these *I. Florentina* is the only one officinal in this country.

Iris Florentina. Willd. *Sp. Plant.* i. 226; Woodv. *Med. Bot.* p. 776, t. 262. The root (rhizoma) of the Florentine Iris is perennial, horizontal, fleshy, fibrous, and covered with a brown epidermis. The leaves spring directly from the root, are sword-shaped, pointed, nerved, and shorter than the stem, which rises from the midst of them more than a foot in height, round, smooth, jointed, and bearing commonly two large white or bluish-white terminal flowers. The calyx is a spathe with two valves. The corolla divides into six segments or petals, of which three stand erect, and the remaining three are bent backward, and bearded within at their base with yellow-tipped white hairs. The fruit is a three-celled capsule, containing many seeds.

This plant is a native of Italy and other parts of the South of Europe, where it is also cultivated. The root, which is the officinal portion, is dug up in spring, and prepared for the market by the removal of its cuticle and fibres. It is brought from Leghorn in large casks.

Properties. Florentine orris is in pieces of various form and size, often branched, usually about as thick as the thumb, knotty, flattened, white, heavy, of a rough though not fibrous fracture, an agreeable odour resembling that of the violet, and a bitterish acrid taste. The acrimony is greater in the recent than in the dried root; but the peculiar smell is more decidedly developed in the latter. The pieces are brittle and easily powdered, and the powder is of a dirty white colour. Vogel obtained from Florentine orris, gum, a brown extractive, fecula, a bitter and acrid fixed oil or soft resin, a volatile crystallizable oil, and vegetable fibre. According to Landerer, the acrid principle is volatile, separating in the form of a stearoptene from water distilled from the root. (*Arch. der Pharm.*, lxv. 302.)

Medical Properties. This medicine is cathartic, and in large doses emetic, and was formerly employed to a considerable extent on the continent of Europe. It is said also to be diuretic, and to have proved useful in dropsies. At present it is valued for its agreeable odour. It is occasionally chewed to conceal an offensive breath, and enters into the composition of tooth-powders. In the form of small round balls, about the size of a pea, it is used by the French for maintaining the discharge from issues, a purpose to which it is adapted by its odour, by the slight acrimony which it retains in its dried state, and by the property of swelling very much by the absorption of moisture. W.

IRIS VERSICOLOR. *U. S. Secondary.*

Blue Flag.

The rhizoma of Iris versicolor. *U. S.*

Iris. See IRIS FLORENTINA.

Iris versicolor. Willd. *Sp. Plant.* i. 233; Bigelow, *Am. Med. Bot.* i. 155. This indigenous species of Iris has a perennial, fleshy, horizontal, fibrous root or rhizoma, and a stem two or three feet high, round on one side, acute on the other, and frequently branching. The leaves are sheathing at the base, sword-shaped, and striated. The flowers are from two to six in number, and are usually blue or purple, though varying much in colour. The capsule has three valves, is divided into three cells, and when mature is oblong, three-sided, with obtuse angles, and contains numerous flat seeds.

The blue flag is found in all parts of the United States, flourishing in low wet places, in meadows, and on the borders of swamps, which it serves to adorn with

its large and beautiful flowers. These make their appearance in June. The root is the medicinal portion. The flowers afford a fine blue infusion, which serves as a test of acids and alkalies.

The recent root is without odour, and has a nauseous, acrid taste, which is imparted to water by decoction, and still more perfectly to alcohol. The acrimony as well as medicinal activity is impaired by age. If cut when fresh into slices, dried at the temperature of about 100°, and then powdered and kept in bottles excluded from the air, the root retains its virtues unimpaired for a considerable time. (*Andrews.*)

Blue flag possesses the cathartic, emetic, and diuretic properties common to most of its congeners. It was said by Mr. Bartram to be much esteemed by the Southern Indians; and Dr. Bigelow states that he has found it efficacious as a purgative, though inconvenient from the distressing nausea and prostration which it is apt to occasion. Dr. M. H. Andrews, of Michigan, has employed it frequently as a cathartic, and found it, when combined with a grain of Cayenne pepper, or two grains of ginger, not less easy and effectual in its operation than the ordinary more active cathartics, and preferable on account of its less disagreeable taste. (*N. Y. Journ. of Med.*, ix. 129.) Dr. Macbride found it useful in dropsy. It is, however, little used by the profession at large, and seldom if ever kept in the shops. It may be given in substance, decoction, or tincture. The dose of the dried root is from ten to twenty grains. W.

JALAPA. *U. S., Lond., Ed., Dub.*

Jalap.

The root of Ipomæa Jalapa (Coxe, *Am. Journ. of Med. Sciences*). *U. S.* Exogonium Purga. The tuber. *Lond.* The root. *Dub.* Ipomæa Purga. The root. *Ed.* Jalap, *Fr.;* Jalappen-Wurzel, *Germ.;* Sciarappa, *Ital.;* Jalapa, *Span.*

The precise botanical origin of jalap remained long unknown. It was at first ascribed by Linnæus to a Mirabilis, and afterwards to a new species of Convolvulus, to which he gave the name of *C. Jalapa.* The correctness of the latter reference was generally admitted; and, as the *Ipomæa macrorhiza* of Michaux, growing in Florida and Georgia, was believed to be identical with the C. Jalapa of Linn., it was thought that this valuable drug, which had been obtained exclusively from Mexico, might be collected within the limits of the United States. But the error of this opinion was soon demonstrated; and botanists now universally concur in the belief, that jalap is the product of a plant first made known to the scientific world by Dr. John R. Coxe, of Philadelphia, and described by Mr. Nuttall under the name of *Ipomæa Jalapa.* When this Dispensatory was first published, opinion in relation to the botanical history of the drug was unsettled, and it was deemed proper to enter at some length into the consideration of the subject; but the subsequent general admission of the views then advocated renders an equal degree of minuteness now unnecessary. It is sufficient to state that Dr. Coxe received living roots of jalap from Mexico in the year 1827, and succeeded in producing a perfect flowering plant, of which a description, by Mr. Nuttall, was published in the *Am. Journ. of Medical Sciences* for January, 1830; that the same plant was afterwards cultivated in France and Germany from roots transmitted to those countries from Mexico; and that one of the authors of this work has produced, from roots obtained in the vicinity of Xalapa, and sent to him by the late Dr. Marmaduke Burrough, then United States consul at Vera Cruz, luxuriant plants, which he was enabled to compare with others descended from the plant of Dr. Coxe, and found to be identical with them. In the United States and all the British Pharmacopœias, this origin of jalap is now admitted; but the Edinburgh

College has adopted Hayne's and Wenderoth's name of *I. Purga*, thus overlooking the prior claims of the American authorities. J. H. Balfour, in the number of Curtis's Magazine for February, 1847, states that the plant belongs to the genus *Exogonium* of Choisy, as defined in De Candolle's Prodromus, being distinguished from Ipomæa by its exserted stamens; and the London and Dublin Colleges endorse this reference.

IPOMÆA. *Sex. Syst.* Pentandria Monogynia. — *Nat. Ord.* Convolvulaceæ. *Gen. Ch. Sepals* five. *Corolla* campanulate. *Stamens* included. *Style* one. *Stigma* two-lobed; the lobes capitate. *Ovary* two-celled; cells two-seeded. *Capsule* two-celled. *Lindley.*

Ipomæa Jalapa. Nuttall, *Am. Journ. of Med. Sciences*, v. 300; Carson, *Illust. of Med. Bot.* ii. 13, pl. 61.—*Ipomæa Purga.* Hayne, *Darstel. und Beschreib.* &c. xii. 33 and 34; Lindley, *Flor. Med.* 396. — *Exogonium Purga.* Balfour, *Curtis's Bot. Mag. 3d ser.* vol. iii. tab. 4280. The root of this plant is a roundish somewhat pear-shaped tuber, externally blackish, internally white, with long fibres proceeding from its lower part, as well as from the upper root-stalks. A tuber produced by Dr. Coxe was, in its third year, between two and three inches in diameter. The stem is round, smooth, much disposed to twist, and rises to a considerable height upon neighbouring objects, about which it twines. The leaves are heart-shaped, entire, smooth, pointed, deeply sinuated at the base, prominently veined on their under surface, and supported upon long footstalks. The lower leaves are nearly hastate, or with diverging angular points. The flowers, which are large and of a lilac-purple colour, stand upon peduncles about as long as the petioles. Each peduncle supports two, or more rarely, three flowers. The calyx is without bractes, five-leaved, obtuse, with two of the divisions external. The corolla is funnel-form. The stamens are five in number, with oblong, white, somewhat exserted anthers. The stigma is simple and capitate. The above description is taken from that of Mr. Nuttall, published in Dr. Coxe's paper in the *American Journal of the Medical Sciences.*

The jalap plant is a native of Mexico, and derived its name from the city of Xalapa, in the state of Vera Cruz, in the neighbourhood of which it grows, at the height of about 6000 feet above the ocean. The drug is brought from the port of Vera Cruz in bags, containing usually between one hundred and two hundred pounds.

Properties. The tuber comes either whole, or divided longitudinally into two parts, or in transverse circular slices. The entire tubers are irregularly roundish, or ovate and pointed, or pear-shaped, usually much smaller than the fist, and marked with circular or vertical incisions, made to facilitate their drying. The root is preferred in this state, as it is less apt to be defective, and is more easily distinguished from the adulterations than when sliced. A much larger proportion comes entire than formerly, indicating a greater scarcity of the older roots, which it is necessary to slice in order to dry them properly. The tuber is heavy, compact, hard, brittle, with a shining undulated fracture, exhibiting numerous resinous points, distinctly visible with the microscope. It is externally brown and wrinkled, internally of a grayish colour, diversified by concentric darker circles, in which the matter is denser and harder than in the intervening spaces. Jalap is always kept in the shops in the state of powder, which is of a yellowish-gray colour, and when inhaled irritates the nostrils and throat, and provokes sneezing and coughing. The odour of the root, when cut or broken, is heavy, sweetish, and rather nauseous; the taste is sweetish, somewhat acrid, and disagreeable. It yields its active properties partly to water, partly to alcohol, and completely to diluted alcohol. M. Cadet de Gassicourt obtained from 500 parts of jalap, 24 of water, 50 of resin, 220 of gummy extract, 12·5 of fecula, 12·5 of albumen, 145 of lignin, 16·3 of saline matters, 2·7 of silica, with a loss of 17

parts. Buchner and Herberger supposed that they had discovered a basic substance, which they called *jalapin*. G. A. Kayser found that the resin of jalap consists of two portions, one of which, amounting to seven parts out of ten, is hard and insoluble in ether, the other is soft and soluble in that menstruum. The hard resin he named *rhodeoretin*, and found to be identical with the jalapin of Buchner and Herberger. By reaction with the alkalies it is converted into an acid, called *rhodeoretinic acid*. Rhodeoretin is slightly soluble in water, freely so in alcohol, and insoluble in ether; and the alcoholic solution is precipitated both by ether and water. It is dissolved by solutions of the alkalies, more quickly if heated, and is not precipitated by acids, having become soluble by conversion into the acid above referred to. It purges violently in the dose of three or four grains, and is supposed to be the active principle of jalap. Mayer has confirmed and extended the observations of Kayser. The formula of rhodeoretin, according to the latter chemist, is $C_{42}H_{35}O_{20}$, according to the former, $C_{72}H_{60}O_{36}$. (See *Chem. Gaz.*, iii. 15, and xi. 21.) The proportion of resin to the other ingredients of the root varies considerably in different specimens. According to Gerber, the root contains 7·8 per cent. of hard resin, 3·2 of soft resin, 17·9 of extractive, 14·5 of gummy extract, 8·2 of a colouring substance which becomes red under the influence of the alkaline carbonates, 1·9 of uncrystallizable sugar, 15·6 of gum mixed with some saline matters, 3·2 of bassorin, 3·9 of albumen, 6·0 of starch, 8·2 of lignin, with some water, and various salts. For the method of obtaining the resin of jalap pure, see *Extractum sive Resina Jalapæ*.

Jalap is apt to be attacked by worms, which, however, are said to devour the amylaceous or softer parts, and to leave the resin; so that the worm-eaten drug is more powerfully purgative than that which is sound. Thus, out of 397 parts of the former, M. Henry obtained 72 parts of resin, while from an equal quantity of the latter he procured only 48 parts. Hence worm-eaten jalap should be employed for obtaining the resin, but should not be pulverized, as it would afford a powder of more than the proper strength. The drug is also liable to various adulterations, or fraudulent substitutions, which, however, can usually be detected without difficulty. Those which have attracted particular attention are mentioned in the note below.* Jalap should be rejected when it is light, of a

* *Adulterations, &c.* Jalap is said to be sometimes adulterated with *bryony root;* but no instance of the kind has come under our notice; and the two drugs are so widely different that the fraud would be instantly detected. (See *Bryony* in the Appendix.) It is probable, however, that the adulteration which has been considered as bryony root, is the *mechoacan*, which in Europe is sometimes called American bryony, and was formerly erroneously supposed to be derived from a species of Bryonia. The *mechoacan*, is a product of Mexico, which was taken to Europe even before the introduction of jalap. The plant producing it has been conjectured to be the *Ipomæa macrorhiza* of Michaux, which is believed to grow in Mexico near Vera Cruz, as well as in our Southern States, and the root of which is said to weigh, when of full size, from fifty to sixty pounds, and, according to Dr. Baldwin, has little or no purgative power. But this origin is altogether uncertain. Mechoacan is in circular slices, or fragments of various shapes, white and farinaceous within, and, as found in European markets, generally destitute of bark, of which, however, portions of a yellowish colour sometimes continue to adhere. The larger pieces are sometimes marked with faint concentric striæ; and upon the exterior surface are brown spots and ligneous points, left by the radicles which have been removed. (*Guibourt.*) Though tasteless when first taken into the mouth, it becomes after a time slightly acrid. It is very feebly purgative. We have seen flat circular pieces of root, mixed with jalap, altogether answering this description, except that the cortical portion still remained, between which and the amylaceous parenchyma there was a very evident line of division.

A drug, formerly known in our markets as spurious jalap, sometimes comes mingled with the genuine, and has been imported, unmixed, in mistake for that root. It is probably the same with that referred to by French writers as the product of a plant denominated *male jalap* in Mexico, and named by M. Ledanois *Convolvulus Orizabensis*, from the city of Orizaba, in the neighbourhood of which it grows abundantly. In the shops of Paris the drug is called *light jalap*, and, in Guibourt's *Histoire des Drogues*, is described under the title of

whitish colour internally, of a dull fracture, spongy, or friable. Powders of calomel and jalap, taken on long voyages to southern climates, are said, when brought back, to have become consolidated, and so far chemically altered as plainly to exhibit globules of mercury. This change is ascribed by Schacht and Wackenroder to a fungous growth. (*Arch. der Pharm.*, xxxiv. 289.)

Medical Properties and Uses. Jalap is an active cathartic, operating briskly and sometimes painfully upon the bowels, and producing copious watery stools.

fusiform jalap. A description of it was first published in this country by Mr. D. B. Smith, in a valuable paper upon the Ipomæa Jalapa, in the *Am. Journ. of Pharm.*, vol. ii. p. 22. For an account of the plant, the reader is referred to the same Journal, vol. x. p. 224. The recent root is large, spindle-shaped, sometimes as much as twenty inches in length, branched at its lower extremity, of a yellow colour on its outer surface, and white and milky within. The drug, as described by Guibourt, is in circular pieces, two or three inches in diameter, or in longer and more slender sections. As we have seen it, the shape of the pieces is often such as to indicate that the root was sliced transversely, and each circular slice divided into quarters. The horizontal cut surface is dark from exposure, unequal from the greater shrinking in the drying process of some parts than others, and presents the extremities of numerous fibres, which are often concentrically arranged, and run in the longitudinal direction of the root. Internally the colour is grayish, and the texture, though much less compact than that of jalap, is sometimes almost ligneous. The taste is at first slight, but after a time becomes somewhat acrid and nauseous. The dried root of the Convolvulus Orizabensis, or male jalap, analyzed by M. Ledanois, yielded in 1000 parts, 80 of resin, 256 of gummy extract, 32 of fecula, 24 of albumen, and 580 of lignin. It has cathartic properties similar to those of the true jalap, but considerably more feeble, requiring to be given in a dose of from thirty to sixty grains in order to operate effectively. The proportion of resin, which in both is the most active purgative principle, is considerably less in the male jalap; while that of lignin, which is wholly inert, is about double. (*Journ. de Pharm.*, xxiv. 166.) This resin, according to G. A. Kayser, differs from the true jalap resin in consisting of only one principle, which is entirely soluble in ether. But both resins are distinguished from all others by being gradually dissolved in concentrated sulphuric acid, and deposited again after some hours in a soft state. (*Chem. Gaz.*, No. 53, from Liebig's *Annalen.*)

A false jalap was some years since brought into the United States, different from anything before seen in our market. It was said to have been imported from Mexico into New York in considerable quantities, and was offered for sale under the name of *overgrown jalap.* A specimen, brought to Philadelphia, and examined by a Committee of the College of Pharmacy, presented the following characters. It was in light, entire or vertically sliced tubers, of different form and magnitude, spindle-shaped, ovate, and kidney-form, some as much as six inches long and three thick, others much smaller, externally somewhat wrinkled, with broad flattish light-brown ridges and shallow darker furrows, internally grayish-white, with distant darker concentric circles, sometimes uniformly amylaceous, of a dull rough fracture, a loose texture, a slight, peculiar, and sweetish odour, and a feeble jalap-like taste. The powder was of a light-gray colour, and did not irritate the nostrils or throat during pulverization. The root differed from mechoacan by the absence of the marks of radical fibres, and from male jalap by the want of a fibrous structure. It yielded by analysis, in 100 parts, 3 of a soft and 4 of a hard and brittle resin, 17 of gummy extractive, 28 of starch and inulin, 10 of gum and albumen, 23·2 of lignin, and 14·8 of saccharine matter and salts of lime, including loss. In doses of from fifteen to twenty grains it produced no effect on the system. A similar root was described by Guibourt by the name of *rose-scented jalap.* It was taken to France from Mexico, mixed with genuine jalap. It proved equally inefficacious as a purgative, and probably had the same origin. This spurious drug is probably the product of a Convolvulus or Ipomæa. See a report by Messrs. Duhamel, Ellis, and Ecky, in the *American Journal of Pharmacy*, xiv. 289.

Two varieties of false jalap imported into New York are described by Mr. John H. Currie in the *N. Y. Journ. of Pharm.* for Jan. 1852. The first corresponds with the root above described as that of the Convolvulus Orizabensis, or *male jalap*, both in appearance and in the character of its resinous ingredient. The second is a tuberous root, resembling in shape, colour, and size the butternut, or fruit of Juglans cinerea, being black or nearly so externally, dull over most of the surface but glossy in spots, with deep longitudinal incisions, internally yellow or yellowish-white, with a horny fracture, and upon the transversely cut surface marked with sparse dots as if from delicate fibres. It contains no resin, and appears to be inert.

The aqueous extract purges moderately, without much griping, and is said to increase the flow of urine. The portion not taken up by water gripes severely. The watery extract obtained from jalap previously exhausted by rectified spirit, is said to have no cathartic effect, but to operate powerfully by urine. (*Duncan.*) The alcoholic extract, usually called resin of jalap, purges actively, and often produces severe griping. From these facts, it would appear that the virtues of this cathartic do not depend exclusively upon any one principle. Jalap was introduced into Europe in the latter part of the sixteenth, or beginning of the seventeenth century, and now ranks among the purgative medicines most extensively employed. It is applicable to most cases in which an active cathartic is required, and from its hydragogue powers is especially adapted to the treatment of dropsy. It is generally given in connexion with other medicines, which assist or qualify its operation. In dropsical complaints it is usually combined with bitartrate of potassa; and the same mixture is much employed in the treatment of the hip disease, and scrofulous affections of other joints. With calomel it forms a cathartic compound, which has long been highly popular in the United States in bilious fever, and other complaints attended with congestion of the liver or portal circle. In over-doses it may produce dangerous hypercatharsis. It is said to purge when applied to a wound.

The dose of jalap in powder is from fifteen to thirty grains; of the resin, or alcoholic extract of the Edinburgh College, from four to eight grains; of the extract of the U. S. and London Pharmacopœias, from ten to twenty grains. The latter extract is preferable to the alcoholic, as it more completely represents the jalap itself. The dose of calomel and jalap is ten grains of each; that of bitartrate of potassa and jalap, two drachms of the former and ten or fifteen grains of the latter.

Off. Prep. Extractum Jalapæ; Extractum sive Resina Jalapæ; Pulvis Jalapæ Compositus; Tinctura Jalapæ; Tinctura Sennæ et Jalapæ. W.

JUGLANS. *U. S.*

Butternut.

The inner bark of the root of Juglans cinerea. *U. S.*

Juglans. *Sex. Syst.* Monœcia Polyandria.—*Nat. Ord.* Juglandaceæ.

Gen. Ch. Male. *Amentum* imbricated. *Calyx* a scale. *Corolla* six-parted. *Filaments* four to eighteen. Female. *Calyx* four-cleft, superior. *Corolla* four-cleft. *Styles* two. *Drupe* coriaceous with a furrowed nut. *Willd.*

Several products of *Juglans regia*, or common European walnut, are used medicinally in Europe. The hull of the fruit has been employed as a vermifuge from the times of Hippocrates, and has been recommended in syphilis and old ulcers. The expressed oil of the fruit is deemed by some practitioners efficacious against the tape-worm, and is also used as a laxative injection. The *leaves*, long occasionally employed for various purposes both in regular and domestic practice, have been found by Professor Négrier, of Angers, in the highest degree efficacious in scrofula. He gave to children a teacupful of a pretty strong infusion, or six grains of the aqueous extract, or an equivalent dose of a syrup prepared from the extract, two, three, or four times a day; and at the same time applied a strong decoction to the ulcers, and as a collyrium when the eyes were diseased. No injury ever resulted from a long-continued use of the remedy. It appears to act as a moderately aromatic bitter and astringent. (*Archives Gén.*, 3*e série*, x. 399 and xi. 41.) The leaves of our *J. nigra* or common black walnut, or those of *J. cinerea*, the only officinal species, would probably answer as good a purpose.

Juglans cinerea. Willd. *Sp. Plant.* iv. 456; Bigelow, *Am. Med. Bot.* ii. 115; Carson, *Illust. of Med. Bot.* ii. 42, pl. 86.—*J. cathartica*, Michaux, *N. Am.*

Sylva. i. 160. This is an indigenous forest tree, known in different sections of the country by the various names of *butternut*, *oilnut*, and *white walnut*. In favourable situations it attains a great size, rising sometimes fifty feet in height, with a trunk three or four feet in diameter at the distance of five feet from the ground. The stem divides, at a small distance from the ground, into numerous nearly horizontal branches, which spread widely, and form a large tufted head. The young branches are smooth and of a grayish colour, which has given origin to the specific name of the plant. The leaves are very long, and consist of seven or eight pairs of sessile leaflets, and a single petiolate leaflet at the end. These are two or three inches in length, oblong-lanceolate, rounded at the base, acuminate, finely serrate, and somewhat downy. The male and female flowers are distinct upon the same tree. The former are in large aments, four or five inches long, hanging down from the sides of the shoots of the preceding year's growth near their extremity. The fertile flowers are at the end of the shoots of the same spring. The germ is surmounted by two large, feathery, rose-coloured stigmas. The fruit is sometimes single, suspended by a thin pliable peduncle; sometimes several are attached to the sides and extremity of the same peduncle. The drupe is oblong-oval, with a terminal projection, hairy, viscid, green in the immature state, but brown when ripe. It contains a hard, dark, oblong, pointed nut, with a rough, deeply and irregularly furrowed surface. The kernel is thick, oily, and pleasant to the taste.

The butternut grows in Upper and Lower Canada, and throughout the whole northern, eastern, and western sections of the United States. In the Middle States, the flowers appear in May, and the fruit ripens in September. The tree, if pierced immediately before the leaves unfold, yields a richly saccharine juice, from which sugar may be obtained, nearly if not quite equal to that from the sugar maple. The wood, though neither strong nor compact, is useful for some purposes on account of its durability, and exemption from the attacks of worms. The fruit, when half-grown, is sometimes made into pickles, and, when ripe, affords in its kernel a grateful article of food. The bark is used for dyeing wool a dark-brown colour, though inferior for this purpose to that of the black walnut. It is said, when applied to the skin, to be rubefacient. The inner bark is the medicinal portion, and that of the root, being considered most efficient, is directed by the national Pharmacopœia. It should be collected in May or June.

On the living tree, the inner bark when first uncovered is of a pure white, which becomes immediately on exposure a beautiful lemon colour, and ultimately changes to deep brown. It has a fibrous texture, a feeble odour, and a peculiar, bitter, somewhat acrid taste. Its medical virtues are extracted by boiling water. Dr. Bigelow could detect no resin in the bark; and the presence of tannin was not evinced by the test of gelatin, though a brownish-black colour was produced by the sulphate of iron.

Medical Properties and Uses. Butternut is a mild cathartic, operating without pain or irritation, and resembling rhubarb in the property of evacuating without debilitating the alimentary canal. It was much employed, during our revolutionary war, by Dr. Rush and other physicians attached to the army. It is especially applicable to cases of habitual costiveness and other bowel affections, particularly dysentery, in which it has acquired considerable reputation. In connexion with calomel it has sometimes been used in our intermittent and remittent fevers, and other complaints attended with congestion of the abdominal viscera. It is given in the form of decoction or extract, never in substance. The extract is officinal, and is almost always preferred. The dose of it is from twenty to thirty grains as a purge, from five to ten grains as a laxative.

Off. Prep. Extractum Juglandis. W.

JUNIPERUS. *U. S., Lond.*

Juniper.

The fruit of Juniperus communis. *U. S., Lond.*

Off. Syn. JUNIPERI CACUMINA. Tops of Juniperus communis. JUNIPERI FRUCTUS. Berries of Juniperus communis. *Ed.* JUNIPERUS COMMUNIS. The tops and berries. *Dub.*

Genevrier commun, Baies de Genièvre, *Fr.;* Gemeiner Wachholder, Wachholderbeeren, *Germ.;* Ginepro, *Ital.;* Enebro, Bayas de enebro, *Span.*

JUNIPERUS. *Sex. Syst.* Diœcia Monadelphia.—*Nat. Ord.* Pinaceæ or Coniferæ.

Gen. Ch. MALE. *Amentum* ovate. *Calyx* a scale. *Corolla* none. *Stamens* three. FEMALE. *Calyx* three-parted. *Petals* three. *Styles* three. *Berry* three-seeded, irregular, with the three tubercles of the calyx. *Willd.*

Juniperus communis. Willd. *Sp. Plant.* iv. 853; Woodv. *Med. Bot.* p. 13, t. 6. This is an erect evergreen shrub, usually small, but sometimes attaining a height of twelve or fifteen feet, with numerous very close branches. The leaves are narrow, longer than the fruit, entire, sharply pointed, channeled, of a deep-green colour, somewhat glaucous on their upper surface, spreading, and attached to the stem or branches in threes, in a verticillate manner. The flowers are diœcious, and disposed in small, ovate, axillary, sessile, solitary aments. The fruit is formed of the fleshy coalescing scales of the ament, and contains three angular seeds.

The common juniper is a native of Europe; but has been introduced into this country, in some parts of which it has become naturalized. It is not uncommon in the neighbourhood of Philadelphia. The plant described in Bigelow's American Medical Botany, under the title of *J. communis*, and very common in certain parts of New England, deserves, perhaps, to be considered a distinct species. It is a trailing shrub, seldom more than two or three feet in height, spreading in all directions, throwing out roots from its branches, and forming beds which are often many rods in circumference. The name of *J. depressa* has been proposed for it. The common juniper flowers in May; but does not ripen its fruit till late in the following year. All parts of the plant contain a volatile oil, which imparts to them a peculiar flavour. The wood has a slight aromatic odour, and was formerly used for fumigation. A terebinthinate juice exudes from the tree and hardens on the bark. This has been erroneously considered as identical with *sandarach*. The peasantry in the South of France prepare a sort of tar, which they call "*huile de cade*," from the interior reddish wood of the trunk and branches, by a distillation *per descensum*. (See *oil of cade* in the Appendix.) The fruit and tops of juniper are the only officinal parts.

The berries, as the fruit is commonly called, are sometimes collected in this country, and parcels are occasionally brought to the Philadelphia market from New Jersey. But, though equal to the European in appearance, they are inferior in strength, and are not much used. The best come from the South of Europe, particularly from Trieste and the Italian ports. They are globular; more or less shriveled; about as large as a pea; marked with three furrows at the summit, and with tubercles from the persistent calyx at the base; and covered with a glaucous bloom, beneath which they are of a shining blackish-purple colour. They contain a brownish-yellow pulp, and three angular seeds. They have an agreeable somewhat aromatic odour, and a sweetish, warm, bitterish, slightly terebinthinate taste. These properties, as well as their medical virtues, they owe chiefly to a volatile oil. (See *Oleum Juniperi.*) The other ingredients, according to Trommsdorff, are resin, sugar, gum, wax, lignin, water, and various saline substances. The proportion of these ingredients varies according to the greater or less maturity of the berries. The volatile oil is most abundant in those which

have attained their full growth and are still green, or in those which are on the point of ripening. In the latter, Trommsdorff found one per cent. of the oil. In those which are perfectly ripe it has been partly changed into resin, and in those quite black, completely so. The berries impart their virtues to water and alcohol. They are very largely consumed in the preparation of gin.

The tops of Juniper are directed by the Edinburgh and Dublin Colleges. Their odour is balsamic, their taste resinous and bitterish; and they possess similar virtues with the berries.

Medical Properties and Uses. Juniper berries are gently stimulant and diuretic, imparting to the urine the smell of violets, and producing occasionally, when very largely taken, disagreeable irritation in the urinary passages. They are chiefly used as an adjuvant to more powerful diuretics in dropsical complaints; but have been recommended also in scorbutic and cutaneous diseases, catarrh of the bladder, and atonic conditions of the alimentary canal and uterus. They may be given in substance, triturated with sugar, in the dose of one or two drachms repeated three or four times a day. But the infusion is a more convenient form. It is prepared by macerating an ounce of the bruised berries in a pint of boiling water, the whole of which may be taken in the course of twenty-four hours. Extracts are prepared from the berries, both bruised and unbruised, and given in the dose of one or two drachms; but, in consequence of the evaporation of the essential oil, they are probably not stronger than the berries in substance.

Off. Prep. Decoctum Scoparii Compositum; Infusum Juniperi; Oleum Juniperi; Spiritus Juniperi Compositus. W.

JUNIPERUS VIRGINIANA. *U. S. Secondary.*

Red Cedar.

The tops of Juniperus Virginiana. *U. S.*

JUNIPERUS. See JUNIPERUS.

Juniperus Virginiana. Willd. *Sp. Plant.* iv. 853; Bigelow, *Am. Med. Bot.* iii. 49; Michaux, *N. Am. Sylv.* iii. 221. This species of Juniper, known commonly by the name of *red cedar*, is an evergreen tree of slow growth, seldom attaining a very large size, though sometimes rising forty or fifty feet in height, with a stem more than a foot in diameter. It has numerous very close branches, which, in the young tree, spread out horizontally near the ground; but, as the tree advances, the lower branches slowly decay, leaving the trunk irregular with knots and crevices. The leaves are very small, fleshy, ovate, concave, pointed, glandular on their outer surface, either ternate or in pairs, and closely imbricated. Those of the young shoots are often much longer, and spreading. The leaves closely invest the extreme twigs, increasing with their growth, till ultimately lost in the encroachments of the bark. "The barren flowers are in oblong aments, formed by peltate scales with the anthers concealed within them. The fertile flowers have a proper perianth, which coalesces with the germ, and forms a small, roundish berry, with two or three seeds, covered on its outer surface with a bright blue powder." (*Bigelow.*)

The red cedar grows in all latitudes of the United States, from that of Burlington, in Vermont, to the Gulf of Mexico; but is most abundant and most vigorous in the southern section. The interior wood is of a reddish colour, and highly valuable on account of its great durability. Small excrescences which are sometimes found on the branches of the tree, are popularly used as an anthelmintic, under the name of *cedar apples*, in the dose of from ten to twenty grains three times a day. The tops or leaves only are officinal.

They have a peculiar not unpleasant odour, and a strong, bitterish, somewhat

pungent taste. These properties reside chiefly in a volatile oil, and are readily imparted to alcohol. The leaves, analyzed by Mr. Wm. J. Jenks, were found to contain volatile oil, gum, tannic acid, albumen, bitter extractive, resin, chlorophylle, fixed oil, lime, and lignin. (*Am. Journ. of Pharm.*, xiv. 235.) They bear a close resemblance to the leaves of *Juniperus Sabina*, from which they can be certainly distinguished only by the difference of odour.

Medical Properties and Uses. The resemblance of red cedar to savine is said also to extend to their medical properties; the former being considered, like the latter, stimulant, emmenagogue, diuretic, and, under certain circumstances, diaphoretic. It is, however, much less energetic; and, though advantage may, as has been asserted, have accrued from its use in amenorrhœa, chronic rheumatism, and dropsy, it has not acquired the confidence of the profession generally.* Externally applied it acts as an irritant; and an ointment, prepared by boiling the fresh leaves for a short time in twice their weight of lard, with the addition of a little wax, is employed as a substitute for savine cerate in maintaining a purulent discharge from blistered surfaces. Sometimes the dried leaves in powder are mixed with six times their weight of resin cerate, and used for a similar purpose. But neither of these preparations is as effectual as the analogous preparation of savine. W.

KINO. *U. S., Lond., Ed., Dub.*

Kino.

The inspissated juice of Pterocarpus Marsupium, and of other plants. *U. S.* Pterocarpus Marsupium. Juice from incisions in the bark, hardened in the sun. *Lond.* Concrete exudation of Pterocarpus erinaceus, and of other undetermined genera and species. *Ed., Dub.*

Kino, *Fr., Germ., Ital.;* Quino, *Span.*

The term kino was originally applied to a vegetable extract or inspissated juice, taken to London from the western coast of Africa, and introduced to the notice of the profession by Dr. Fothergill. Vegetable products obtained from various other parts of the world, resembling kino in their appearance and properties, afterwards received the same name; and much confusion and uncertainty have existed, and in some degree still exist, in relation to the botanical and commercial history of the drug. We shall first give an account of the general properties of the medicines denominated kino, and shall then treat of the several varieties.

General Properties. Kino, as found in the shops, is usually in small, irregular, angular, shining fragments, seldom so large as a pea, of a dark reddish-brown or blackish colour, very brittle, easily pulverizable, and affording a reddish powder, much lighter coloured than the drug in its aggregate state. If in larger masses, it may be reduced without difficulty into these minute fragments. It is without odour, and has a bitterish, highly astringent taste, with a somewhat sweetish after-taste. It burns with little flame, and does not soften with heat. It imparts its virtues and a deep-red colour to water and alcohol. Cold water forms with

* In the *Boston Medical and Surgical Journal* (xl. 469), several cases of poisoning are recorded by Dr. S. C. Watt, of Gouverneur, New York, resulting from the use of "*cedar oil*," which we presume to be the volatile oil procured by distillation from the red cedar, though no information on that point is given. It appears that this oil has the reputation of producing abortion, and was taken, in three of the cases described, with a view to this effect. In one instance a fluidrachm was taken, in another a fluidounce, and in both of these cases recovery took place. Two of the cases were fatal. The symptoms were burning in the stomach, sometimes vomiting, violent convulsions, coma, and a very slow pulse. The operation of the poison was mainly on the brain. No abortive effect was experienced in either case. The stomach, on examination after death, showed some marks of inflammation, but not violent.—*Note to the ninth edition.*

it a clear infusion. Boiling water dissolves it more largely; and the saturated decoction becomes turbid on cooling, and deposits a reddish sediment. The tincture is not disturbed by water. When long kept it often gelatinizes, and loses its astringency. (See *Tinctura Kino.*) Kino has been supposed to consist chiefly of a modification of tannic acid or tannin, with extractive, gum, and sometimes probably a little resin; but we need a careful analysis of the different well-ascertained varieties. The aqueous solution is precipitated by gelatin, the soluble salts of iron, silver, lead, and antimony, bichloride of mercury, and sulphuric, nitric, and muriatic acids. The precipitate with iron is of an olive or greenish-black colour. The alkalies favour the solubility of kino in water, but essentially change its nature, and destroy its astringency.

1. *East India Kino.* This is the variety at present probably most used, and most highly esteemed. Its origin was long unknown. It is now ascertained, through the united researches of Drs. Pereira, Royle, Wight, and others, to be the product of *Pterocarpus Marsupium*, a lofty tree, growing upon the mountains of the Malabar coast of Hindostan. Kino is the juice of the tree, extracted through longitudinal incisions in the bark, and afterwards dried in the sun. Upon drying it breaks into small fragments, and is put into wooden boxes for exportation. It is collected near Tellicherry, and exported from Bombay. It is sometimes imported into this country directly from the East Indies, but more commonly from London. From a communication in the Journal of the Asiatic Society of Bengal, by the Rev. F. Mason, it appears that kino is also collected in the Tenasserim provinces, in further India, and has been exported from Maulmain to Europe. It is produced by a tree called *Pa-douk*, which is supposed to be a species of Pterocarpus; but its precise character was not certainly known. (*Am. Journ. of Pharm.*, xxi. 134.) Dr. Christison has subsequently recognised, in a description of this tree furnished to him by Mr. Begbie, of Maulmain, the precise characters of Pterocarpus Marsupium; so that this kino has the same origin with that from Malabar.

East India kino is in small, angular, glistening fragments, of a uniform consistence, appearing as if formed by the breaking down of larger masses. The larger fragments are opaque and nearly black; but minute splinters are sometimes translucent, and of a deep garnet redness when viewed by transmitted light. This variety of kino is very brittle, readily breaking between the fingers, and easily pulverized, affording a dark reddish powder, a portion of which, resulting from the mutual attrition of the fragments, is often found interspersed among them. When chewed, it softens in the mouth, adheres somewhat to the teeth, and tinges the saliva of a blood-red colour. In odour, taste, and chemical relations, it corresponds with the account already given of kino in general. According to Vauquelin, it contains 75 per cent. of tannin and peculiar extractive, 24 of red gum, and 1 of insoluble matter. But new views have recently been advanced as to its composition. When kino is boiled in water, the decoction deposits on cooling a bright-red substance; and a similar deposition takes place when a cold filtered aqueous solution of kino is long exposed with a broad surface to the air. Dr. Gerding considers this deposit as the result of the combination of oxygen with kino-tannic acid, and calls it *kino-red*. (*Chem. Gaz.*, ix. 260, from Liebig's *Annalen.*) Hennig, who has examined East India kino with some care, considers this kino-red as a colouring matter in intimate combination with the tannic acid, which he is disposed to think identical in its pure state with tannic acid of galls; and he extends the same views to the other forms of this astringent principle which give greenish precipitates with the sesquisalts of iron, and which are generally believed to be somewhat different, as they occur in different plants. Finding this red colouring matter to possess acid properties, he has named it *kinoic acid*. According to Hennig, kino consists of tannic acid with a trace of

gallic acid, kinoic acid, pectin, ulmic acid, and inorganic salts with excess of earthy bases. (See *Am. Journ. of Pharm.*, xxv. 544.)

2. *West India or Jamaica Kino.* This is believed to be the product of the *Coccoloba uvifera*, or *sea-side grape*, a tree twenty feet or more in height, bearing beautiful broad shining leaves, and large bunches of purple berries, to which it owes its vernacular name. It grows in the West Indies and neighbouring parts of the continent. The kino is said to be obtained by evaporating a decoction of the wood and bark, which are very astringent. Many years since, a thick reddish-brown liquid was imported into Philadelphia from the West Indies, which, when dried by exposure to the air in shallow vessels or by heat, afforded an extract having all the properties of kino, for which it was sold by the druggists. This has been long exhausted; but some years since, a considerable quantity of West India kino was brought into this market, which may still enter into the consumption of the country. It was contained in large gourds, into which it was evidently poured while in a liquid or semi-liquid state, and then allowed to harden. We have specimens of this kino in our possession.

When taken from the gourd, it breaks into fragments of various sizes, upon an average about as large as a hazelnut, and having some tendency to the rectangular form. The consistence of these fragments is uniform, their surface smooth and shining, and their colour a dark reddish-brown, approaching to black. They are, however, not so glistening, nor so black as the East India kino. In mass they are quite opaque, but in thin splinters are translucent and of a ruby redness. They are readily broken by the fingers into smaller fragments, are easily pulverized, and yield a dull-reddish powder, considerably lighter-coloured than that of the former variety. The West India kino is without odour, and has a very astringent bitterish taste, with a scarcely observable sweetish after-taste. It adheres to the teeth when chewed, though rather less than the East India variety, and colours the saliva red. The solubility of Jamaica kino was very carefully examined, at our request, by Dr. Robert Bridges, of this city, who found that cold water dissolved 89 per cent., and ordinary officinal alcohol 94 per cent. The portion dissolved by alcohol and not by water was probably of a resinous nature; as it appeared to be viscid, and very much impeded the filtration of the watery solution. Considering the nature of this substance, the form of kino in which it was found is probably, like that from the East Indies, an inspissated juice. Guibourt, who states that Jamaica kino is but slightly dissolved by cold water, must have operated on a different product.

3. *South American Kino.—Caracas Kino.* In 1839, when the fourth edition of this Dispensatory was published, an astringent extract was described, which had recently been introduced into our market, derived, as we were informed, from Caracas, and known by that name to the druggists. Since that period it has come much more extensively into use. It is probably the same as that described by Guibourt, in the last edition of his History of Drugs, as the kino of *Columbia*. As imported, this variety of kino is in large masses, some weighing several pounds, covered with thin leaves, or exhibiting marks of leaves upon their unbroken surface, externally very dark, and internally of a deep reddish-brown or dark port-wine colour. It is opaque in the mass, but translucent in thin splinters, very brittle, and of a fracture always shining, but in some masses wholly rough and irregular, in others rough only in the interior, while the outer portion, for an inch or two in depth, breaks with a rather smooth and uniform surface like that of the West India kino. This outer portion is easily broken into fine angular fragments, while the interior crumbles quite irregularly. Some of the masses are very impure, containing pieces of bark, wood, leaves, &c.; others are more homogeneous, and almost free from impurities. The masses are broken up by means of a mill so as to resemble East India kino, from which, however, this

variety differs in being more irregular, less sharply angular, more powdery, and less black. On comparing the finer and more angular portions of the masses with the West India kino, we were strongly struck with their resemblance; and in fact could discover no difference between the two varieties either in colour, lustre, taste, the colour of the powder, or other sensible property. South American kino was found by Dr. Bridges to yield 93·5 per cent. to cold water, and 93 per cent. to alcohol; so that, while it has almost the same solubility as Jamaica kino in alcohol, it is somewhat more soluble in cold water. The aqueous solution, in this case, was not embarrassed by the adhesive matter which impeded the filtration in the former variety; and the want of a minute proportion of resinous matter in the South American kino is the only difference we have discovered between the two drugs. It is not improbable that they are derived from the same plant; and there is no difficulty in supposing that this may be the Coccoloba uvifera, as that tree grows as well upon the continent as in the islands.

4. *African Kino.* The original kino employed by Dr. Fothergill was known to be the produce of a tree growing in Senegal, and upon the banks of the Gambia, on the western coast of Africa; but the precise character of the tree was not ascertained, until a specimen, sent home by Mungo Park during his last journey, enabled the English botanists to decide that it was the *Pterocarpus erinaceus* of Lamarck and Poiret. The Edinburgh and Dublin Colleges accordingly refer kino in chief to this plant; but in so doing have overlooked the fact that not one of the varieties now used is brought from Africa. The importation of African kino has long ceased; and the most experienced pharmacologist cannot speak with certainty of having seen a specimen. That described by Guibourt has turned out to be the *Butea gum*;* and the description in the first edition of Christison's Dispensatory evidently applies to the common East India kino. A specimen given to Dr. A. T. Thomson as African kino, and described in his Dispensatory, is certainly not the drug spoken of by Fothergill, but rather resembles the Butea gum.

As described by Fothergill, the African kino, for which he proposed the name of *gummi rubrum astringens Gambinense*, was in lumps of about the size of those of gum Senegal or dragon's blood, and so similar in appearance to the latter that a good judge might easily be deceived. These lumps were hard, brittle, opaque, and almost black; but minute fragments were reddish and transparent like garnet. The drug was inodorous, of a strongly astringent and sweetish taste, and soluble in water to the extent of about five or six parts out of seven, forming a deep-red astringent infusion. There can be little doubt that this variety of kino is a concrete juice, which exudes either spontaneously or from wounds in the bark, and hardens in the air. (See *Med. Obs. and Inq.*, i. 358.)

5. *Botany Bay Kino.* This is the concrete juice of the *Eucalyptus resinifera*,

* *Butea gum* is the concrete juice of the *Butea frondosa* or *Dhak-tree* of Hindostan. The juice flows from natural fissures, and from wounds made in the bark of the tree, and quickly hardens. It is in small elongated tears, or irregular angular masses, less in size than a grain of barley, apparently black and opaque, but translucent and of a ruby-red colour, when examined in small fragments by transmitted light. Many of the tears have small portions of bark adhering to them. They are very brittle, and readily pulverizable, yielding a reddish powder. They are very astringent to the taste, do not adhere to the teeth when chewed, and tinge the saliva red. The relations of this product to water, alcohol, and other chemical reagents are nearly the same as those of ordinary kino. When freed from impurities, consisting of from 15 to 25 per cent. of wood, bark, sand, &c., it contains, according to Mr. E. Solly, 73·26 per cent. of tannin, 5·05 of soluble extractive, and 21·67 of gum and other soluble substances. It is used in the arts in India, and might undoubtedly be employed as kino in medicine. It is, however, very seldom imported into England, and never, at present, into this country. Dr. Pereira found a quantity in an old drug store in London, and sent a portion to Guibourt, from which that writer drew up his description of African kino. It is possible that the kino which formerly reached us, full of small pieces of wood, bark, &c., may have been the *Butea gum*.

or brown gum tree of New Holland, a lofty tree, belonging to the class and order *Icosandria Monogynia*, and the natural order *Myrtaceæ*. When the bark is wounded the juice flows very freely, and hardens in the air. According to Mr. White, a single tree is capable of furnishing five hundred pounds of kino in one year. (*White's Voyage.*) Duncan states that specimens of the juice have reached Great Britain in the fluid form, and that when he first examined kino in 1802, it was common, and was the finest kind in commerce. According to information received by Dr. Thomson, its importation into Great Britain must have ceased soon after that period (*Thomson's Dispensatory*, 1826, p. 506); but Dr. Pereira speaks of it as imported in boxes, and has himself met with a parcel of it from Van Dieman's Land. Ainslie informs us that he has seen it in the markets of Hindostan. We have never met with it in this country.

The specimen examined by Pereira was in irregular masses, many of them in the form of tears as large as those of Senegal gum. "The purer pieces were vitreous, almost black in the mass, but transparent and of a beautiful ruby-red in small and thin fragments. Some of the pieces, however, were opaque and dull, from the intermixture of wood and other impurities." This variety of kino is brittle, with a resinous unequal fracture, and yields a reddish-brown powder. It is infusible, without odour, of an astringent taste followed by sweetness, and when long chewed adheres to the teeth. (*Duncan.*) It swells up and becomes gelatinous with cold water, yielding a red solution, which gives precipitates with lime-water, gelatin, and sesquichloride of iron, but not with alcohol or tartar emetic. With rectified spirit it also becomes gelatinous, and forms a red tincture which is not precipitated by water. (*Pereira.*) White states that only one-sixth of this kino is soluble in water; Guibourt found it wholly soluble with the exception of foreign matters; and Dr. Thomson informs us that water at 60° dissolves more than one-half. These writers must have experimented with different substances. According to Dr. Duncan, alcohol dissolves the whole except impurities; and the tincture, with a certain proportion of water, lets fall a copious red precipitate, but with a large proportion only becomes slightly turbid.

It is said that catechu, broken into small fragments, has sometimes been sold as kino. Fortunately little injury can result from the substitution, as the medical virtues of the two substances are very nearly the same.

Medical Properties and Uses. Kino is powerfully astringent, and in this country is much used for the suppression of morbid discharges. In diarrhœa not attended with febrile excitement or inflammation, it is often an excellent adjunct to opium and the absorbent medicines, and is a favourite addition to the chalk mixture. It is also used in chronic dysentery when astringents are admissible; in leucorrhœa and diabetes; and in passive hemorrhages, particularly that from the uterus. It was formerly used in intermittent fever.

It may be given in powder, infusion, or dissolved in diluted alcohol. The dose of the powder is from ten to thirty grains. The infusion, which is a very convenient form of administration, may be made by pouring eight fluidounces of boiling water on two drachms of the extract, and straining when cool. Aromatics may be added, if deemed advisable. The dose is a fluidounce. The proportion of alcohol in a dose of the tincture renders it frequently an unsuitable preparation.

Locally applied, kino is often productive of benefit. Its infusion is useful as an injection in leucorrhœa and obstinate gonorrhœa, and thrown up the nostrils we have found it very efficacious in suppressing epistaxis. A case of obstinate hemorrhage from a wound in the palate, after resisting various means, yielded to the application of powdered kino, which was spread thickly on lint, and pressed against the wound by the tongue. The powder is also a very useful application to indolent and flabby ulcers.

Off. Prep. Electuarium Catechu; Pulvis Aluminis Compositus; Pulvis Catechu Comp.; Pulvis Kino Comp.; Tinctura Kino. W.

KRAMERIA. *U. S., Lond., Ed., Dub.*

Rhatany.

The root of Krameria triandra. *U. S., Lond., Ed., Dub.*
Ratanhie, *Fr.;* Ratanhiawurzel, *Germ.;* Ratania, *Ital., Span.*

KRAMERIA. *Sex. Syst.* Tetrandria Monogynia.—*Nat. Ord.* Polygaleæ, *De Cand.* Krameriaceæ, *Lindley.*

Gen. Ch. Calyx none. *Corolla* four-petalled; the superior nectary three-parted, and inferior two-leaved. *Berry* dry, echinated, one-seeded. *Willd.*

Krameria triandra. Ruiz and Pavon, *Flor. Peruv.* i. 61. The rhatany plant is a shrub, having a long, much branched, and spreading root, of a blackish-red colour; with a round, procumbent, very dark-coloured stem, divided into numerous branches, of which the younger are leafy and thickly covered with soft hairs, giving them a white, silky appearance. The leaves are few, sessile, oblong-ovate, pointed, entire, presenting on both surfaces the same silky whiteness with the young branches, on the sides of which they are placed. The flowers are lake-coloured, and stand singly on short peduncles at the axils of the upper leaves. There are only three stamens. The nectary consists of four leaflets, of which the two upper are spatulate, the lower roundish and much shorter: it does not correspond with the generic character of Willdenow, which was drawn from the *Krameria Ixina.* The fruit is globular, of the size of a pea, surrounded by stiff reddish-brown prickles, and furnished with one or two seeds. The name *rhatany* is said to express, in the language of the Peruvian Indians, the creeping character of the plant.

This species of Krameria is a native of Peru, growing in dry argillaceous and sandy places, and abundant about the city of Huanuco. It flowers at all seasons, but is in the height of its bloom in October and November. The root is dug up after the rains. Tschudi states that most of the rhatany now exported is obtained in the Southern provinces of Peru, particularly in Arica and Islay. (*Trav. in Peru*, Am. ed., p. 214.)

The *K. Ixina*, growing in Hayti, and in Cumana on the South American continent, is said to afford a root closely analogous in appearance and properties to that of the Peruvian species; but the latter only is officinal.

We receive rhatany in pieces of various shapes and dimensions, some being simple, some more or less branched, the largest as much as an inch in thickness, derived from the main body of the root, the smallest not thicker than a small quill, consisting of the minute ramifications. The pieces are often nearly cylindrical, and as much as two or three feet in length. Sometimes many of the radicles are united in a common head, which is short, and from half an inch to two inches or more in diameter. The roots are composed of a dark reddish-brown, slightly fibrous, easily separable bark, and a central woody portion, less coloured, but still reddish or reddish-yellow. Rhatany is without smell, but has a bitter, very astringent, slightly sweetish taste, which is connected with its medical virtues, and is much stronger in the cortical than the ligneous part.*

* Mettenheimer describes a false rhatany, which has occurred in German commerce, as follows. The body of the root is from 1 to 2 inches thick, and 4 long, knotty, with numerous branches from 4 to 12 inches long; but the branches are generally separate, and nearly half an inch thick. The body resembles the genuine; but the branches are smoother, in parts somewhat shining, with deeper longitudinal furrows, and transverse fissures, which sometimes divide the bark quite around the root. They are more undulating, and, as well as the body, have more frequent wart-like elevations. The false root is more bitter than the genuine, with a thicker bark, and in mass has a dirty violet reddish-brown colour. Exteriorly the bark is of a dirty dark brownish-red, with a granular fracture; interiorly it is lighter coloured, with a fibrous fracture; and when cut with a knife has a shining surface. The interior ligneous part is pale-red, hard, of a short fibrous fracture, and,

The smallest pieces are therefore preferable, as they contain the largest proportion of the bark. The powder is of a reddish colour. The virtues of the root are extracted by water and alcohol, to which it imparts a deep reddish-brown colour. From the researches of Vogel, Gmelin, Peschier, and Trommsdorff, it appears to contain tannin, lignin, and minute quantities of gum, starch, saccharine matter, and an acid which Peschier considered as peculiar, and named *krameric acid.* The tannin is in three states; 1st, that of purity, in which it is without colour; 2d, that of apotheme, in which it has lost its astringency, and been rendered insoluble by the action of the air, and 3d, that of extractive, which is a soluble combination of tannin and its apotheme, and is the substance which imparts to the infusion and tincture of rhatany their characteristic reddish-brown colour. (Soubeiran, *Journ. de Pharm.*, xix. 596.) The proportion of red astringent matter obtained by Vogel was 40 per cent. The mineral acids and most of the metallic salts throw down precipitates with the infusion, decoction, and tincture of rhatany, and are incompatible in prescription.

Cold water, by means of displacement or perçolation, extracts all the astringency of rhatany, forming a clear deep red infusion, which, upon careful evaporation, yields an almost perfectly soluble extract. The root yields its virtues also to boiling water by maceration; but the resulting infusion becomes turbid upon cooling, in consequence of the deposition of apotheme taken up by the water when heated. By boiling with water a still larger proportion of the apotheme is dissolved, and a considerable quantity of the pure tannin becomes insoluble in cold water, and medicinally inert, either by combining with the starch which is also dissolved, or by conversion into apotheme through the agency of the atmosphere. The decoction is, therefore, an ineligible preparation, and the extract resulting from its evaporation, though greater in weight than that from the cold infusion, contains much less soluble and active matter. Alcohol dissolves a larger proportion of the root than water, but this excess is owing to the solution of apotheme; and the alcoholic extract contains little if any more of the astringent principle than that prepared by cold water, while it is encumbered with much inert matter. (See *Extractum Krameriæ.*)

Medical Properties and Uses. Rhatany is gently tonic and powerfully astringent; and may be advantageously given in chronic diarrhœa, passive hemorrhages, especially menorrhagia, some forms of leucorrhœa, and in all those cases in which kino and catechu are beneficial. It has long been used in Peru as a remedy in bowel complaints, as a corroborant in cases of enfeebled stomach, and as a local application to spongy gums. Ruiz, one of the authors of the Peruvian Flora, first made it known in Europe. It was not till after the year 1816 that it began to come into general use. It has the advantage over the astringent extracts imported, that, being brought in the state of the root, it is free from adulteration, and may be prescribed with confidence.

The dose of the powder is from twenty to thirty grains; but in this form the root is little used. The infusion or decoction is more convenient. The proportions are an ounce of the bruised or powdered root to a pint of water, and the dose one or two fluidounces. The extract, tincture, and syrup are officinal preparations; and may be given, the first in the dose of fifteen or twenty grains, the second in that of two or three fluidrachms, and the third in that of half a fluidounce for an adult. In the form of infusion, tincture, and extract, rhatany has been highly recommended as a local remedy in fissure of the anus, prolapsus ani, and leucorrhœa.

Off. Prep. Extractum Krameriæ; Infusum Krameriæ; Syrupus Krameriæ; Tinctura Krameriæ. W.

when cut across, dull and without the dark central point of the genuine root. The false root is inodorous. Its taste is more astringent than the genuine. Its source is unknown. (*Pharm. Cent. Blatt*, March 24, 1852, p. 221.)—*Note to the tenth edition.*

LACMUS. *Ed.*

Litmus.

A peculiar colouring matter from Roccella tinctoria. *Ed.*

Turnsole; Tournesol, *Fr.*; Lakmus, *Germ.*

Three purple or blue colouring substances are known in commerce, obtained from lichenous plants. They are called severally *litmus*, *orchil*, and *cudbear*. The lichens employed are different species of *Roccella*, *Lecanora*, *Variolaria*, and others. They grow on alpine or maritime rocks, in various parts of the world, and for commercial purposes are collected chiefly upon the European and African coasts, and the neighbouring islands, as the Azores, Madeira, Canaries, and Cape de Verds. The particular species most employed are probably *Lecanora tartarea* or *Tartarean moss*, growing in the North of Europe, and *Roccella tinctoria* or *orchilla weed*, which abounds upon the African and insular coasts, and is called commercially, in common with other species of the same genus, *Angola weed*, *Canary weed*, &c., according to the place from which it may be brought.

The principles in these plants upon which their valuable properties depend, are themselves colourless, and yield colouring substances by the reaction of water, air, and ammonia. They are generally acids, and are named *lecanoric*, *orsellic*, *erythric*, &c., according to their use or origin. What is the exact chemical change by which the colouring matters are developed is not determined; but the original body, in some instances at least, undergoes a series of changes, before the ultimate result is obtained. Dr. Stenhouse proposes that the principles should be extracted from the plants at their place of collection, so as to diminish the cost of carriage. For this purpose the lichens, having been finely divided, are to be macerated with milk of lime, the infusion thus obtained to be precipitated with muriatic or acetic acid, and the precipitate to be dried with a gentle heat. Almost the whole of the colouring principles are thus extracted, and obtained in a small bulk. To test the value of the plants as dye-stuffs, they may be macerated in a weak solution of ammonia, or a solution of hypochlorite of lime may be added to their alcoholic tincture. In the former case, a rich violet-red colour is produced; in the latter a deep blood-red colour instantly appears, but soon fades. All the three colouring substances above referred to may be obtained from the same plants.

Lacmus or *Litmus* is prepared chiefly if not exclusively in Holland. The process consists in macerating the coarsely powdered lichen, in wooden vessels under shelter, for several weeks, with occasional agitation, in a mixture of urine, lime, and potash or soda. A fermentation ensues, and the mass, becoming first red and ultimately blue, is after the last change removed, mixed with calcareous or silicious matter to give it consistence, and with indigo to deepen the colour, and then introduced into small moulds, where it hardens. It comes to us in rectangular cakes from a quarter of an inch to an inch in length, light, friable, finely granular, of an indigo-blue or deep-violet colour, and scattered over with white saline points. It has the combined odour of indigo and violets, tinges the saliva of a deep blue, and is somewhat pungent and saline to the taste. From most other vegetable blues it differs in not being rendered green by alkalies. It is *reddened by acids*, and restored to its original blue colour by *alkalies*.

Its chief use in medicine is as a test of acids and alkalies. For this purpose it is employed either in infusion or in the form of litmus-paper. The infusion, usually called *tincture of litmus*, may be made in the proportion of one part of the litmus to twenty of distilled water, and two parts of alcohol may be added to preserve it. *Litmus-paper* is prepared by first forming a strong clear infusion with one part of litmus to four of water, and either dipping slips of white unsized

paper into it, or applying it by a brush to one surface only of the paper. The paper should then be carefully dried, and kept in well-stopped vessels, from which the light is excluded. It should have a uniform blue or slightly purple colour, neither very light nor very dark. As a test for alkalies, the paper may be stained with an infusion of litmus previously reddened by an acid.

Orchil or *archil*, as prepared in England, is in the form of a thickish liquid, of a deep reddish-purple colour, but varying in the tint, being in one variety redder than in the other. The odour is ammoniacal. It is made by macerating lichens, in a covered wooden vessel, with an ammoniacal liquor, either consisting of stale urine and lime, or prepared by distilling an impure salt of ammonia with lime and water. (*Pereira.*)

Cudbear is in the form of a purplish-red powder. It is procured in the same manner as orchil; but the mixture, after the development of the colour, is dried, and pulverized.

The difference in the preparation of these colouring substances and litmus appears to be, that potash or soda is added, in the latter, to the ammoniacal liquid used. Orchil and cudbear are employed as dye-stuffs, and sometimes in like manner with litmus as a test of acids and alkalies. W.

LACTUCA. *Lond.*

Lettuce.

Lactuca sativa. The leaves. *Lond.*

Off. Syn. LACTUCA SATIVA. The leaves. *Dub.*

Laitue, *Fr.;* Garten Lattig, *Germ.;* Lattuga, *Ital.;* Lechuga, *Span.*

LACTUCARIUM. *U. S., Ed., Dub.*

Lactucarium.

The inspissated juice of Lactuca sativa. *U. S.* Inspissated juice of Lactuca virosa and sativa. *Ed., Dub.*

Lactuca. *Sex. Syst.* Syngenesia Æqualis.—*Nat. Ord.* Compositæ Cichoraceæ, *De Cand.* Cichoraceæ, *Lindley.*

Gen. Ch. Receptacle naked. *Calyx* imbricated, cylindrical, with a membranous margin. *Pappus* simple, stipitate. *Seed* smooth. *Willd.*

The plants of this genus yield when wounded a milky juice, to which, indeed, they owe their generic name. In some of them this juice possesses valuable narcotic properties. This is the case, among others, with *L. sativa*, *L. virosa*, and *L. altissima*. The two former are officinal, and are here described. It was supposed that our native *L. elongata* or *wild lettuce* might have similar virtues; and Dr. Bigelow was informed by physicians who had employed it, that it acts as an anodyne, and promotes the secretion from the skin and kidneys. But, according to M. Aubergier, who experimented with different species of Lactuca in order to ascertain from which of them lactucarium might be most advantageously obtained, the milky juice of this plant is of a flat and sweetish taste without bitterness, contains much mannite, but no bitter principle, and is destitute of narcotic properties. (*Ann. de Thérap.*, 1843, p. 18.) The probability is that it is nearly or quite inert. It was, therefore, discarded, at the last revision, from our national Pharmacopœia.

Lactuca sativa. Willd. *Sp. Plant.* ii. 1523. The garden lettuce is an annual plant. The stem, which rises above two feet in height, is erect, round, simple below, and branching in its upper part. The lower leaves are obovate, rounded

at the end, and undulating; the upper are smaller, sessile, cordate, and toothed; both are shining, and of a yellowish-green colour. The flowers are pale-yellow, small, and disposed in an irregular terminal corymb. Before the flower-stem begins to shoot, the plant contains a bland, pellucid juice, has little taste or smell, and is much used as a salad for the table; but during the period of inflorescence it abounds in a milky juice, which readily escapes from incisions in the stem, and has been found to possess decided medicinal as well as sensible properties. This juice is more abundant in the wild than in the cultivated plants. That of *L. sativa*, inspissated by exposure to the air, has been adopted as officinal in the U. S. and British Pharmacopœias, under the name of *Lactucarium*. The Edinburgh and Dublin Colleges admit also *L. virosa* as a source of it.

The original native country of the garden lettuce is unknown. The plant has been cultivated from time immemorial, and is now employed in all parts of the civilized world. It flourishes equally in hot and temperate latitudes. Some botanists suppose that *L. virosa* of the old continent is the parent of all the varieties of the cultivated plant.

The milky juice undergoes little alteration, if confined in closely stopped bottles from which the air is excluded. But, when exposed to the air, it concretes, and assumes a brownish colour somewhat like that of opium. The following mode of collecting it was recommended by Mr. Young, of Edinburgh. When the stem is about a foot high, the top is cut off, and the juice which exudes, being absorbed by cotton or a piece of sponge, is pressed out into a cup or other small vessel, and exposed till it concretes. In order to obtain all the juice which the plant is capable of affording, it is necessary to cut off five or six successive slices of the stem at short intervals, and to repeat the process two or three times a day. The juice may also be collected by the finger as it flows from the incisions.

A plan proposed by Mr. Probart, of London, is to collect the milky juice on pieces of woven cotton about half a yard square, to throw these when fully charged into a vessel containing a small quantity of water, and allow the water thus impregnated to evaporate in shallow dishes at the ordinary atmospheric temperature. The lactucarium is left in the form of an extract.

Another method of extracting the virtues of the lettuce has been recommended by Mr. Probart. When the plant begins to assume a yellow hue, the white juice concretes in the bark of the stem, and in the old leaves, which become very bitter. These parts being separated, are macerated for twenty-four hours in water, then boiled for two hours; and the clear decoction, after having been allowed to drain off through a sieve without pressure, is evaporated in shallow vessels by simple exposure. The resulting extract, according to Mr. Probart, has half the strength of lactucarium, and may be obtained at one-sixth of the cost.

The London College directs an extract to be prepared by inspissating the expressed juice of the leaves; but this must be exceedingly uncertain, from the variable quantity of the milky juice contained in the plant; and, as the young leaves, which contain little or none of it, are often employed, the preparation is liable to be quite inert. The *thridace* of Dr. François, at one time supposed to be identical with lactucarium, is in all probability nothing more than the inspissated expressed juice, and, indeed, is directed as such in the last French Codex, the leaves being rejected, and the stalks alone, near the flowering period, being subjected to pressure.

M. Aubergier, of Clermont, in a treatise presented to the French Academy of Sciences in November, 1842, states that lactucarium, identical with that of the garden lettuce, is yielded by several other species of Lactuca, and can be abundantly and cheaply procured from *Lactuca altissima*, which is a large plant with a stem more than nine feet high, and an inch and a half in diameter. (*Annuaire de Thérap.*, 1843, p. 18.)

Lactucarium is in small irregular lumps, of a reddish-brown colour externally, and of a narcotic odour and bitter taste. As prepared near Edinburgh, it is commonly in roundish, compact, and rather hard masses, weighing several ounces. (*Christison.*) In colour, taste, and smell it bears considerable resemblance to opium, and has sometimes been called *lettuce opium.* It does not attract moisture from the air. It yields nearly half its weight to water, with which it forms a deep-brown infusion. From its resemblance in sensible properties and therapeutical effects to opium, it was conjectured to contain morphia, or some analogous principle; but this conjecture has not yet been realized. Buchner, Aubergier, and Walz claim severally to have discovered the active principle, which has been named *lactucin;* but the substance obtained by these different chemists is not exactly identical in properties; and the lactucin of Walz and Aubergier is considered by M. Lenoir as owing its bitterness to impurities, separated from which it is without taste and inert. It is at least doubtful whether the constituent upon which the medical virtues of lactucarium depend has yet been isolated. We give in a note the results of various analyses of this medicine. They all relate to the lactucarium obtained from the Lactuca virosa.*

* Buchner published experiments on lactucarium in 1832. His results are not essentially different from those subsequently obtained. The principle, named by him *lactucin*, is bitter, soluble in water, more soluble in alcohol, less so in ether, without alkaline reaction though precipitated by tannic acid, destitute of nitrogen, capable of forming with acids very soluble bitter combinations, and not easily obtained perfectly white and crystallized. (*Pharm. Journ. and Trans.*, vii. 74, from *Buchner's Repertorium*, xiv.)

Dr. Walz, in an inaugural thesis published at Heidelberg in 1839, gives the following constituents of lactucarium from L. virosa; viz., a peculiar principle denominated *lactucin*, volatile oil, a fatty matter easily dissolved by ether, and another of difficult solubility in that fluid, a reddish-yellow tasteless resin, a greenish-yellow acrid resin, common sugar, uncrystallizable sugar, gum, pectic acid, a brown humus-like acid, a brown basic substance, albumen, oxalic, citric, malic, and nitric acids, potassa, lime, and magnesia. Lactucin, as obtained by Walz, is in yellow crystalline needles, inodorous, of a strong and durable bitter taste, easily fusible, soluble in from 60 to 80 parts of cold water, freely soluble in alcohol, less so in ether, soluble in very dilute acids, and without either alkaline or acid reaction. (*Annal. der Pharm.*, xxxii. 97.) It was obtained by treating lactucarium with alcohol acidulated with one-fifteenth of concentrated vinegar, adding an equal volume of water, precipitating by subacetate of lead, separating the excess of lead by sulphuretted hydrogen, filtering, evaporating by a gentle heat, treating the residuum by ether, and allowing the ethereal solution to evaporate spontaneously.

M. Aubergier, in his memoir presented to the French Academy in 1842, gives the following as the result of his analysis: 1. a bitter crystallizable substance (*lactucin*) soluble in alcohol and boiling water, scarcely soluble in cold water, insoluble in ether, without alkaline reaction, and supposed to be the active principle; 2. mannite; 3. asparamide; 4. a crystallizable substance having the property of colouring green the sesquisalts of iron. 5. an electro-negative resin, combined with potassa; 6. a neuter resin; 7. ulmate of potassa; 8. cerin, myricin, pectin, and albumen; 9. oxalate, malate, nitrate, and sulphate of potassa, chloride of potassium, phosphate of lime and magnesia, oxides of iron and manganese, and silica. The bitter principle above referred to separates from its solution in boiling water upon cooling, in pearly scales. By the reaction of alkalies it loses its bitterness, which is not restored by acids. The lactescence of the fresh juice of lettuce is owing to a mixture of wax and resin, and not to caoutchouc, as previously supposed. (*Ann. de Thérap.*, 1843, p. 19.) The bitter principle of Aubergier differs from that of Dr. Walz in being less soluble in cold water, and insoluble in ether.

M. Lenoir considers the lactucin of these two chemists as impure, and denies that it is the active principle, which, he thinks, is probably an organic alkali. He obtained the lactucin pure by treating the lactucarium of L. virosa with boiling alcohol, and filtering while hot. It was deposited on the cooling of the liquid, and afterwards purified by frequent crystallization from alcohol, and treatment with animal charcoal. Thus obtained, it was without taste or smell, and without effect upon the system. It was nearly insoluble in water, but readily dissolved by alcohol, ether, and the volatile and fixed oils. He proposed to name it *lactucone*, leaving the former name for the active principle when isolated. (*Ann. de Chim. et de Phys.*, Feb. 1847.) According to Walz, the lactucone of Lenoir is only the fatty matter

Medical Properties and Uses. That lettuce possesses soporific properties, is a fact which was known to the ancients; but Dr. J. R. Coxe, of Philadelphia, enjoys the credit of having first proposed the employment of its inspissated milky juice as a medicine. From experiments with a tincture prepared from lactucarium, Dr. Coxe obtained the same results as usually follow the administration of laudanum. Dr. Duncan, senior, of Edinburgh, afterwards paid particular attention to the subject, and, in his treatise on pulmonary consumption, recommended lactucarium as a substitute for opium, the anodyne properties of which it possesses, without being followed by the same injurious effects. In consequence of this recommendation, the medicine came into extensive use, and was adopted as officinal in several of the Pharmacopœias. Dr. François, a French physician, also investigated the medicinal properties of the inspissated juice of lettuce. According to that author, it is sedative, diminishing the rapidity of the circulation, and consequently the temperature of the body, without producing that disturbance of the functions which often follows the use of opium. The general inference which may be drawn from the recorded experience in relation to lactucarium is, that it has, in a much inferior degree, the anodyne and calming properties of opium, without its disposition to excite the circulation, to produce

discovered by himself. Thieme could not divide this into the two kinds noticed by Walz as differing in their solubility in ether, and, considering it as a peculiar substance, proposes for it the name of *lactucerin*. (*Am. Journ. of Pharm.*, through *Chem. Gaz.*, from *Arch. der Pharm.*)

The most recent analysis of lactucarium is by Ludwig. That chemist found in 100 parts 48·63 of substances insoluble in water, and 51·37 of those soluble in water. Of the insoluble matter 42·64 parts were of *lactucerin or lactucone*, which he obtained by first exhausting lactucarium with water, then treating the insoluble residue several times with hot alcohol of 0·833, allowing the alcoholic solution to evaporate slowly, washing the yellowish substance thus procured with water, and purifying it by re-solution in alcohol, and crystallization. Thus obtained, it is in snow-white aggregated granules, dissolves in strong hot alcohol, which deposits it on cooling, is readily soluble in ether but insoluble in water, becomes transparent and tenacious when moderately heated in a platinum dish, melts completely at a higher heat with the escape of white odorous vapours, is incapable of saponification by caustic potassa, and is therefore not properly a fat, and in alcoholic solution faintly reddens litmus paper. It consists of carbon, hydrogen, and oxygen ($C_{40}H_{34}O_5$). Besides this principle there were 3·99 parts of *wax*, and 2·00 of *lignin*, and of a substance which swelled in ammonia, and was insoluble in water, alcohol, and ether. Of the 51·37 parts soluble in water, 6·98 were of *albumen*, 1·75 of *lactucerin* held in solution by other substances, 27·68 of *bitter extract soluble in water and in alcohol*, and 14·96 of *watery extract* insoluble in alcohol of 0·830. The former of these extracts was found to contain a peculiar acid substance called *lactucic acid*, and the lactucin of Aubergier. To obtain these principles, 80 parts of lactucarium, in fine powder, were triturated with 80 of pure cold diluted sulphuric acid, and then mixed with 400 parts of alcohol of 0·851; the liquor was filtered, shaken with hydrate of lime till it yielded no precipitate with baryta-water or oxalate of potassa, then decolorized with pure animal charcoal and evaporated; the brown tenacious mass thus obtained (alcoholic extract) was treated with boiling water, which left behind a viscid substance; the aqueous solution was treated with animal charcoal, and on being evaporated yielded a mixture of lactucic acid and lactucin; these were separated by dissolving the mixture in boiling water, which on cooling deposited the latter in white crystalline scales, and gave up the former upon subsequent evaporation. *Lactucic acid* is of difficult crystallization, light-yellow, strongly bitter, without sour taste, of an acid reaction, and readily soluble in alcohol and water. It has as much claim as any other discovered substance to be considered the active principle of lactucarium. *Lactucin*, purified by animal charcoal, is in white pearly scales, the solution of which exhibits no reaction with subacetate or acetate of lead, or solution of iodine. It is dissolved without change of colour by concentrated sulphuric acid. Besides the above ingredients, Ludwig found also in lactucarium *a substance resembling mannite, oxalic acid, another organic acid* not well determined, a *soft resin, potassa, magnesia*, and *oxide of iron*. Distilled with diluted sulphuric acid, it gave an acid product smelling like lactucarium, which, saturated with carbonate of lime, and again distilled with bisulphate of potassa, yielded an acid fluid having the odour of valerian. (*Pharm. Cent. Blatt*, June, 1847, p. 438, from *Arch. der Pharm.*, ii., 1 and 129. See also *Am. Journ. of Pharm.*, xx. 57.)—*Note to the eighth edition.*

headache and obstinate constipation, and to derange the digestive organs. In this country the medicine is occasionally employed to allay cough, and quiet nervous irritation. It may be given in all cases in which, while opium is indicated in reference to its anodyne or soothing influence, it cannot be administered from idiosyncrasy of the patient. It is, however, very uncertain. The dose is from five to fifteen or twenty grains. An alcoholic extract would be a good preparation. It may be given in the dose of from two to five grains.

Water distilled from lettuce (*eau de laitue*) is used in France as a mild sedative, in the quantity of from two to four ounces. The fresh leaves boiled in water are sometimes employed in the shape of cataplasm. It is said that in Egypt a mild oil is derived from the seeds, fit for culinary use.

Off. Prep. of Lactuca. Extractum Lactucæ.

Off. Prep. of Lactucarium. Tinctura Lactucarii; Trochisci Lactucarii.

W.

LACTUCA VIROSA. *Dub.*

Acrid Lettuce.

Laitue vireuse, *Fr.;* Gift-Lattig, *Germ.;* Lattuga salvatica, *Ital.*

LACTUCA. See LACTUCA.

Lactuca virosa. Willd. *Sp. Plant.* iii. 1526; Woodv. *Med. Bot.* p. 75, t. 31. The *acrid* or *strong-scented lettuce* is biennial, with a stem from two to four feet high, erect, prickly near the base, above smooth and divided into branches. The lower leaves are large, oblong-obovate, undivided, toothed, commonly prickly on the under side of the midrib, sessile, and horizontal; the upper are smaller, clasping, and often lobed; the bractes are cordate and pointed. The flowers are numerous, of a sulphur-yellow colour, and disposed in a panicle. The plant is a native of Europe.

L. virosa is lactescent, and has a strong disagreeable smell like that of opium, and a bitterish acrid taste. The inspissated expressed juice is the part usually employed in medicine. It should be prepared while the plant is in flower; as the milky fluid, upon which its virtues depend, is then most abundant. Lactucarium may be advantageously prepared from this species, which is said to yield it in greater quantity, and of better quality, than the garden lettuce. Mr. Schutz, of Germany, obtained only 17 grains, on the average, from a single plant of the garden lettuce, while a plant of L. virosa yielded 56 grains.

Medical Properties and Uses. The extract or inspissated expressed juice is a sedative narcotic, said also to be gently laxative, powerfully diuretic, and somewhat diaphoretic. It is employed in Europe, particularly in Germany, in the treatment of dropsy, and is especially recommended in cases attended with visceral obstruction. It is usually, however, combined with squill, digitalis, or some other diuretic; and it is not easy to decide how much of the effect is justly ascribable to the lettuce. The medicine is never used in this country. The dose is eight or ten grains, which may be gradually increased to a scruple or more. *Lactuca Scariola*, another European species, possesses similar properties, and is used for the same purposes. W.

LAPPA. *U. S. Secondary.*

Burdock.

The root of Lappa minor. *U. S.*

Bardane, *Fr.;* Gemeine Klette, *Germ.;* Bardana, *Ital., Span.*

ARCTIUM. *Sex. Syst.* Syngenesia Æqualis.—*Nat. Ord.* Compositæ Cinareæ, *De Cand.* Cynaraceæ, *Lindley.*

Gen. Ch. Receptacle chaffy. *Calyx* globular; the scales at the apex with inverted hooks. *Seed-down* bristly, chaffy. *Willd.*

Arctium Lappa. Willd. *Sp. Plant.* iii. 1631; Woodv. *Med. Bot.* p. 32, t. 13.—*Lappa major.* De Cand. *Prodrom.* vi. 661. Burdock is a biennial plant, with a simple spindle-shaped root, a foot or more in length, brown externally, white and spongy within, furnished with thread-like fibres, and having withered scales near the summit. The stem is succulent, pubescent, branching, and three or four feet in height, bearing very large cordate, denticulate leaves, which are green on their upper surface, whitish and downy on the under, and stand on long footstalks. The flowers are purple, globose, and in terminal panicles. The calyx consists of imbricated scales, with hooked extremities, by which they adhere to clothes, and the coats of animals. The seed-down is rough and prickly, and the seeds quadrangular.

This plant, which is the one intended to be designated in the Pharmacopœia, is a native of Europe, and is abundant in the United States, where it grows on the roadsides, among rubbish, and in cultivated grounds. Pursh thinks that it was introduced. The root, which should be collected in spring, loses four-fifths of its weight by drying.

The odour of the root is weak and unpleasant, the taste mucilaginous and sweetish, with a slight degree of bitterness and astringency. Among its constituents, inulin has been found by Guibourt, and sugar by Fée.

The seeds are aromatic, bitterish, and somewhat acrid.

Medical Properties and Uses. The root is considered aperient, diaphoretic, and sudorific, without irritating properties; and has been recommended in gouty, scorbutic, venereal, rheumatic, scrofulous, leprous, and nephritic affections. To prove effectual its use must be persevered in for a long time. It is best administered in the form of decoction, which may be prepared by boiling two ounces of the recent bruised root in three pints of water to two, and given in the quantity of a pint during the day. A syrup has also been prepared from it. The seeds are diuretic, and have been used in the same complaints, in the form of emulsion, powder, and tincture. The dose is a drachm. The leaves have also been employed both externally and internally in cutaneous eruptions and ulcerations.

W.

LAURO-CERASUS. *Ed., Dub.*

Cherry-Laurel.

Leaves of Prunus lauro-cerasus. *Ed.* Cerasus Laurocerasus. The leaves. *Dub.* Laurier cerise, *Fr.;* Kirschlorbeer, *Germ.;* Lauro ceraso, *Ital.*

Cerasus. *Sex. Syst.* Icosandria Monogynia.—*Nat. Ord.* Amygdaleæ.

Gen. Ch. Differing from Prunus only in its fruit being destitute of bloom, with the stone round instead of acute, and the leaves when in bud folded flat, not rolled up. (Lindley, *Flor. Med.*, 232.)

Cerasus Lauro-cerasus. De Cand. *Prodrom.* ii. 540.—*Prunus Lauro-cerasus.* Willd. *Sp. Plant.* ii. 988; Woodv. *Med. Bot.* p. 513, t. 185.—This is a small evergreen tree, rising fifteen or twenty feet in height, with long spreading branches, which, as well as the trunk, are covered with a smooth blackish bark. The leaves, which stand alternately on short strong footstalks, are oval-oblong, from five to seven inches in length, acute, finely toothed, firm, coriaceous, smooth, beautifully green and shining, with oblique nerves, and yellowish glands at the base. The flowers are small, white, strongly odorous, and disposed in simple axillary racemes. The fruit consists of oval drupes, very similar in shape and structure to small black cherries.

The cherry-laurel is a native of Asia Minor, but has been introduced into

Europe, throughout which it is cultivated, both for medical use and for the beauty of its shining evergreen foliage. Almost all parts of it are more or less impregnated with the odour supposed to indicate the presence of hydrocyanic acid. The leaves only are officinal.

In their recent and entire state they have scarcely any smell; but, when bruised, they emit the characteristic odour of the plant in a high degree. Their taste is somewhat astringent and strongly bitter, with the flavour of the peach kernel. By drying they lose their odour, but retain their bitterness. They yield a peculiar volatile oil and hydrocyanic acid by distillation with water, which they strongly impregnate with their flavour. The oil resembles that of bitter almonds, for which it is said to be sometimes sold in Europe, where it is employed to flavour liquors and various culinary preparations; but, as it is highly poisonous, danger may result from its careless use. It has not been determined how far the mode of production of this oil resembles that of bitter almonds. (See *Amygdala Amara.*) Chemists have failed in obtaining amygdalin from the leaves. That the oil exists already formed, to a certain extent, in the fresh leaves, is rendered probable by the fact, stated by Winckler, that they yield it in considerable quantity when distilled without water. (*Journ. de Pharm.*, xxv. 195.) The fresh leaves are used to flavour milk, cream, &c., and more safely than the oil; though they also are poisonous when too largely employed.

Medical Properties and Uses. The leaves of the cherry-laurel possess properties similar to those of hydrocyanic acid; and the water distilled from them is much employed in various parts of Europe for the same purposes as that active medicine. But it is deteriorated by age; and, therefore, as kept in the shops, must be of variable strength. Hence, while Hufeland directs only twenty drops for a dose every two hours, to be gradually increased to sixty drops, M. Fouquier has administered several ounces without effect. Another source of inequality of strength must be the variable quality of the leaves, according to the time they have been kept after separation from the tree, and probably also to their age and degree of development. It is not, therefore, to be regretted, that the want of the plant in this country has prevented the introduction of the distilled water into our shops.

Off. Prep. Aqua Lauro-cerasi. W.

LAURUS. *Lond.*

Bay Berries.

Laurus nobilis. The fruit. *Lond.*

Laurier, *Fr.;* Lorbeer, *Germ.;* Allorg, *Ital.;* Laurel, *Span.*

Laurus. *Sex. Syst.* Enneandria Monogynia. — *Nat. Ord.* Lauraceæ.

Gen. Ch. Flowers dicœcious or hermaphrodite, involucrated. *Calyx* four-parted; segments equal, deciduous. *Fertile stamens* twelve in three rows; the outer alternate with the segments of the calyx; all with two glands in the middle or above it. *Anthers* oblong, two-celled, all looking inwards. *Fertile flowers* with two to four castrated males surrounding the ovary. *Stigma* capitate. *Fruit* succulent, seated in the irregular base of the calyx. Umbels axillary, stalked. (Lindley, *Flor. Med.*, 340.)

Laurus nobilis. Willd. *Sp. Plant.* ii. 479; Woodv. *Med. Bot.* p. 678, t. 235. This species of laurel is an evergreen tree, attaining in its native climate the height of twenty or thirty feet. Its leaves are alternate, on short petioles, oval-lanceolate, entire, sometimes wavy, veined, of a firm texture, smooth, shining, deep-green upon their upper surface, paler beneath. The flowers are dicœcious, of a yellowish-white colour, and placed in small clusters of three or four together

upon a common peduncle in the axils of the leaves. The corolla is divided into four oval segments. The fruit is an oval berry, of the size of a small cherry, and when ripe of a dark purple, nearly black colour.

The bay tree, so famous among the ancients, is a native of the countries bordering on the Mediterranean. Its leaves and fruit, and an oil expressed from the latter, are the officinal parts.

The *leaves* have a fragrant odour, especially when bruised, and a bitter, aromatic, somewhat astringent taste. They yield by distillation a greenish-yellow volatile oil, upon which their properties chiefly depend. Water distilled from them has their peculiar odour. The *berries* when dried are black and wrinkled, and contain two oval, fatty seeds within a thin, friable envelope; or they may be considered as drupes, with a kernel divisible into two lobes. They have the same aromatic odour and taste as the leaves, but are more pungent. Besides an essential oil, they contain also a fixed oil, which may be separated by expression or decoction. The *expressed oil*, which is obtained from the fresh fruit, is concrete, of a greenish colour, and retains a portion of the volatile oil, which renders it agreeably aromatic. Lard, impregnated with the odorous principle of the berries, and coloured green, is said to be often substituted for the genuine expressed oil. The sophistication may be detected by means of boiling alcohol, which dissolves the laurel oil.

Medical Properties and Uses. The leaves, berries, and oil of the bay tree possess exciting and narcotic properties; but at present are never used internally as medicines, and in this country are scarcely employed in any manner. Their chief use is to communicate a pleasant odour to external stimulant remedies. Dr. A. T. Thomson says that he has found an infusion of the berries useful in impetigo.

Off. Prep. Confectio Rutæ; Emplastrum Cumini. W.

LAVANDULA. *U. S., Lond., Ed., Dub.*

Lavender.

The flowers of Lavandula vera. *U. S., Lond., Dub.* The flowering heads. *Ed.*
Lavande, *Fr.;* Lavandelblumen, *Germ.;* Lavandola, *Ital.;* Espliego, alhucema, *Span.*

LAVANDULA. *Sex. Syst.* Didynamia Gymnospermia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Calyx ovate, somewhat toothed, supported by a bracte. *Corolla* resupine. *Stamens* within the tube. *Willd.*

Lavandula vera. De Cand. *Flor. Fr. Sup.* p. 398.—*L. Spica.* Willd. *Sp. Plant.* iii. 60; Woodv. *Med. Bot.* p. 321, t. 114.—The *Lavandula Spica* of Linnæus includes two distinct species, which were considered by him merely as varieties of the same plant, but have been separated by subsequent botanists. Of these, the officinal plant, the narrow-leaved variety of Linnæus, has been denominated by De Candolle *L. vera*, while the broad-leaved variety still retains the title of *L. Spica*. The latter is scarcely cultivated in Great Britain or the United States.

The common lavender is a small shrub, usually not more than two or three feet high, but sometimes as much as six feet. The stem is woody below, and covered with a brown bark; above, is divided into numerous, slender, straight, herbaceous, pubescent, quadrangular branches, furnished with opposite, sessile, narrow, nearly linear, entire, and green or glaucous leaves. The flowers are small, blue, and disposed in interrupted whorls around the young shoots, forming terminal cylindrical spikes. Each whorl is accompanied with two bractes. The corolla is tubular and labiate, with the lower lip divided into three segments, the upper larger and bifid. The filaments are within the tube.

The plant is a native of Southern Europe, and covers vast tracts of dry and barren land in Spain, Italy, and the South of France. It is cultivated abundantly in our gardens, and in this country flowers in August. It is said that in fields, when too thickly planted, it is apt to suffer from a disease consequent on the noxious influence of its own aroma, which is relieved by thinning the plants. (*Pharm. Journ. and Trans.*, x. 119.) All parts of it are endowed with aromatic properties; but the flowers only are officinal. The spikes should be cut when they begin to bloom.

Lavender flowers have a strong fragrant odour, and an aromatic, warm, bitterish taste. They retain their fragrance long after drying. Alcohol extracts their virtues; and a volatile oil upon which their odour depends rises with that liquid in distillation. The oil may be procured separate by distilling the flowers with water. (See *Oleum Lavandulæ.*) Hagan obtained from a pound of the fresh flowers from half a drachm to two drachms of the oil.

Medical Properties and Uses. Lavender is an aromatic stimulant and tonic, esteemed useful in certain conditions of nervous debility, but seldom given in its crude state. The products obtained by its distillation are much used in perfumery, and as adjuvants to other medicines, which they render at the same time more acceptable to the palate, and cordial to the stomach.

Off. Prep. Oleum Lavandulæ; Spiritus Lavandulæ. W.

LIMON. *U. S.*

Lemons.

The fruit of Citrus Limonum (*De Candolle*). *U. S.*

Off. Syn. LIMONES. Fruit of Citrus medica and Citrus Limonum. *Lemons and Limes. Ed.*

Limons, Citrons, *Fr.;* Limonen, Citronen, *Germ.;* Limoni, *Ital.;* Limones, *Span.*

LIMONIS CORTEX. *U. S.*

Lemon Peel.

The outer rind of the fruit of Citrus Limonum. *U. S.*

Off. Syn. LIMONUM CORTEX. Citrus Limonum. The recent and dried exterior rind of the fruit. *Lond.* Rind of the fruit of Citrus Medica. *Ed.* LIMONES. CITRUS LIMONUM. The fresh rind of the fruit. *Dub.*

LIMONUM SUCCUS. *Lond.*

Lemon Juice.

The juice of the fruit. *Lond.*

Off. Syn. LIMONES. CITRUS LIMONUM. The juice of the fruit. *Dub.*

For some general remarks on the genus CITRUS, see *Aurantii Cortex.*

Citrus medica. Willd. *Sp. Plant.* iii. 1426; Woodv. *Med. Bot.* p. 582, t. 189. This tree closely resembles in its general aspect the *C. Aurantium* before described. The leaves, however, are larger, slightly indented at the edges, and stand upon footstalks which are destitute of the winged appendages that characterize the other species. The flowers, moreover, have a purplish tinge on their outer surface, and the fruit is entirely different in appearance from the orange. There are several varieties of *Citrus medica*, which some botanists consider as distinct species, but which scarcely differ except in the character of their

fruit. Those particularly deserving of notice are the citron, lemon, and lime. 1. In the *citron*, *C. medica* of Risso, the fruit is very large, sometimes six inches in length, ovoidal with a double rind, of which the outer layer is yellowish, thin, unequal, rugged, with innumerable vesicles filled with essential oil; the inner is white, very thick, and spongy. It is divided in the interior into nine or ten cells, filled with oblong vesicles, which contain an acid juice precisely like that of the lemon, and used for the same purposes. The rind is applied to the preparation of conserves, to which it is adapted by its thickness. This fruit is called *cedrat* by the French. 2. The *lemon*—*C. medica*, variety *limon* of Linnæus—the *Citrus Limonium* of Risso—is smaller than the preceding variety, with a smoother and thinner rind, a pointed nipple-shaped summit, and a very juicy and acid pulp. In other respects it closely resembles the citron, to which, however, it is usually preferred in consequence of the greater abundance of its juice. 3. The *lime* is still smaller than the lemon, with a smoother and thinner rind, oval, rounded at the extremities, of a pale-yellow or greenish-yellow colour, and abounding in a very acid juice, which renders it highly useful for all the purposes to which the lemon is applied. It is the product of the variety *C. acris* of Miller.

The *Citrus medica*, like the orange-tree, is a native of Asia. It was introduced into Europe from Persia or Media, was first cultivated in Greece, afterwards in Italy, so early as the second century, and has now spread over the whole civilized world, being raised by artificial heat, where the climate is too cold to admit of its exposure with safety during winter to the open air.

We are supplied with lemons and limes chiefly from the West Indies and the Mediterranean. Though the former of these fruits only is directed by the United States Pharmacopœia, both kinds are employed indiscriminately for most medicinal purposes; and the lime affords a juice at least equal in proportional quantity, and in acidity, to that obtained from the lemon.

Properties. The exterior rind of the lemon has a fragrant odour, and a warm, aromatic, bitter taste, somewhat similar to that of the orange, though less agreeable. It contains a bitter principle, and yields, by expression or distillation, an essential oil which is much used for its flavour. Both this and the rind itself are recognised as officinal in all the Pharmacopœias. (See *Oleum Limonis.*) Lemon peel yields its virtues to water, wine, and alcohol.

But the juice is the part for which this fruit is most esteemed. It is sharply acid, with a peculiar grateful flavour, and consists chiefly of citric acid, mucilage, and extractive, dissolved in water. As lemons cannot always be obtained, the juice is often kept in a separate state; but, from its liability to spontaneous decomposition, it speedily becomes unfit for medical use; and, though various means have been resorted to for its preservation, it can never be made to retain for any length of time its original flavour unaltered. The best medicinal substitute for lemon juice is a solution of crystallized citric acid in water, in the proportion of about an ounce to the pint, with the addition of a little oil of lemons.* One of the most effectual methods of preserving the juice is to allow it to stand for a short time after expression till a coagulable matter separates, then to filter, and introduce it into glass bottles, with a stratum of almond oil or other sweet oil upon its surface. It will keep still better, if the bottles containing the filtered juice be suffered, before being closed, to stand for fifteen minutes in a vessel of boiling water. Another mode is to add one-tenth of alcohol, and to filter. The juice may also be preserved by concentrating it either by evaporation with a gentle heat, or by exposure to a freezing temperature, which congeals the watery portion, and leaves the acid much stronger than before. When

* Nine drachms and a half, dissolved in a pint of water, form a solution of the average strength of lime juice; but, where precision is not requisite, the proportion mentioned in the text is most convenient.

wanted for use it may be diluted to the former strength; but, though the acid properties are retained, the flavour of the juice is found to have been deteriorated. Lemon syrup is another form in which the juice is preserved.

Medical Properties and Uses. The rind of the lemon is sometimes used to qualify the taste and increase the power of stomachic infusions and tinctures. The juice is refrigerant, and properly diluted forms a refreshing and agreeable beverage in febrile and inflammatory affections. It may be given with sweetened water in the shape of lemonade, or may be added to the mildly nutritive drinks, such as gum-water, barley-water, &c., usually administered in fevers. It is also much employed in the formation of those diaphoretic preparations known by the names of *neutral mixture* and *effervescing draught.* (See *Liquor Potassæ Citratis.*) One of the most beneficial applications of lemon juice is to the prevention and cure of scurvy, for which it may be considered almost a specific. For this purpose, ships destined for long voyages should always be provided with a supply of the concentrated juice, or of crystallized citric acid with the oil of lemons. Lemon-juice is sometimes prescribed in connexion with opium and Peruvian bark, the effects of which it is thought in some instances to modify favourably, by substituting the citrate of their respective alkalies for the native salts. It has recently been employed with great supposed advantage in the treatment of acute rheumatism, having been given in quantities varying from one to four fluid-ounces, from four to six times a day. It has been used with advantage as a local application in pruritus of the scrotum, and in uterine hemorrhage after delivery.

Off. Prep. of the Peel. Infusum Aurantii Compositum; Infusum Gentianæ Comp.; Spiritus Ammoniæ Aromaticus; Tinctura Limonis.

Off. Prep. of the Juice. Acidum Citricum; Liquor Potassæ Citratis; Syrupus Limonis. W.

LINUM. *U. S., Dub.*

Flaxseed.

The seeds of Linum usitatissimum. *U. S., Dub.*

Off. Syn. LINI SEMEN. Linum usitatissimum. The seed. *Lond.;* LINI SEMINA. Seeds of Linum usitatissimum. LINI FARINA. Meal of the seeds deprived of their fixed oil by expression. *Ed.*

Linseed; Grains de lin, *Fr.;* Leinsame, *Germ.;* Semi di lino, *Ital.;* Linaza, *Span.*

LINUM. *Sex. Syst.* Pentandria Pentagynia.—*Nat. Ord.* Linaceæ.

Gen. Ch. Calyx five-leaved. *Petals* five. *Capsule* five-valved, ten-celled. *Seeds* solitary. *Willd.*

Linum usitatissimum. Willd. *Sp. Plant.* i. 1533; Woodv. *Med. Bot.* p. 565, t. 202. Common flax is an annual plant with an erect, slender, round stem, about two feet in height, branching at top, and, like all other parts of the plant, entirely smooth. The leaves are small, lanceolate, acute, entire, of a pale-green colour, sessile, and scattered alternately over the stem and branches. The flowers are terminal and of a delicate blue colour. The calyx is persistent, and composed of five ovate, sharp-pointed, three-nerved leaflets, which are membranous on their border. The petals are five, obovate, striated, minutely scolloped at their extremities, and spread into funnel-shaped blossoms. The filaments are also five, united at the base; and the germ, which is ovate, supports five slender styles, terminating in obtuse stigmas. The fruit is a globular capsule, about the size of a small pea, having the persistent calyx at the base, crowned with a sharp spine, and containing ten seeds in distinct cells.

This highly valuable plant, now almost everywhere cultivated, is said by some to have been originally derived from Egypt, by others from the great elevated plain of central Asia. It flowers in June and July, and ripens its seeds in August. The seeds, and an oil expressed from them, are officinal.

The seeds are oval, oblong, flattened on both sides with acute edges, somewhat pointed at one end, about a line in length, smooth, glossy, of a brown colour externally, and yellowish-white within. They are inodorous, and have an oily mucilaginous taste. Meyer found in them fixed oil, wax, resin, extractive, tannin, gum, azotized mucilage, starch, albumen, gluten, and various salts. M. Meurein could find no starch, but detected phosphates which had escaped the notice of Meyer. (*Journ. de Pharm.*, 3e *sér.*, xx. 97.) Their investing coat or husk abounds in a peculiar gummy matter or mucilage, which is readily imparted to hot water, forming a thick viscid fluid, which lets fall white flakes upon the addition of alcohol, and affords a copious dense precipitate with subacetate of lead. By Berzelius the term *mucilage* is applied to a proximate vegetable principle, distinguished from gum by being insoluble in cold, and but slightly soluble in boiling water, in which it swells up and forms a mucilaginous, viscid body, which loses its water when placed upon filtering paper, or other porous substance, and contracts like starch in the gelatinous state. The name, however, is unfortunate; as it is generally applied to the solution of gum, and must inevitably lead to confusion. Nor is it strictly a distinct proximate principle; as it embraces a number of different bodies, such as bassorin, cerasin, &c. According to Guerin, the mucilage of flaxseed, obtained at a temperature of from 120° to 140°, and evaporated to dryness, by means of a salt water bath, contains in 100 parts, 52·70 of a principle soluble in cold water, 29·89 of a principle insoluble in that liquid, and 10·30 of water, and yields 7·11 per cent. of ashes. The soluble part he believes to be arabin or pure gum; the insoluble he found not to afford mucic acid with the nitric, and therefore to differ from both bassorin and cerasin. There was also a small proportion of azotized matter which he did not isolate. (*Ann. de Chim. et de Phys.*, xlix. 263.) Vauquelin found among its constituents free acetic acid, silica, and various salts of potassa and lime. Meurein discovered in the mucilage extracted by cold water, albumen, and a very small proportion of an oleo-resin, which resides in the coats of the seed, and to which they owe their peculiar odour and taste. (*Journ. de Pharm.*, 3e *sér.*, xx. 98.)

The interior part of the seed, or nucleus, is rich in a peculiar oil, which is separated by expression, and very extensively employed in the arts. (See *Oleum Lini.*) The ground seeds are kept in the shops under the name of *flaxseed meal.* This is of a dark-gray colour, highly oleaginous, and when mixed with hot water forms a soft adhesive mass, which is much employed for luting by practical chemists. The cake which remains after the expression of the oil, usually called *oil-cake*, still retains the mucilaginous matter of the envelope, and affords a highly nutritious food for cattle. This is the *Lini Farina* of the Edinburgh Pharmacopœia.

Flaxseed is sometimes accidentally or fraudulently mixed with other seeds, especially of plants which grow among the flax. We have seen a parcel containing a considerable proportion of the seeds of an indigenous species of garlic.

Medical Properties and Uses. Flaxseed is demulcent and emollient. The mucilage obtained by infusing the entire seeds in boiling water, in the proportion of half an ounce to the pint, is much and very advantageously employed in catarrh, dysentery, nephritic and calculous complaints, strangury, and other inflammatory affections of the mucous membrane of the lungs, intestines, and urinary passages. By decoction water extracts also a portion of the oleaginous matter, which renders the mucilage less fit for administration by the mouth, but superior as a laxative enema. The meal mixed with hot water forms an excellent emollient poultice.

Off. Prep. Cataplasma Carbonis; Cataplasma Conii; Cataplasma Lini; Cataplasma Sinapis; Cataplasma Sodæ Chlorinatæ; Infusum Lini Compositum.

W.

LINUM CATHARTICUM. *Ed.*

Purging Flax.

Herb of Linum catharticum. *Ed.*

Lin cathartique, *Fr.;* Purgirflacks, *Germ.;* Lino purgativo, *Ital.;* Cantilagua, *Span.*

LINUM. See LINUM.

Linum catharticum. Willd. *Sp. Plant.* i. 1541; Smith, *Flor. Brit.* 344. This is an annual plant, about six or eight inches high, having erect, slender stems, dichotomous near the summit, furnished with opposite, obovate-lanceolate, entire leaves, and bearing minute white flowers, the petals of which are obovate and acute. It is a native of Europe, and not found in the United States, where it is never employed as a medicine.

The whole plant is very bitter and somewhat acrid, and imparts its virtues to water, which acquires a yellow colour. It appears to owe its activity to a peculiar drastic principle, which has received the name of *linin*, and which is afforded most largely by the plant after the flower has fallen. (*Pharm. Central Blatt*, 1844, p. 110.) Purging flax formerly enjoyed some reputation in Europe as a gentle cathartic, but has fallen into disuse. Attention has been recently called to it as an excellent remedy in muscular rheumatism, catarrhal affections, and dropsy with disease of the liver. From four to eight grains of the extract, given twice or thrice daily, are said to operate as a purgative and diuretic, without inconvenience to the patient. (*Medical Times*, July, 1850.) A drachm of the powder, or an infusion containing the virtues of two or three drachms of the herb, may be taken for a dose. W.

LIRIODENDRON. *U. S. Secondary.*

Tulip-tree Bark.

The bark of Liriodendron tulipifera. *U. S.*

LIRIODENDRON. *Sex. Syst.* Polyandria Polygynia.—*Nat. Ord.* Magnoliaceæ.

Gen. Ch. Calyx three-leaved. *Petals* six. *Samaræ* sublanceolate, one or two-seeded, imbricated in a cone. *Nuttall.*

Liriodendron tulipifera. Willd. *Sp. Plant.* ii. 1254; Bigelow, *Am. Med. Bot.* ii. 107; Barton, *Med. Bot.* i. 92. This noble tree is the boast of American landscape. Rising on an erect, straight, cylindrical stem, which is often of nearly equal thickness for the distance of forty feet, it attains, in favourable situations, an elevation seldom less than fifty and sometimes more than one hundred feet, with a diameter of trunk varying from eighteen inches to three feet; and individuals are occasionally met with which greatly exceed these dimensions. The bark is of a brown or grayish-brown colour, except in the young branches, on which it is bluish or of a reddish tinge. The leaves, which stand on long footstalks, are alternate, somewhat fleshy, smooth, of a beautiful shining green colour, and divided into three lobes, of which the upper one is truncated and horizontally notched at its summit, so as to present a two-lobed appearance, and the two lower are rounded at the base and usually pointed. In the larger leaves, the lateral lobes have each a tooth-like projection at some distance below their apex. This peculiar form of the leaf serves to distinguish the tree from all others inhabiting the American forests. On isolated trees the flowers are very numerous. They are large, beautifully variegated with different colours, among which yellow predominates, and in their general appearance bear some resemblance to the tulip, which has given a name to the species. Each flower stands on a distinct terminal

peduncle. The calyx is double, the outer being two-leaved and deciduous, the inner consisting of three large, oval, concave leaves, of a pale-green colour. The corolla is composed of six, seven, or more obtuse, concave petals. The stamens are numerous, with short filaments, and long linear anthers. The pistils are collected into the form of a cone, the upper part of which is covered with minute stigmas. The fruit consists of numerous long, narrow scales, attached to a common axis, imbricated in a conical form, and containing each two seeds, one or both of which are often abortive.

The tulip-tree extends from New England to the borders of Florida, but is most abundant and attains the greatest magnitude in the Middle and Western States. It delights in a rich strong soil, and luxuriates in the exhaustless fertility of the banks of the Ohio and its tributary streams. Throughout the United States it is known by the inappropriate name of *poplar*, for which that of *tulip-tree* is sometimes substituted. When in full bloom, about the middle of May, it presents, in its profusion of flowers, its rich, shining, luxuriant foliage, its elevated stature, and elegant outline, one of the most magnificent objects which the vegetable kingdom affords. The interior or heart wood, which is yellowish, of a fine grain, and compact without being heavy, is much employed in the making of furniture, carriages, door-panels, and for other useful purposes. It is recommended by its property of resisting the influence of atmospheric moisture and the attacks of worms. The bark is the officinal portion. It is taken for use indiscriminately from the root, trunk, and branches; though that derived from the root is thought to be the most active.

Deprived of the epidermis, it is yellowish-white; the bark of the root being somewhat darker than that of the stem or branches. It is very light and brittle, of a feeble, rather disagreeable odour, strongest in the fresh bark, and of a bitter, pungent, and aromatic taste. These properties are weakened by age, and we have found specimens of the bark long kept in the shops, almost insipid. The peculiar properties of liriodendron appear to reside in a volatile principle, which partially escapes during decoction. The late Professor Emmet, of the University of Virginia, believed that he had isolated this principle, and gave it the name of *liriodendrin*. As described by Professor Emmet, it is, in the pure state, solid, white, crystallizable, brittle, insoluble in water, soluble in alcohol and ether, fusible at 180°, volatilizable and partly decomposed at 270°, of a slightly aromatic odour, and a bitter, warm, pungent taste. It is incapable of uniting with alkalies, which precipitate it from the infusion of the bark by combining with the matter which renders it soluble in water. Neither does it unite with acids. Water precipitates it from its alcoholic solution. It is obtained by macerating the root in alcohol, boiling the tincture with magnesia till it assumes an olive-green colour, then filtering, concentrating by distillation till the liquid becomes turbid, and finally precipitating the liriodendrin by the addition of cold water. (*Journ. of the Phil. Col. of Pharm.*, iii. 5.) The virtues of the bark are extracted by water and alcohol, but are injured by long boiling.

Medical Properties. Liriodendron is a stimulant tonic, with diaphoretic properties. It has been used as a substitute for Peruvian bark in intermittent fevers, and has proved serviceable in chronic rheumatism, dyspepsia, and other complaints in which a gently stimulant and tonic impression is desirable. The dose of the bark in powder is from half a drachm to two drachms. The infusion and decoction are also used, but are less efficient. They may be prepared in the proportion of an ounce of the bark to a pint of water, and given in the quantity of one or two fluidounces. The dose of the saturated tincture is a fluidrachm.

W.

LOBELIA. *U. S., Lond., Ed., Dub.*

Lobelia.

Herb of Lobelia inflata. *U. S., Ed., Dub.* The herb in flower. *Lond.*

Lobelia. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Lobeliaceæ.

Gen. Ch. Calyx five-cleft. *Corolla* irregular, five-parted, cleft on the upper side nearly to the base. *Anthers* united into a tube. *Stigma* two-lobed. *Capsule* inferior or semi-superior, two or three-celled, two-valved at the apex. *Torrey.*

Lobelia inflata. Willd. *Sp. Plant.* i. 946; Bigelow, *Am. Med. Bot.* i. 177; Barton, *Med. Bot.* i. 181; Carson, *Illust. of Med. Bot.* i. 60, pl. 51. This species of Lobelia, commonly called *Indian tobacco*, is an annual or biennial indigenous plant, usually a foot or more in height, with a fibrous root, and a solitary, erect, angular, very hairy stem, much branched about midway, but rising considerably above the summits of the highest branches. The leaves are scattered, sessile, oval, acute, serrate, and hairy. The flowers are numerous, small, disposed in leafy terminal racemes, and supported on short axillary footstalks. The segments of the calyx are linear and pointed. The corolla, which is of a delicate blue colour, has a labiate border, with the upper lip divided into two, the lower into three segments. The united anthers are curved, and enclose the stigma. The fruit is an oval, striated, inflated capsule, crowned with the persistent calyx, and containing, in two cells, numerous very small, brown seeds.*

Lobelia inflata is a very common weed, growing on the road-sides, and in neglected fields, throughout the United States. Its flowers begin to appear towards the end of July, and continue to expand in succession till the occurrence of frost. All parts of it are medicinal; but, according to Dr. Eberle, the root and inflated capsules are most powerful. The plant should be collected in August or September, when the capsules are numerous, and should be carefully dried. It may be kept whole, or in powder. As found in the shops, it is often in oblong compressed cakes, prepared by the Shakers.

Dried lobelia has a slight irritating odour, and when chewed, though at first without much taste, soon produces a burning acrid impression upon the posterior parts of the tongue and palate, very closely resembling that occasioned by tobacco, and attended, in like manner, with a flow of saliva and a nauseating effect. The powder is of a greenish colour. The plant yields its active properties readily to water and alcohol. Water distilled from it, according to Prof. Procter, has the odour of the plant, without its acrimony. Prof. Procter found the plant to contain an odorous volatile principle, probably volatile oil; a peculiar alkaline principle named lobelina; a peculiar acid, first noticed as distinct by Pereira, called *lobelic acid;* besides gum, resin, chlorophylle, fixed oil, lignin, salts of lime and potassa, and oxide of iron. The seeds contain at least twice as much of lobelina, in proportion, as the whole plant, which yielded only one part in five hundred. They contain also thirty per cent. of a nearly colourless fixed oil, having the drying property in an extraordinary degree. *Lobelina* was obtained by Prof. Procter by the following process. The seeds were treated with alcohol

* In case of poisoning from lobelia, it may be very desirable to be able to recognise the seeds. The following microscopic characters of them are given by Mr. Frederick Curtis in the *Lond. Med. Gaz.* for July, 1851 (p. 160). They are almond-shaped, about 1-30th of an inch long by 1-75th broad, puce-coloured, regularly marked with longitudinal ridges and furrows, and cross ridges generally at right-angles with the former, so that the surface presents the appearance of basket-work. No other seeds examined by the author could be mistaken for them, except those of *Lobelia cardinalis*, which, however, are larger, coarser, of a lighter colour, and with the superficial rectangular chequering less distinct.—*Note to the tenth edition.*

acidulated with acetic acid, until deprived of their acrimony, and the tincture was evaporated; the resulting extract was triturated with magnesia and water, and, after repeated agitation for several hours, the liquor, holding lobelina in solution, was filtered; this was then shaken repeatedly with ether until deprived of acrimony; and the ethereal solution, having been decanted, was allowed to evaporate spontaneously. The residue, which had a reddish-brown colour, and the consistence of honey, was deprived of colouring matter by dissolving it in water, adding a slight excess of sulphuric acid, boiling with animal charcoal, saturating with magnesia, filtering, agitating with ether until this fluid had deprived the water of acrimony, and finally decanting, and allowing the ether to evaporate. Thus obtained, *lobelina* is a yellowish liquid, lighter than water, of a somewhat aromatic odour, and a very acrid durable taste. It is soluble in water, but much more copiously in alcohol and ether, and the latter fluid readily removes it from its aqueous solution. It has a decided alkaline reaction, and forms soluble and crystallizable salts with sulphuric, nitric, and muriatic acids, and a very soluble but not crystallizable salt with acetic acid. It forms an insoluble compound with tannic acid, which instantly precipitates it from its solution. By a boiling heat it is entirely decomposed, losing all its acrimony; but, when combined with acids, it may be subjected to ebullition with water without change. Prof. Procter introduced a grain of it diluted with water into the stomach of a cat, which became immediately prostrate, remained for an hour nearly motionless, with dilated pupils, and had not wholly recovered at the end of fifteen hours. It did not occasion vomiting or purging. There can be little doubt that it is the narcotic principle of lobelia. (*Am. Journ. of Pharm.*, ix. 105, and xiii. 1.)* The late Dr. S. Colhoun, of Philadelphia, was the first to announce the existence of a peculiar principle in lobelia, capable of forming salts with the acids; but he did not obtain it in an isolated state. An important inference from the effects of heat upon lobelina is, that, in any of the preparations of lobelia, the plant should never be heated in connexion with a salifiable base.

Medical Properties and Uses. Lobelia is emetic, and, like other medicines of the same class, is occasionally cathartic, and in small doses diaphoretic and expectorant. It is also possessed of narcotic properties. The leaves or capsules, chewed for a short time, occasion giddiness, headache, general tremors, and ultimately nausea and vomiting. When swallowed in the full dose, the medicine produces speedy and severe vomiting, attended with continued and distressing nausea, copious sweating, and great general relaxation. Its effects in doses too large, or too frequently repeated, are extreme prostration, great anxiety and distress, and ultimately death preceded by convulsions. Dr. Letheby found 110 grains of it in the stomach of a patient killed by this poison, and states that he has known much less to cause death. (*Lond. Med. Times and Gaz.*, March, 1853, p. 270.) From experiments made by Mr. Curtis and Dr. Pearson on hedgehogs and cats, it would appear that the poison produces inflammation of the alimentary mucous membrane in those animals, but that death mainly results from the suspension of respiration; the heart continuing to act after that process has ceased. It is probable that it paralyzes, by a directly depressing influence, the respiratory centres in the medulla oblongata. (*Lond. Med. Gaz.*, xlv. 285.) Death has often resulted from its empirical use. Its poisonous effects are most apt to occur, when, as sometimes happens, it is not rejected by vomiting. In

* Mr. William Bastick, of London, has published in the *Pharmaceutical Journal and Transactions* for December, 1850, an account of lobelina and its mode of extraction, apparently in entire ignorance of the previous experiments and observations of Professor Procter. His process does not differ essentially from that above given. In one magnesia is used to decompose the native salt of lobelina, in the other lime; the caustic alkalies not being applicable to the purpose, as they decompose this organic alkali with great facility. —*Note to the ninth edition.*

its operation upon the system, therefore, as well as in its sensible properties, lobelia bears a close resemblance to tobacco. It is among the medicines which were employed by the aborigines of this country; and was long in the hands of empirics before it was introduced into regular practice. The Rev. Dr. Cutler, of Massachusetts, first attracted to it the attention of the profession.

As an emetic it is too powerful, and too distressing as well as hazardous in its operation for ordinary use. The disease in which it has proved most useful is spasmodic asthma, the paroxysms of which it often greatly mitigates, and sometimes wholly relieves, even when not given in doses sufficiently large to produce vomiting. It was from the relief obtained from an attack of this complaint in his own person, that Dr. Cutler was induced to recommend the medicine. It has also been used in catarrh, croup, pertussis, and other laryngeal and pectoral affections; and we have seen it apparently advantageous in some of these complaints, especially in severe croup, and in chronic bronchitis with dyspnœa; but it should always be used with caution. Administered by injection it produces the same distressing sickness of stomach, profuse perspiration, and universal relaxation, as result from a similar use of tobacco. Dr. Eberle administered a strong decoction of it successfully by the rectum, as a substitute for this narcotic in a case of strangulated hernia. It has been employed effectually, in small doses repeated so as to sustain a slight nausea, for producing relaxation of the os uteri. (*Am. Journ. of Med. Sci.*, xvii. 248.)

It may be given in substance, tincture, or infusion. The dose of the powder as an emetic is from five to twenty grains, to be repeated if necessary. The tincture is most frequently administered. The full dose of this preparation for an adult is half a fluidounce; though in asthmatic cases it is better administered in the quantity of one or two fluidrachms, repeated every two or three hours till its effects are experienced.*

Two other species of Lobelia have attracted some attention from medical writers. *L. cardinalis* or *cardinal flower*, distinguished for its showy red flowers, is supposed to possess anthelmintic properties; but is seldom or never used. *L. syphilitica* is said to have been used by the Indians in the cure of the venereal disease, but has upon trial been found wholly inefficacious in that complaint. It is emetic and cathartic, and appears also to possess diuretic properties; whence it has been conjectured that it might have proved serviceable in gonorrhœa. Dr. Chapman states that it has been employed, as he has been informed, by some practitioners of the western country in dropsy, and not without success. The root is the part used. Both these species of Lobelia are indigenous. For a more detailed account of them, the reader is referred to Dr. W. P. C. Barton's Medical Botany.

Off. Prep. Tinctura Lobeliæ; Tinct. Lobeliæ Ætherea. W.

LUPULINA. *U. S., Dub.*

Lupulin.

The powder attached to the strobiles of Humulus Lupulus. *U. S., Dub.*
Lupulina is described under HUMULUS, p. 392.

* Professor Procter prepares a fluid extract by macerating eight ounces of finely bruised lobelia mixed with a fluidounce of acetic acid, in a pint and a half of diluted alcohol, for twenty-four hours; then percolating with an equal quantity of diluted alcohol, and afterwards with water, until three pints of liquor are obtained; next evaporating to ten fluidounces, straining, adding six fluidounces of alcohol, and finally filtering through paper. Each teaspoonful of this preparation is equal to half a fluidounce of the tincture, which represents about 30 grains of the powder. (*Am. Journ. of Pharm.*, xxiv. 207.)—*Note to the tenth edition.*

LYCOPUS. *U. S. Secondary.*

Bugle-weed.

The herb of Lycopus Virginicus. *U. S.*

Lycopus. *Sex. Syst.* Diandria Monogynia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Calyx tubular, five-cleft, or five-toothed. *Corolla* tubular, four-lobed, nearly equal; the upper segment broader, and emarginate. *Stamens* distant. *Seeds* four, naked, retuse. *Nuttall.*

Lycopus Virginicus. Michaux, *Flor. Boreal, Americ.* i. 14; Rafinesque, *Med. Flor.* vol. ii. The *bugle-weed* is an indigenous herb, with a perennial creeping root, which sends up an erect, nearly simple, obtusely quadrangular stem, from twelve to eighteen inches high, and furnished with opposite sessile leaves. These are broad-lanceolate, attenuated and entire at both extremities, remotely serrate in the middle, somewhat rough, purplish, and beset with glandular dots on their under surface. The flowers are minute, in small axillary whorls, with two small subulate bractes to each flower, and a white corolla. The seeds are longer than the calyx, which is spineless.

This plant grows in shady and wet places throughout the greater part of the United States. Its flowering period is August. The whole herb is used. It has a peculiar odour, and a nauseous slightly bitter taste, and imparts these properties, as well as its medical virtues, to boiling water.

Lycopus Europæus is said to be frequently collected and sold for *L. Virginicus.* The former may be distinguished by its acutely quadrangular stem, its narrow lanceolate leaves, of which the lower are somewhat pinnatifid, its more crowded flowers, and the acute segments of its calyx, armed with short spines. It has been employed in Europe as a substitute for quinia.

Medical Properties and Uses. According to Dr. A. W. Ives, the bugle-weed is a very mild narcotic. It is said also to be astringent. It was introduced into notice by Drs. Pendleton and Rogers, of New York, who obtained favourable effects from its use in incipient phthisis and hemorrhage from the lungs. (*N. Y. Med. and Phys. Journ.*, i. 179.) It proves useful by diminishing the frequency of the pulse, quieting irritation, and allaying cough. The use of it has been extended with advantage to the hemorrhages generally. (*Transact. of Am. Med. Assoc.*, i. 347.) It is most conveniently employed in the form of infusion, which may be prepared by macerating an ounce of the herb in a pint of boiling water. From half a pint to a pint may be taken daily. W.

MAGNESIÆ CARBONAS. *U. S., Lond., Ed., Dub.*

Carbonate of Magnesia.

Magnesia alba, *Lat.;* Carbonate de magnesie, *Fr.;* Kohlensaure Magnesia, *Germ.;* Carbonato di magnesia, *Ital.;* Carbonato de magnesia, *Span.*

Carbonate of magnesia sometimes though rarely occurs as a native mineral. That which is sold in the shops is prepared on a large scale by the manufacturer; and the article is, therefore, very properly placed in the list of Materia Medica of the United States Pharmacopœia. The British Colleges still retain it among the preparations, and direct it to be prepared by decomposing the sulphate of magnesia with carbonate of soda. The *London College* dissolves four pounds nine ounces of carbonate of soda, and four pounds of sulphate of magnesia, separately, in two gallons (*Imp. meas.*) of distilled water; then mixes the solutions, boils for two hours, constantly stirring with a spatula, and adding a little distilled water now

and then so as nearly to preserve the measure; and, lastly, pours off the liquor, washes the precipitate with boiling distilled water, and dries it. The *Edinburgh* and *Dublin* processes differ from the above mainly in the shorter period of boiling, which in the former is fifteen or twenty minutes, in the latter only ten.

Under the name of MAGNESIÆ CARBONAS PONDEROSUM or *Heavy Carbonate of Magnesia,* the Dublin College also directs the salt to be prepared in the following manner. It must be recollected that the new Dublin weights are the *avoirdupois.* Ten ounces of sulphate of magnesia having been dissolved in half a pint (*Imp. meas.*) of boiling distilled water, and twelve ounces of crystallized carbonate of soda in a pint, the solutions are mixed and evaporated to dryness. The residue is digested for half an hour with two pints (*Imp. meas.*) of boiling distilled water; the undissolved matter is collected on a calico filter, and treated repeatedly with warm distilled water until the washings cease to yield a precipitate with nitrate of baryta; and, finally, the product is dried at a heat not exceeding 212°.

The carbonate of potassa is less eligible than the carbonate of soda for the preparation of carbonate of magnesia. It is difficult to separate the last portions of sulphate of potassa from the precipitate, and the carbonate of potassa usually contains silica, which is thrown down with the magnesia. The consequence is that, when prepared with that salt, the carbonate of magnesia is liable to be gritty to the touch, and to have a saline taste. The following is said to be the method pursued by some of the best manufacturers. To a saturated solution of one hundred parts of sulphate of magnesia, a solution of one hundred and twenty-five parts of crystallized carbonate of soda is gradually added, the solutions being constantly stirred. The mixture is then heated to ebullition, to complete the precipitation of the magnesia, which is afterwards washed with tepid and finally with cold water, until the washings no longer give a precipitate with the barytic salts. When it is sufficiently washed, the carbonate is allowed to drain for one or two days on large linen filters, and is then placed in wooden moulds with a porous bottom of brick or gypsum, and subjected to pressure in order to give it the square and compact form into which it is usually wrought.

The density of carbonate of magnesia is said to depend upon the strength of the solutions from which it is first precipitated, and its fineness and softness to the touch, upon the use of carbonate of soda in its preparation.

The principal part of the carbonate of magnesia used in this country is imported from Scotland. In the New England States it is prepared from the bittern of salt works, which consists chiefly of sulphate of magnesia and chloride of magnesium; and it is manufactured in Baltimore from the sulphate of magnesia prepared in that city. The Scotch magnesia is generally put up in cases of one hundred and twenty pounds each, the American in boxes containing fifty pounds.

When made from the bittern of salt works, carbonate of magnesia is contaminated with carbonate of lime, salts of that earth being contained in sea-water; and when it is prepared from magnesia, or from magnesian schist, iron is almost always present. The only way in which these impurities can be avoided, is to prepare pure sulphate of magnesia by repeated crystallization, and to use a pure carbonate of soda. It is also necessary that the water with which the precipitate is washed should be free from earthy salts, which would be decomposed and contaminate the magnesia.

Properties. Carbonate of magnesia is inodorous, nearly insipid, perfectly white, smooth to the touch, and nearly insoluble in water, requiring 2493 parts of cold, and 9000 parts of hot water for solution. It is decomposed by strong heat, by all the acids, by potassa, soda, lime, baryta, and strontia, and by acidulous and metallic salts.

Two kinds of carbonate of magnesia are distinguished, the light and the heavy. The *light carbonate* is the kind manufactured in Scotland. The Dublin process

for the *heavy* has been already given. It may also, according to Dr. Pereira, be prepared as follows. "Add one volume of a cold saturated solution of carbonate of soda to a boiling mixture of one volume of a saturated solution of sulphate of magnesia, and three volumes of water. Boil until effervescence has ceased, constantly stirring with a spatula. Then dilute with boiling water, set aside, pour off the supernatant liquor, and wash the precipitate with hot water on a linen cloth: afterwards dry it by heat in an iron pot." Dr. Pereira states that the *light carbonate*, when examined with the microscope, is seen to consist of an amorphous powder, more or less intermingled with slender prismatic crystals, which appear as if they were eroded or effloresecent; the *heavy carbonate* consists of granules of various sizes, without any traces of the prismatic crystals observed in the former variety.

A solution in carbonic acid water, prepared by passing carbonic acid gas into a reservoir containing the carbonate of magnesia suspended in water, has been introduced into use as a cathartic and antacid. *Dinneford's magnesia* is a solution of this nature. According to Dr. Christison's analysis, it contains only nine grains of carbonate in the fluidounce, though it is alleged to contain twice that quantity. Its taste is more disagreeable than that of the undissolved carbonate.

Adulterations and Tests. Carbonate of magnesia may contain an alkaline carbonate, or an alkaline sulphate, or both, from insufficient washing; also chloride of sodium, alumina, and carbonate of lime. If water boiled on it changes turmeric, an alkaline carbonate is indicated. If chloride of barium produces a precipitate in the water, the presence of a sulphate or carbonate, or both, is shown; and if nitrate of silver produces the same effect, a chloride is indicated. When dissolved in an excess of muriatic acid, an excess of ammonia will throw down alumina, which is scarcely ever absent in minute quantity; and oxalate of ammonia, afterwards added to the filtered muriatic solution, will throw down lime as oxalate of lime, if that earth be present. If the same solution, nearly neutralized, be rendered blue by ferrocyanuret of potassium, the presence of iron is indicated.

Composition. According to Berzelius, the carbonate of magnesia of the shops (*magnesia alba*) is a combination of three eqs. of carbonate of magnesia with one of hydrate of magnesia. Each eq. of carbonate contains an eq. of water, and the composition of the salt may be thus stated:—three eqs. of carbonate (acid 66, magnesia 60, water 27) = 153 + one eq. of hydrate (magnesia 20, water 9) = 29 = 182. This theoretic composition agrees nearly with the analysis of Berzelius, who fixes it at 44·75 magnesia, 35·77 acid, and 19·48 water. According to Phillips, whose analysis agrees with the subsequent one by George Fownes, four eqs. of the carbonate are combined with one of the bihydrate, and four of water. (*Pharm. Journ. and Trans.*, iii. 480.) The composition of this salt varies with the mode of preparation. Thus Bucholz, by decomposing the sulphate of magnesia with 170 per cent. of carbonate of soda, and using only cold water throughout, obtained a very light, spongy, somewhat coherent carbonate of magnesia, containing 32 acid, 33 base, and 35 water. By using 120 per cent. of the carbonate, and boiling the water for fifteen minutes, he obtained a heavy granular, precipitate, containing 35 acid, 42 base, and 23 water.

Medical Properties and Uses. Carbonate of magnesia is antacid, and, by combining with acid in the stomach, becomes generally cathartic. When it undergoes no change in the alimentary canal, it produces no purgative effect. Under these circumstances, it may usually be made to operate by following it with draughts of lemonade. It is useful in all cases which require a laxative antacid; and, though apt to produce flatulence in consequence of the extrication of its carbonic acid in the stomach and bowels, and therefore in ordinary cases inferior to calcined magnesia, it sometimes operates favourably, in consequence of

this very property, in sick stomach attended with acidity. Carbonate of magnesia is also an excellent antilithic in those cases in which uric acid is secreted in too great abundance. The dose is from half a drachm to two drachms, which may be given suspended in water or milk. In order that it may be accurately diffused through water, it should be previously rubbed down with simple syrup or ginger syrup.*

Carbonate of magnesia is a useful agent for diffusing camphor and the volatile oils through water, in preparing several of the medicated waters.

Off. Prep. Hydrargyrum cum Magnesiâ; Liquor Magnesiæ Citratis; Magnesia; Mistura Camphoræ cum Magnesiâ; Trochisci Magnesiæ. D. B. S.

MAGNESIÆ SULPHAS. *U. S., Lond., Ed., Dub.*

Sulphate of Magnesia.

Epsom salt; Sulfate de magnésie, *Fr.;* Schwefelsaure Magnesia, *Germ.;* Solfato di magnesia, *Ital.;* Sulfato de magnesia, *Span.*

Sulphate of magnesia is one of the constituents of sea-water, and of some saline springs. It also occurs native, either crystallized in long, slender, prismatic, adhering crystals, or as an efflorescence on certain rocks and soils, which contain magnesia and a sulphate or sulphuret. In the United States it is found abundantly in the great caverns, so numerous to the west of the Alleghany mountains. In one of those caves, near Corydon in Indiana, it forms a stratum on the bottom several inches deep; or appears in masses sometimes weighing ten pounds; or is disseminated in the earth of the cavern, one bushel of which yields from four to twenty-five pounds of this sulphate. It also appears on the walls of the cavern, and, if it be removed, acicular crystals again appear in a few weeks. (*Cleaveland.*)

Sulphate of magnesia was originally procured by evaporating the waters of some saline springs at Epsom in England. Dr. Grew prepared it in this manner in 1675. It was afterwards discovered that the brine remaining after the crystallization of common salt from sea-water, furnished by careful evaporation precisely the same salt; and, as this was a much cheaper product, it superseded the former. This residual brine or bittern consists of sulphate of magnesia, and the chlorides of magnesium and calcium. As the sulphate of magnesia crystallizes first, it may with proper care be obtained nearly pure, although most frequently the salt prepared in this way is deliquescent from being contaminated with the chloride of magnesium. It may be freed from this impurity by washing the crystals with its own saturated solution. It was from this source that the greater part of the Epsom salt of commerce was long obtained in Europe. The salt works of New England supplied our own markets with an impure and deliquescent sulphate. With the improvements of chemistry, other and better processes have latterly been adopted. In the neighbourhood of Genoa and Nice, sulphate of magnesia is prepared in large quantities from a schistose rock, which contains magnesia and sulphuret of iron. The mineral is roasted and exposed in heaps for some months to the combined action of air and water. It is then lixiviated, the sulphate of iron decomposed by lime-water, and the salt is obtained pure by repeated solution and crystallization.

William Henry, of Manchester, whose calcined magnesia has become famous throughout the world, took out a patent for a mode of preparing magnesia and its salts from the double carbonate of magnesia and lime—the *dolomite* of mine-

* *Dalby's Carminative* consists of carbonate of magnesia ℈ij, oil of peppermint ♏j, oil of nutmeg ♏ij, oil of aniseed ♏iij, tincture of castor ♏xxx, tincture of assafetida ♏xv, tincture of opium ♏v, spirit of pennyroyal ♏xv, compound tincture of cardamom ♏xxx, peppermint water f℥ij.

ralogists. His process was to drive off the carbonic acid by heat, and to convert the remaining earths into hydrates. He treated these with a sufficient quantity of muriatic acid to dissolve out the lime, and then converted the magnesia into a sulphate either by sulphuric acid or sulphate of iron.

This salt is extensively manufactured in Baltimore and Philadelphia from the silicious hydrate of magnesia, or *magnesite*. This mineral occurs in veins in the serpentine and other magnesian rocks which abound in the neighbourhood of Baltimore, and in the southern counties of Pennsylvania. The advantage which it possesses over the dolomite, in the preparation of this salt, is the almost entire absence of lime, owing to which circumstance there is little or no waste of acid, and the operation is much simplified. The mineral is reduced to a fine powder, and saturated with sulphuric acid. The mass is then dried and calcined at a red heat, in order to convert the sulphate of iron, which may be present, into red oxide. It is then dissolved in water, and sulphuret of lime added to separate any remaining portion of iron. The salt is crystallized and dissolved a third time, in order to purify it. The sulphate prepared at the Baltimore works by this process is generally very pure and clean, although it sometimes contains sulphate of iron.

Properties, &c. Sulphate of magnesia is a colourless transparent salt, without smell, and of a bitter, nauseous, saline taste. It crystallizes in quadrangular prisms, terminating in a four-sided pyramid or in a dihedral summit. It usually occurs in small acicular crystals, which are produced by agitating the solution while crystallizing. It slowly effloresces in the air. At 32° F. 100 parts of water dissolve 25·76 parts of the anhydrous salt, and, for every increased degree, 0·8597 parts additional are taken up. The crystals contain 51·22 per cent. of water of crystallization, and dissolve in their own weight of water at 60°, and in three-fourths of their weight of boiling water. They melt in their water of crystallization, and at a high temperature fuse into an enamel. (*Berzelius.*) This salt consists of one equivalent of acid 40, one of base 20, and seven of water 63 = 123.

Sulphate of magnesia is completely decomposed by potassa, soda, and their carbonates; by lime, baryta, and strontia, and their soluble salts. Ammonia partially decomposes it, and forms with the remaining salt a double sulphate. The bicarbonates of potassa and soda do not decompose it, except by the aid of heat.

Sulphate of magnesia is liable to contain iron and chloride of magnesium, the former of which may be detected by ferrocyanuret of potassium, and the latter by its rendering the salt moist. If the addition of sulphuric acid produce no extrication of muriatic acid gas, the fact proves the absence of all chlorides. One hundred grains of the salt in aqueous solution should yield, when completely decomposed by a boiling solution of carbonate of soda, thirty-four grains of dry carbonate of magnesia. If the dry precipitate be less, the specimen tested is not all sulphate of magnesia, and probably contains sulphate of soda.

Medical Properties and Uses. Sulphate of magnesia is a mild and safe cathartic, operating with little pain or nausea, and producing watery stools. It is more acceptable to the stomach than most medicines of its class, and will often be retained when others are rejected. Like many of the other neutral salts it is refrigerant, and may be made to act as a diuretic, by keeping the skin cool, and walking about after it has been taken. It is well adapted to the treatment of fevers and inflammatory affections, especially after a previous thorough evacuation of the bowels by a more energetic cathartic. It is also useful in colic and obstinate constipation, and may be employed in most cases which require the use of a cathartic, without being attended with debility or relaxation of the stomach and bowels. The medium dose is an ounce; but advantage often results from its administration in divided doses frequently repeated. It is often given in combination with other medicines, especially with senna, the griping effect of which it

tends to obviate. The most agreeable form for administering the salt, and that in which it usually agrees best with the stomach, is a solution in carbonic acid water with lemon syrup. By Dr. Henry, of Dublin, it is highly recommended in connexion with sulphuric acid. To seven ounces of a saturated aqueous solution of the salt he adds an ounce of the diluted sulphuric acid of the Pharmacopœias, and gives a tablespoonful of the mixture for a dose, in a wineglassful of water.*

Off. Prep. Enema Catharticum; Magnesiæ Carbonas; Magnesiæ Carbonas Ponderosum; Pulvis Salinus Compositus. D. B. S.

MAGNOLIA. *U. S. Secondary.*

Magnolia.

The bark of Magnolia glauca, Magnolia acuminata, and Magnolia tripetala. *U. S.*

Magnolia. *Sex. Syst.* Polyandria Polygynia.—*Nat. Ord.* Magnoliaceæ.

Gen. Ch. Calyx three-leaved. *Petals* six or more. *Capsules* two-valved, one-seeded, imbricated in a cone. *Seeds* berried, pendulous. *Bigelow.*

The medicinal properties which have rendered the bark of the Magnolia officinal, are common to most, if not all of the species composing this splendid genus. Among the numerous trees which adorn the American landscape, these are most conspicuous for the beautiful richness of their foliage, and the magnificence as well as delicious odour of their flowers; and *M. grandiflora* of the Southern States rivals in magnitude the largest inhabitants of our forests. The Pharmacopœia designates *M. glauca*, *M. acuminata*, and *M. tripetala*, each of which we shall briefly describe.

1. *Magnolia glauca.* Willd. *Sp. Plant.* ii. 1256; Bigelow, *Am. Med. Bot.* ii. 67; Barton, *Med. Bot.* i. 77; Michaux, *N. Am. Sylv.* ii. 8. This species of Magnolia, which in the Northern States is often nothing more than a shrub, sometimes attains in the South the height of forty feet. The leaves are scattered, petiolate, oval, obtuse, entire, glabrous, thick, opaque, yellowish-green on their upper surface, and of a beautiful pale glaucous colour beneath. The flowers are large, terminal, solitary, cream-coloured, strongly and gratefully odorous, often scenting the air to a considerable distance. The calyx is composed of three leaves; the petals, from eight to fourteen in number, are obovate, obtuse, concave, and contracted at the base; the stamens are very numerous, and inserted on a conical receptacle; the germs are collected into a cone, and each is surmounted by a linear recurved style. The fruit is conical, about an inch in length, consisting of numerous imbricated cells, each containing a single scarlet seed. This escapes through a longitudinal opening in the cell, but remains for some time suspended from the cone by a slender thread.

M. glauca extends along the seaboard of the United States, from Cape Ann, in Massachusetts, to the shores of the Gulf of Mexico. It is abundant in the Middle and Southern States, usually growing in swamps; and is seldom met with in the interior, west of the mountains. It begins to flower in May, June, or July, according to the latitude. It is known by the name of *magnolia* simply in the Northern and Middle States, by that of *white bay* or *sweet bay* in the South, and is occasionally called *swamp sassafras*, *beaver tree*, &c.

2. *M. acuminata.* Willd. *Sp. Plant.* ii. 1257; Michaux, *N. Am. Sylv.* ii. 12. This species is much larger than the preceding, often growing to the height of

* It is said that a solution of an ounce of the salt in about a pint of water, boiled for three minutes with a grain and a half of tannic acid, or with two or three drachms of roasted coffee, is entirely deprived of bitterness. The liquid prepared with coffee should be strained, and may be sweetened with sugar. (Combes, *Journ. de Pharm.*, 3e sér., xii. 110.)

seventy or eighty feet. The leaves are six or seven inches long, by three or four in breadth, oval, acuminate, and pubescent on their under surface. The flowers are five or six inches in diameter, bluish or cream-coloured, slightly odorous, with obovate rather obtuse petals from six to nine in number. Mingled with the splendid foliage, they give a magnificent aspect to the tree when large and in full bloom. The tree grows in the interior mountainous regions of the United States, extending along the Alleghanies from the State of New York to their termination in Georgia, and seldom existing in the low country far either to the east or the west of that range. It is called *cucumber tree*, from the resemblance of its fruit in shape and size to the common cucumber.

3. *M. tripetala.* Willd. *Sp. Plant.* ii. 1258; Michaux, *N. Am. Sylv.* ii. 18. This is a small tree, sometimes though rarely reaching an elevation of thirty feet, and almost always having an inclined trunk. It is remarkable for the size of its leaves and flowers. The former are eighteen or twenty inches long by seven or eight in breadth, thin, obovate, somewhat wedge-shaped, entire, acute at both extremities, pubescent when young, and often disposed in rays at the extremity of the shoots, displaying a surface thirty inches in diameter. Hence has arisen the name of *umbrella tree*, by which this species is distinguished. The flowers are terminal, seven or eight inches in diameter, white, with from five to twelve oval acute petals, of which the three outer are reflexed. This species extends from the northern parts of New York to the southern limits of the United States. It is found only in shady situations, with a strong, deep, and fertile soil.

The bark and fruit of all the species of Magnolia are possessed of similar medicinal properties; but the bark only is officinal; and that of the root is thought to be most efficient. It has an aromatic odour, and a bitter, pungent, spicy taste. The aromatic property, which resides in a volatile principle, is diminished by desiccation, and entirely lost when the bark is long kept. The bitterness, however, remains. The bark is destitute of astringency. The bark of Magnolia grandiflora, examined by Dr. Stephen Procter, was found to contain volatile oil, resin, and a principle analogous to the liriodendrin of Professor Emmet. (*Am. Journ. of Pharm.*, xiv. 95.)

Medical Properties and Uses. Magnolia is a gently stimulant aromatic tonic and diaphoretic, useful in chronic rheumatism, and capable, if freely given, of arresting the paroxysms of intermittent fever. It has been used advantageously in these complaints, and in remittents, especially of a typhoid character. The dose of the recently dried bark in powder is from half a drachm to a drachm, frequently repeated. The infusion may also be used, but is less efficient. Diluted alcohol extracts all the virtues of the medicine; and a tincture, made by macerating the fresh bark or fruit in brandy, is a popular remedy in chronic rheumatism. W.

MALVA. *Ed.*

Common Mallow.

Herb of Malva sylvestris. *Ed.*

Mauve sauvage, *Fr.*; Waldmalve, *Germ.*; Malva, *Ital.*, *Span.*

MALVA. *Sex. Syst.* Monadelphia Polyandria.—*Nat. Ord.* Malvaceæ.

Gen. Ch. Calyx double, the exterior three-leaved. *Capsules* very many, one-seeded. *Willd.*

Malva sylvestris. Willd. *Sp. Plant.* iii. 787; Woodv. *Med. Bot.* p. 554, t. 197. This is a perennial, herbaceous plant, with a round, hairy, branching, usually erect stem, from one to three feet high, bearing alternate, petiolate, cordate, roughish leaves, which are divided into five or seven crenate lobes, and on the upper part of the stem are almost palmate. The flowers are large, pur-

plish, and placed from three to five together at the axils of the leaves, upon long slender peduncles, which, as well as the petioles, are pubescent. The petals are five, inversely cordate, and three times as long as the calyx. The capsules are disposed compactly in a circular form.

This species of mallow is a native of Europe, where it grows abundantly on waste grounds and by the way-sides, flowering from May to August. It is sometimes cultivated in our gardens. Other species, indigenous or naturalized in this country, are possessed of the same properties, which are in fact common to the whole genus. *Malva rotundifolia* is one of the most common, and may be substituted for *M. sylvestris.*

The herb and flowers have a weak, herbaceous, slimy taste, without odour. They abound in mucilage, which they readily impart to water; and the solution is precipitated by acetate of lead. The infusion and tincture of the flowers are blue, and serve as a test of acids and alkalies, being reddened by the former, and rendered green by the latter. The roots and seeds also are mucilaginous.

Medical Properties and Uses. Common mallow is emollient and demulcent. The infusion and decoction are sometimes employed in catarrhal, dysenteric, and nephritic complaints; and are applicable to all other cases which call for the use of mucilaginous liquids. They are also used as an emollient injection; and the fresh plant forms a good suppurative or relaxing cataplasm in external inflammation. It was formerly among the culinary herbs. W.

MANGANESII OXIDUM. *Ed.*

Oxide of Manganese.

Off Syn. MANGANESII BINOXIDUM. *Lond.;* MANGANESII PEROXYDUM. *Dub.*

Manganese, Peroxide of manganese, Deutoxide of manganese, Black oxide of manganese, Pyrolusite; Oxide noir de manganese, *Fr.;* Braunstein, *Germ.;* Manganese, *Ital., Span.*

The officinal oxide of manganese is the deutoxide or binoxide of a peculiar metal properly called manganese; though this name is commonly applied to the oxide itself. *Metallic manganese* was discovered by Scheele and Gahn in 1774, and is obtained from the native black oxide by intense ignition with charcoal. It is hard, brittle, granular, and of a grayish-white colour. It oxidizes readily by the action of the air, first tarnishing, then assuming a yellowish or violet colour, and finally becoming converted into a black powder. Its sp. gr. is 8, melting point 160° of Wedgwood, and equivalent number 27·7. With oxygen it forms five combinations, three regular oxides and two acids. The *protoxide* is of a light green colour, and is the oxide present in the salts of manganese. The *sesquioxide* is black or dark-brown, and the *deutoxide* black. The two acids are formed by the action of potassa on the deutoxide, and are called *manganic* and *hypermanganic acids.* Assuming one eq. of manganese in each of these combinations, the protoxide contains one, the sesquioxide one and a half, the deutoxide two, manganic acid three, and hypermanganic acid three and a half equivalents of oxygen.* (*Berzelius.*) Besides these, there exists a double oxide, of a brownish-red colour, called the *red oxide,* consisting of one eq. of protoxide, and one of sesquioxide, and invariably formed when any one of the other oxides of manganese is exposed to a white heat; and a native oxide, called *Varvicite,* composed of two eqs. of deutoxide, and one of sesquioxide. Metallic manganese is an occasional constituent of organic matter. It was detected in minute quantity in bones by Fourcroy and Vauquelin, and has recently been found by Millon and

* In order to avoid fractional equivalents, the sesquioxide is generally stated to consist of two eqs. of metal and three of oxygen, and the hypermanganic acid, of two eqs. of metal and seven of oxygen.

others in the blood. It is often present in the ashes of plants. In the mineral kingdom, it occurs sometimes as a sulphuret, rarely as a phosphate, but very abundantly as the black or deutoxide, called *pyrolusite.* It is the latter mineral which constitutes the officinal oxide.

Properties. Deutoxide of manganese, as it occurs in nature, is very variable in its appearance. Its sp. gr. varies from 4·7 to 4·9. It is found sometimes in brilliant needle-shaped crystals, often in compact masses having the metallic lustre, but far more frequently in the form of a dull earthy-looking substance of a black or brown colour. It is purest when crystallized. As it occurs in commerce it is usually in the form of powder, of a black colour, insoluble in water, and containing as impurities more or less oxidized iron, carbonate of lime, sulphate of baryta, and earthy matter. Iron, which is rarely absent, is detected by the production of a greenish or blue tint on the addition of ferrocyanuret of potassium to its muriatic solution. When exposed to a red heat it yields half an equivalent of oxygen, and is reduced to the state of sesquioxide. Hence its use in obtaining that gas. When dried, and afterwards heated to whiteness, good samples lose twelve per cent. of oxygen. It is distinguished from the sulphuret of antimony by its infusibility, and by its causing the evolution of chlorine on being heated with muriatic acid. When of a brown colour, it is not of good quality. Its composition has been given above.

But few mines of deutoxide of manganese exist, though the metal itself is very generally diffused throughout the mineral kingdom. It occurs most abundantly in Bohemia, Saxony, the Hartz, France, and Great Britain. In the United States no mines have been opened, except in Vermont, from which State an inferior brown ferruginous manganese is supplied through Boston. Besides this source of supply, the mineral is received from Nova Scotia, France, Germany, England, and occasionally Scotland. It comes packed in casks or barrels, generally in lumps and coarse powder, just as it is dug out of the mines; though occasionally it is received from England ready pulverized. It is a good rule to buy it unpowdered; as its quality can be better judged of in that state. A dark shining crystalline appearance may be taken as an indication of good quality. The Nova Scotia manganese is better than the Vermont; but that received from Germany and England is the best, and commands the highest price. The Scotch manganese is also of good quality.

Medical Properties and Uses. Deutoxide of manganese is deemed a tonic by some experimenters. When slowly introduced into the system, as happens to those engaged in grinding the mineral, it acts, according to Dr. Coupar, of Glasgow, as a cumulative poison, inducing a disease which first shows itself by a staggering gait, and ends in paraplegia. It has been used in syphilis, chlorosis, scurvy, and various skin diseases, especially itch and porrigo. The dose is from three to twenty grains, three times a day, given in the form of pill. For external use, an ointment may be made of one or two drachms of the oxide to an ounce of lard. For a notice of other compounds of manganese which have been tried as medicines, see the article *Manganese* in the Appendix.

This oxide is used in the arts for obtaining chlorine in the manufacture of bleaching powder, for giving a black glazing to pottery, and for freeing glass from the colour which it derives from the sesquioxide of iron. According to Berzelius, a few pounds of it added to each cask of water intended for sea-voyages, will preserve it sweet. In the laboratory, it is employed to obtain oxygen and chlorine, and to form the salts of manganese. In pharmacy it is used for liberating chlorine from muriatic acid and from common salt, and iodine from iodide of sodium, contained in kelp.

Pharm. Uses. Deutoxide of manganese is used in preparing Chlorinii Liquor; Chloroformum, *Dub.;* Liquor Sodæ Chlorinatæ. B.

MANNA. *U. S., Lond., Ed., Dub.*

Manna.

The concrete juice of Ornus Europæa. *U. S.* Fraxinus rotundifolia, and Fraxinus Ornus? The juice obtained by incision, hardened in the air. *Lond.* Sweet concrete exudation, probably from several species of Fraxinus and Ornus. *Ed.* Fraxinus Ornus. An exudation from this and other species. *Dub.*

Manne, *Fr.;* Manna, *Germ., Ital.;* Mana, *Span.*

Manna is not the product of one plant exclusively. Besides *Ornus Europæa* indicated by the U. S. Pharmacopœia, it is said to be obtained also from several other trees, belonging to the genera *Ornus* and *Fraxinus*, among which *O. rotundifolia*, *F. excelsior*, and *F. parviflora* have been particularly designated. Burckhardt states that a species of manna, which exudes from the tamarisk of the North of Africa (*Tamarix Gallica*, Ehrenberg), is used by the Bedouin Arabs of the neighbourhood of Mount Sinai with their food. This substance, however, according to Mitscherlich, contains no mannite, but consists wholly of mucilaginous sugar. The manna used in India is said to be the product of *Hedysarum Alhagi* of Linn., *Alhagi Maurorum* of De Candolle, a thorny shrub which grows abundantly in the deserts of Persia and Arabia. It is, however, much inferior to that obtained from the Ornus. A substance closely resembling manna is procured by exudation from a species of *Eucalyptus*, called *E. mannifera*, growing in New South Wales. It has been shown to contain a saccharine matter different from mannite, and, though isomeric with glucose, differing from it as well as from other varieties of sugar in properties. Another manna found in New Holland is produced by exudation from the leaves of *Eucalyptus dumosa*, when very small, and sometimes appears spread over large extents of country like a kind of snow. The natives use it for food. It is a complex body, containing sugar, gum, starch, inulin, and lignin. (*Journ. de Chim. et de Pharm.*, xvi. 240.) The substance known in France by the name of *Briançon manna*, is an exudation from the common European larch — *Larix Europæa* or *Pinus Larix* — and differs chemically from ordinary manna in containing no mannite. A substance resembling manna, of a sweet, slightly bitter, and terebinthinate taste, and actively purgative, exudes from incisions in the *Pinus Lambertiana*, of Southern Oregon, and is used by the inhabitants. (*Nar. of U. S. Expl. Exped.*, v. 232.)

Ornus. *Sex. Syst.* Diandria Monogynia. — *Nat. Ord.* Oleaceæ.

Gen. Ch. Calyx very small, four-cleft. *Corolla* divided to the base into linear segments. *Pericarp* a winged key not deliscing. *Lindley.*

This genus was separated by Persoon from the Fraxinus of Linnæus, and is now admitted by the best botanists.

Ornus Europæa. Persoon, *Synops.* i. 9; Lindley, *Flor. Med.* 547; Carson, *Illust. of Med. Bot.* ii. 8, pl. 61. — *Fraxinus Ornus.* Willd. *Sp. Plant.* iv. 1104; Woodv. *Med. Bot.* p. 589, t. 209. The *flowering ash** is a tree of moderate height, usually from twenty to twenty-five feet, very branching, with opposite, petiolate, pinnate leaves, composed of three or four pairs of leaflets, and an odd one at the end. The leaflets are oval, acuminate, obtusely serrate, about an inch and a half in length, smooth, of a bright-green colour, and supported on short footstalks. The flowers are white, and usually expand with the leaves. They grow in close

* A syrup prepared from the inner bark of this tree has been employed, in Europe, by Dr. Devergie, with supposed advantage, in chronic eczema and impetigo. The bark contains much tannin, and a mucilaginous principle, which renders diluted alcohol a better menstruum than boiling water. (*Journ. de Pharm.*, 3e sér., ix. 347.)

panicles at the extremities of the young branches, and have a very short calyx with four teeth, and four linear-lanceolate petals.

Both this species of *Ornus* and the *O. rotundifolia* are natives of Sicily, Calabria, and Apulia; and both contribute to supply the manna of commerce. The former is cultivated in Sicily, yields manna after the eighth year, and continues to yield it for ten or twelve years, when it is usually cut down, and young sprouts allowed to grow up from the root. (Stettner, *Archiv. der Pharm.*, liii. 194.) During the hot months the juice exudes spontaneously from the bark, and concretes upon its surface; but, as the exudation is slow, it is customary to facilitate the process by making deep longitudinal incisions on one side of the trunk. In the following season these are repeated on the other side, and thus alternately for the whole period during which the trees yield manna, extending sometimes, it is said, to thirty or even forty years. Straw or clean chips are frequently placed so as to receive the juice, which concretes upon them. The manna varies in its character according to the mode of collection and nature of the season, and the period of the year in which the exudation takes place. That procured in Sicily is said to be the best. Three varieties are distinguishable in commerce.

1. The purest is that usually known by the name of *flake manna*, called also *manna cannulata*. It exudes spontaneously, or by incisions, during the hottest and dryest weather in July and August. According to Stettner, it is furnished by the upper incisions upon the trunk; while the lower incisions yield the inferior varieties. It is in irregular, unequal pieces, often several inches long, resembling stalactites, rough, light, porous, brittle, whitish or yellowish-white, and frequently concave on the surface by which they were attached to the trunk, and which is often soiled by impurities, sometimes by adherent fragments of the bark. When broken, these pieces exhibit a crystalline or granular structure. This variety is sometimes in small fragments, generally less than an inch in length.

2. *Common manna*—*manne en sorte* of French pharmacy—is next in quality, and is collected in September and the beginning of October, when the heat of the weather has begun to moderate. The juice does not now concrete so readily, and a portion, falling on the ground at the root of the tree, becomes more or less mixed with impurities, and forms imperfectly solid masses, which require to be further dried in the sun. The common manna consists of whitish or yellowish fragments similar to the pieces of flake manna, but much smaller, mixed with a soft, viscid, uncrystallized brownish matter, identical with that which constitutes the following variety.

3. *Fat manna* is collected in the latter part of October and November, when the weather is cooler and rains more common. The juice is now still less disposed to concrete, and flowing down the trunk is received in a small excavation at its base. As found in commerce, it is in the form of a soft, viscous mass, containing few crystalline fragments, of a brown or yellowish-brown colour, and full of impurities.

Manna may be found in the shops of every grade, from the most impure of the third variety to the purest of the first; but the worst kind is not often imported into this country.

Attempts have sometimes been made to counterfeit manna; but the facility of detection renders frauds of this kind unprofitable, and they are not often practised. Dr. R. P. Thomas has described in the *Am. Journ. of Pharm.* (xxiv. 208) a sophisticated drug, which was not long since brought into our markets under the name of manna, but which differed from the genuine drug both in sensible and chemical properties, not even containing mannite. Baumé describes a method in which common manna is purified so as to resemble flake manna. It consists in dissolving common manna in a little water, allowing the liquid to settle, decanting it in order to separate the impurities, then inspissating it so

that it will congeal on cooling, and immersing threads in the inspissated liquid several times successively in the manner practised by candle-makers. It may be still further purified by the use of animal charcoal. Thus prepared it contains less mannite than flake manna, and less of the nauseous principle; but is said not to operate less effectively as a laxative.

Properties. Manna has a slight, peculiar odour, and a sweet taste, which in the impure kinds is also very nauseous, but in the finest flake manna, scarcely so much so as to be disagreeable. It melts with heat, and takes fire, burning with a blue flame. When pure it is soluble in three parts of cold, and in its own weight of boiling water. From a boiling saturated aqueous solution, it separates in partially crystalline masses. Alcohol also dissolves it, and, if saturated by means of heat, deposits upon cooling a large proportion of the manna in a beautifully crystalline form. Analyzed by Fourcroy and Vauquelin, manna was found to consist of, 1. a peculiar crystallizable sweet principle, called mannite, which constitutes seventy-five per cent.; 2. true sugar; 3. a yellow nauseous matter, upon which the purgative property is thought chiefly to depend; and 4. a small quantity of mucilage. Leuchtweiss obtained from 105 parts of manna 11·6 of water, 0·4 of insoluble matter, 9·1 of sugar, 42·6 of mannite, 40·0 of a mixture of mucilaginous matter containing mannite, with resin, an organic acid, and a nitrogenous substance, and 1·3 of ashes. (*Ann. der Chem. und Pharm.*, liii. 124.) It is owing to the presence of true sugar that manna is capable of fermenting. *Mannite* is white, inodorous, crystallizable in semi-transparent needles, of a sweetish taste, soluble in five parts of cold water, scarcely soluble in cold alcohol, but readily dissolved by that liquid when hot, and deposited when it cools. Unlike sugar, it is incapable of undergoing the vinous fermentation. It may be obtained by boiling manna in alcohol, allowing the solution to cool, and redissolving the crystalline precipitate. Pure mannite is now deposited. This principle has been found in numerous vegetables. It is said to be gently laxative in the dose of one or two ounces.*

Manna, when long kept, acquires a deeper colour, softens, and ultimately deliquesces into a liquid, which, on the addition of yeast, undergoes the vinous fermentation. This is probably owing to its conversion into sugar by the absorption of enough oxygen to neutralize the slight excess of hydrogen, which constitutes the only essential difference in composition between it and proper sugar. (See *Am. Journ. of Pharm.*, xxv. 32.) That which is dryest resists this change the longest. It is said that manna, recently gathered, is less purgative than it afterwards becomes.

Medical Properties and Uses. Manna is a gentle laxative, usually operating mildly, but in some cases producing flatulence and pain. Though peculiarly adapted to children and pregnant women, it may be given with advantage in ordinary cases of piles from constipation, unattended with dyspeptic symptoms. It is usually, however, prescribed with other purgatives, particularly senna, rhubarb, magnesia, and the neutral salts, the taste of which it conceals, while it adds to the purgative effect.

The dose for an adult is from one to two ounces; for children, from one to four drachms. It is usually given dissolved in water or some aromatic infusion; but the best flake manna may be administered in substance.

Off. Prep. Confectio Cassiæ; Syrupus Sennæ. W.

* G. Ruspini prepares mannite more economically from common manna, by first melting six pounds over the fire with three pounds of water previously beaten with the white of an egg, boiling for a few minutes, straining through flannel, and allowing the liquid to solidify by cooling; then adding an equal weight of cold water, expressing, dissolving the residue in boiling water with animal charcoal, filtering the liquid boiling hot, and, lastly, evaporating to a pellicle. The mannite separates, upon cooling, in beautiful truncated quadrangular prisms, perfectly white, and transparent. (*J. de Pharm.*, 3e sér., x. 117.)

MARANTA. *U. S., Lond., Ed.*

Arrow-root.

The fecula of the rhizoma of Maranta arundinacea. *U. S.* Fecula of the tuber. *Lond.* Fecula of the tubers of Maranta arundinacea and Maranta indica. *Ed.*

Off. Syn. MARANTA ARUNDINACEA. *Arrow Root.* Fecula of the tubers. *Dub.*

Arrow-root, *Fr.;* Amerikanisches Stärkmehl, Arrowmehl, *Germ.*

MARANTA. *Sex. Syst.* Monandria Monogynia.—*Nat. Ord.* Marantaceæ.

Gen. Ch. Anther attached to the petal-like filament. *Style* petal-shaped. *Stigma* three-sided. *Flowers* panicled. *Loudon's Encyc.*

Maranta arundinacea. Willd. *Sp. Plant.* i. 13; Carson, *Illust. of Med. Bot.* ii. 53, pl. 97. The root (rhizoma) of this plant is perennial, tuberous, fleshy, horizontal, nearly cylindrical, scaly, from six inches to a foot or more in length, and furnished with numerous long white fibres. It sends forth several tuberous, jointed, curved, white, scaly stoles, the points of which sometimes rise above the ground, and become new plants. The stems, of which several proceed from the same root, are annual, slender, branched, jointed, leafy, and about three feet in height. The leaves are ovate-lanceolate, about four inches long, alternate, and supported solitarily at the joints of the stem upon long, sheathing footstalks. The flowers are in a long, loose, spreading, terminal panicle, at each ramification of which is a solitary linear bracte. The calyx consists of three small lanceolate leaves. The corolla is white and monopetalous, with a tube longer than the calyx, and a double border, of which the three outermost segments are smallest, and the two inner obovate, and slightly emarginate.

The arrow-root plant is a native of the West Indies, where it is largely cultivated. It is cultivated also in the East Indies, Sierra Leone, the South of Africa, and our Southern States, especially Georgia and Florida. The plant is easily propagated by cuttings of the root. The fecula is prepared in the following manner. The roots are dug up when a year old, washed, and then beaten into a pulp, which is thrown into water, and agitated so as to separate the amylaceous from the fibrous portion. The fibres are removed by the hand, and the starch remains suspended in the water, to which it gives a milky colour. This milky fluid is strained through coarse linen, and allowed to stand that the fecula may subside, which is then washed with a fresh portion of water, and afterwards dried in the sun. We obtain the officinal arrow-root from the West Indies, and the Southern Atlantic States. That from the Bermudas has in general been most highly esteemed.

Other plants contribute to furnish the arrow-root of commerce. Lindley states that it is procured in the West Indies from *Maranta Allouya* and *M. nobilis*, besides *M. arundinacea*. Under the name of *M. Indica*, Tussac describes a distinct species, which he says was originally brought from the East Indies, and is now cultivated in Jamaica. This, however, is generally considered as a mere variety of M. arundinacea, from which it differs chiefly in having leaves more elongated at the point, and smooth on both sides. Very fine arrow-root is obtained in the East Indies from the root of *Curcuma angustifolia*, of Roxburgh, which is cultivated in Travancore. But the product is lighter than the maranta arrow-root, and does not so quickly make a jelly. Ainslie states that *M. arundinacea* has been introduced from the West Indies into Ceylon, where good arrow-root is prepared from it. A fecula, closely resembling that of the Maranta, is said by Guibourt to be prepared in the West Indies from the root of the cassava plant, *Janipha Manihot;* and it is not improbable that a variety of arrow-root brought to this country from Brazil has a similar origin. In fact, it

often contains small lumps, as large as a pin's head, identical with tapioca, which is a product of *J. Manihot.* A variety of arrow-root has been imported from the Sandwich Islands. Mr. Nuttall, during a visit to these islands, found that it was the product of a species of Tacca, which he has described under the name of *Tacca oceanica.* (*Am. Journ. of Pharm.*, ix. 305.) It is said that a similar product is obtained from *Tacca pinnatifida*, growing in the East India province of Arracan. (*Pharm. Journ. and Trans.*, vi. 383.) Arrow-root has been brought into the market from Florida, prepared in the neighbourhood of St. Augustine from the root of *Zamia integrifolia*, by a process similar to that employed in the preparation of the fecula of the Maranta (Dr. Joseph Carson, *Am. Journ. of Pharm.*, xiv. 22); but care must be taken not to confound this with the genuine maranta from the same State. Attempts have been made to substitute finely prepared potato starch for arrow-root; and there is no doubt that in nutritive properties it is quite equal; but patients complain of an unpleasant taste of the potato which it is apt to retain.

Arrow-root is in the form of a light white powder, or of small pulverulent masses, without smell or taste. It has a firm feel when pressed between the fingers, and produces a faint crackling sound when rubbed. It is a pure starch, corresponding in chemical properties with that of wheat and the potato. It is very apt to be musty, and should then be rejected. The odour and taste are the best criteria of its purity. It should be perfectly free from smell and unpleasant flavour. Prof. Procter has rendered musty arrow-root quite sweet and fit for use by washing it thoroughly with two successive portions of cold water, and then drying it upon frames of muslin in a warm place. (*Am. Journ. of Pharm.*, xiii. 188.) Arrow-root is said to be sometimes adulterated with common starch, and that of the potato. These may be detected by the aid of the microscope. Muriatic acid has been proposed as a test of their presence. A mixture of equal parts of that acid and of water, rubbed with about half its weight of potato or wheat starch, very quickly forms so thick a mucilage that the mortar in which the trituration is effected may be raised by the pestle; while the same result does not take place with rice flour or arrow-root under 25 or 30 minutes. So small a proportion as from four to six per cent. of the impurity may, it is asserted, be detected in this way. (*Journ. de Pharm.*, 3*e sér.*, ii. 246.)

As the microscope affords the best means of distinguishing the different varieties of fecula sold as arrow-root, or used for its adulteration, it is proper to indicate the form of their granules as exhibited by this instrument. Those of the proper officinal or *Maranta arrow-root* are rarely oblong, somewhat ovate-oblong, or irregularly convex, with very fine rings, a circular hilum which cracks in a linear or stellate manner, and small mammillary processes occasionally projecting from them. (*Pereira.*) The largest are the 750th of an inch, but many not more than the 2000th of an inch long; and their breadth is generally two-thirds of their length. (*Christison.*) The granules of the *East India arrow-root* are, according to Pereira, of unequal size, ovate or oblong-ovate, flattened, and often furnished with a very short neck or nipple-like projection. The rings are numerous, close, and very fine; and the hilum, which is situated at the narrow extremity, is circular, small, and indistinct. The microscopic appearance of the *tapioca fecula* will be described under the head of *Tapioca*, to which the reader is referred. The *Tacca fecula* from the South Sea Islands, examined by Pereira, consisted of circular, muller-shaped, or polyhedral granules, with few and not very distinct rings, and a small, circular hilum, which cracked in a linear or stellate manner. The *Florida arrow-root* was found by Dr. Carson to consist of granules, forming the half, the third, or the quarter of a solid sphere. The *potato starch* granules are of various shape and size, but generally ovate or elliptical, and from the 7000th to the 300th of an inch in length, the largest being inferior in size only to the largest of the canna starch or *tous-les-mois.* (See *Canna.*) They

are strongly marked with concentric rings, and have a circular hilum, from which usually proceed the cracks observable in some of the larger grains. (*Pereira.*)

Medical Properties and Uses. Arrow-root is nutritious and demulcent, affording a light, very mild, and easily digested article of diet, well adapted for the sick and convalescent, and peculiarly suited, from its demulcent properties, to bowel complaints and diseases of the urinary passages. It is much used as food for infants after weaning, or when the mother's milk is insufficient. It is prepared by dissolving it in hot water, with which it forms a pearly gelatinous solution, and, if in sufficient quantity, a jelly-like mass on cooling. A tablespoonful will communicate sufficient consistence to a pint of water. It should first be formed into a paste with a little cold water, and the boiling water then gradually added with brisk agitation. The preparation may be rendered more palatable by lemon-juice and sugar, or in low forms of disease by wine and spices, if not contra-indicated. For children, arrow-root is usually prepared with milk.

Off. Prep. Trochisci Ipecacuanhæ. W.

MARMOR. *U. S., Ed.*

Marble.

White granular carbonate of lime. *U. S.* Massive crystalline carbonate of lime. *Ed.*

Off. Syn. MARMOR ALBUM. *Dub.*

White marble; Marbre, *Fr.;* Marmor, *Germ.;* Marmo, *Ital.;* Marmol, *Span.*

Marble is used for obtaining carbonic acid, and for making several officinal preparations. For the former purpose, common marble is sufficiently pure; but for the latter, the purer varieties must be selected.

The officinal marble is a white granular substance, having a specific gravity varying from 2·7 to 2·8. It is brittle, pulverizable, and insoluble in water. It is wholly dissolved by dilute muriatic acid with effervescence. If magnesia be present, the neutral muriatic solution will be precipitated by ammonia; and if baryta or strontia be an impurity, a similar effect will be produced by a solution of sulphate of lime. When marble is exposed to a full red heat, it loses about 44 per cent. of carbonic acid, and is converted into lime. (See *Calx.*) In composition it agrees with chalk.

The purest kind of marble is that of *Carrara*, sometimes called *statuary marble;* but it is not necessary that this kind should be obtained for pharmaceutic operations. Marble, sufficiently pure for these purposes, is found in various parts of the United States. It is necessary, however, to reject the *dolomitic marbles*, which contain a considerable proportion of magnesia.

Marble is used by the Edinburgh College, merely to get rid of excess of acid by saturating it, in the processes for preparing muriate of morphia, and the sulphates of potassa and soda.

Off. Prep. Aqua Acidi Carbonici; Calcis Murias; Calx; Liquor Calcii Chloridi; Potassæ Bicarbonas; Sodæ Bicarbonas. B.

MARRUBIUM. *U. S. Secondary.*

Horehound.

The herb of Marrubium vulgare. *U. S.*

Marrube blanc, *Fr.;* Weisser Andorn, *Germ.;* Marrubio, *Ital., Span.*

MARRUBIUM. *Sex. Syst.* Didynamia Gymnospermia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Calyx salver-shaped, rigid, ten-streaked. *Corolla* with the upper lip bifid, linear, and straight.

Marrubium vulgare. Willd. *Sp. Plant.* iii. 111; Woodv. *Med. Bot.* p. 332, t. 118. *White horehound* has a perennial fibrous root, and numerous annual stems, which are quadrangular, erect, very downy, and from twelve to eighteen inches high. The leaves are roundish-ovate, dentate or deeply serrate, wrinkled, veined, hoary on the under surface, and supported in pairs upon strong footstalks. The flowers are white, and in crowded axillary whorls. The calyx is tubular, and divided at the margin into ten narrow segments, which are hooked at the end. The corolla is also tubular, with a labiate margin, of which the upper lip is bifid, the under reflected and three-cleft, with the middle segment broad and slightly scolloped. The seeds are four, and lie in the bottom of the calyx. The plant is a native of Europe, but has been naturalized in this country, where it grows on the roadsides, and flowers in July and August.

The herb has a strong rather agreeable odour, which is diminished by drying, and is lost by keeping. Its taste is bitter and durable. The bitterness is extracted by water and alcohol. It contains a volatile oil, bitter extractive, resin, tannin, and lignin.

Medical Properties and Uses. Horehound is tonic, in large doses laxative, and may be so given as to increase the secretion from the skin, and occasionally from the kidneys. It was formerly considered a valuable deobstruent, and recommended in chronic hepatitis, jaundice, menstrual obstructions, phthisis, and various cachectic affections. By its gently tonic powers it may undoubtedly have proved advantageous in some of these complaints; but it exerts no specific influence over any; and has now passed almost entirely from the hands of physicians into domestic use. It is employed chiefly in catarrh, and other chronic affections of the lungs attended with cough and copious expectoration. The infusion made in the proportion of an ounce of the herb to a pint of boiling water may be given in wineglassful doses. The dose of the powder is from thirty grains to a drachm. The medicine is also much used in the shape of syrup and candy. W.

MASTICHE. *Lond., Ed., Dub.*

Mastich.

Pistacia Lentiscus. The resin flowing from incisions in the bark. *Lond.* Concrete resinous exudation. *Ed., Dub.*

Mastic, *Fr.;* Mastix, *Germ.;* Mastice, *Ital.;* Almastiga, *Span.;* Sakes, *Turk.;* Arah, *Arab.*

PISTACIA. *Sex. Syst.* Dicœcia Pentandria.—*Nat. Ord.* Anacardiaceæ.

Gen. Ch. MALE. *Calyx* five-cleft. *Corolla* none. FEMALE. *Calyx* three-cleft. *Corolla* none. *Styles* three. *Drupe* one-seeded. *Willd.*

Pistacia Lentiscus. Willd. *Sp. Plant.* iv. 753; Woodv. *Med. Bot.* p. 26, t. 11. The *lentisk* is a shrub or small tree, seldom rising more than twelve feet in height, much branched towards the top, and furnished with petiolate, abruptly pinnate leaves. The leaflets are from eight to twelve in number, usually alternate, with the exception of the two upper which are opposite. They are ovate-lanceolate, entire, obtuse, often mucronate, and sessile upon the common footstalk, which has a narrow foliaceous expansion on each side. The flowers are dicœcious, and very small. The male are in an axillary ament; the female are arranged alternately upon a common peduncle, which is also axillary.

This tree is a native of the countries which border upon the Mediterranean; but does not yield mastich in all places. The island of Scio in the Grecian Archipelago is the place whence the drug is chiefly obtained. Incisions are made in the trunk and principal branches, from which the juice slowly exudes, and either hardens in tears upon the bark, or drops on the ground, where it is sometimes received upon cloths, sometimes upon the bare earth, and concretes in irregular masses. The tears are most esteemed. They are of various sizes, oval

or roundish, often compressed, smooth, semi-transparent, of a pale-yellow colour, of a shining fracture, friable, and usually covered with a whitish powder, occasioned by their friction against each other. The masses consist of yellowish agglutinated tears, with others of a darker colour and less translucent, and often fragments of wood, bark, or earthy matter intermingled.

Mastich is nearly inodorous, unless rubbed or heated, when it becomes fragrant. Its taste is weak but agreeably terebinthinate, and, after long chewing, very slightly acrid. It is at first friable under the teeth, but soon becomes soft and ductile, and acquires a white opaque appearance. Its sp. gr. is 1·074. It is fusible and inflammable by heat. Alcohol dissolves about four-fifths of it, leaving a viscid substance which becomes brittle when dried, and for which the name of *masticin* has been proposed. This substance, though not dissolved by alcohol, softens and swells up in it, as gluten does in water. According to Berzelius, it possesses the same general properties as copal, and should be considered as a variety of resin. Mastich is wholly soluble in ether, chloroform, and oil of turpentine, scarcely soluble in the fixed oils, and insoluble in water. It consists chiefly of resin, with *masticin*, and a minute proportion of volatile oil, which can scarcely be said to have been obtained in a separate state, though it imparts flavour to alcohol and water distilled from the mastich, especially when this has been previously triturated with an equal weight of carbonate of potassa.

Mastich is occasionally adulterated with olibanum, sandarach, and other resinous bodies; and, in seasons of scarcity, with sea-salt.

Medical Properties and Uses. Mastich was formerly thought to possess properties analogous to those of the turpentines, and was used in debility of the stomach, hæmoptysis from ulceration, leucorrhœa, chronic diarrhœa, &c.; but its virtues were overrated; and it is at present scarcely ever given internally. It is sometimes employed to fill the cavities of carious teeth, for which purpose it is well fitted by its softness. Great quantities of it are consumed in Turkey, where it is habitually chewed by the women, under the impression that it sweetens the breath, and preserves the gums and teeth. The alcoholic solution has been employed as a styptic in bleeding from the nose, leech-bites, &c., being applied by means of a camel's hair pencil directly to the bleeding vessel. Dissolved in alcohol or oil of turpentine, it forms a brilliant varnish. A solution made by macerating half an ounce of mastich and fifteen grains of caoutchouc in two fluidounces of chloroform, and filtering in close vessels, forms a varnish highly esteemed by some microscopists.

The following mode of applying it to carious teeth is highly recommended. Dissolve four parts of mastich in one part of ether, in a bottle well stopped. With the solution thus formed, which is of a yellow colour and oily consistence, saturate a small piece of cotton of the size of the carious cavity, and, having well cleansed and dried the cavity, introduce the cotton, without painful pressure, so as to fill it exactly. The ether is soon evaporated, and the resin, remaining soft and adhesive, attaches itself to the diseased surface of the tooth, which it protects from the action of the air, and of the food taken into the mouth.

Off. Prep. Tinctura Ammoniæ Composita. W.

MATICO. *Dub.*

Matico.

Artanthe elongata. The leaves. *Dub.*

PIPER. See CUBEBA.

Piper angustifolium. Ruiz and Pavon, *Flor. Peruv.*—*Piper elongatum.* Vahl.—*Artanthe elongata.* Miquel; *Dub. Pharm.;* Lindley, *Med. and Œconom. Bot.* p. 133, fig. 195. This is a shrub with a jointed stem, about twelve feet

in height. In a dried specimen presented by Dr. Ruschenberger, of the U. S. Navy, to one of the authors, the leaves are sessile or very shortly petiolate, oval-lanceolate, acuminate, two or three inches long by about an inch in breadth, bright green on the upper surface, paler and downy beneath, crenate, minutely and strongly reticulated, of an agreeable aromatic odour, and a strong spicy taste. The spikes are solitary, opposite the leaves, and cylindrical. The bractes are pellate or cucullate; the flowers hermaphrodite. The plant is a native of Peru.

The leaves, spikes and stalks are mixed together, and more or less compressed, in the packages of the imported drug; and are all possessed of activity, though the leaves only are recognised by the Dublin College. Their shape and general aspect have been described above, as well as their smell and taste. They are readily pulverized, forming a light, greenish, absorbent powder. According to Dr. Hodges, they contain chlorophylle, a soft dark-green resin, brown and yellow colouring matters, gum, salts, lignin, a light-green, thickish volatile oil, and a peculiar bitter principle, soluble in water and alcohol, but not in ether, which he calls *maticin*. (*Philos. Mag.*, Sept. 1844, p. 206.) The volatile oil and maticin are probably the active ingredients.

Medical Properties and Uses. Matico is an agreeable aromatic tonic and stimulant, having a tendency, like cubebs, to act on the urinary passages. It has long been known as a medicine in Peru. Dr. Martius speaks of its use by the natives externally as a vulnerary, and internally as aphrodisiac (*Pharm. Cent. Blatt*, 1843, p. 12); and, according to Dr. Scrivener, who practised medicine at Lima, it is much employed in Peru locally for arresting hemorrhage, and in the treatment of ulcers. (*Am. Journ. of Pharm.*, xviii. 175.) In 1839 it was introduced into England, and was prescribed by Dr. Jeffreys, of Liverpool, with advantage, in diseases of the mucous membranes, as gonorrhœa, leucorrhœa, menorrhagia, catarrh of the bladder, hemorrhoids, and epistaxis. Others have employed it with benefit in similar cases; and it is said to have proved useful in hæmoptysis, hæmatemesis, dysentery, and hæmaturia. Dr. Ruschenberger gives strong testimony in its favour in several of the diseases mentioned. Its most useful internal application is probably as an alterative stimulant to the diseased mucous membranes. If efficient as a hæmostatic, it must be on principles similar to those upon which the oil of turpentine acts; for it is not astringent. As a local styptic it probably acts mechanically in the same manner as agaric. The dose of the powder is from half a drachm to two drachms three times a day. The infusion and tincture are officinal. (See *Infusum Matico* and *Tinctura Matico.*)

The root of another species of Piper, *P. methisticum* (*Macropiper methysticum*, Miquel), is used in the Sandwich Islands to form an intoxicating drink, under the name of *ava* or *kava*. See an article by Mr. Morson in the *Pharm. Journ. and Trans.* (iii. 472), where the plant is figured.

Off. Prep. Infusum Matico; Tinctura Matico. W.

MATRICARIA. *U. S. Secondary.*

German Chamomile.

The flowers of Matricaria Chamomilla. *U. S.*

Matricaria. *Sex. Syst.* Syngenesia Superflua. — *Nat. Ord.* Compositæ-Senecionideæ, *De Cand.* Asteraceæ, *Lindley.*

Gen. Ch. Calyx flat, imbricate, with scales having scarious margins. *Receptacle* naked, terete. *Pappus* none.

Matricaria Chamomilla. Linn. *Sp.* 1256. This is an annual plant, with a branching stem a foot or two in height, bearing alternate leaves about two inches long, the lower ones tripinnate, the upper bipinnate or simply pinnate, and all of them very green, and nearly or quite smooth. The leaflets are linear and very

small. The flowers appear singly at the ends of the stem and branches. They are about three-quarters of an inch in diameter, with the ray spreading. The scales of the calyx are obtuse, green in the middle, and whitish, membranous, and translucent at the margin. The ray florets are white, at first spreading, and ultimately reflected. The disk is of a deep-yellow colour, at first flat, but in the end convex, and even somewhat conical.

The plant is a native of Europe, and is occasionally cultivated in our gardens. All parts of it are active; but the flowers only are officinal. These shrink in drying, so that they are scarcely half as large as in their recent state. Those found in our shops are imported from Germany.

The dried flowers of the Matricaria are considerably smaller than common chamomile, and exhibit a larger proportion of the disk florets compared with those of the ray. They have a strong, peculiar, rather unpleasant odour, and a disagreeable bitter taste. Their active constituents are volatile oil and bitter extractive, which are readily extracted by water and alcohol. The oil, which is obtained by distillation with water, is thick, somewhat tenacious, of a dark-blue colour becoming brown by age, and almost opaque in mass.

Medical Properties and Uses. Matricaria is a mild tonic, very similar to chamomile in medical properties, and, like it, capable, in large doses, of producing an emetic effect. It is esteemed also in Europe antispasmodic and anthelmintic. It is much employed in Germany; but in this country scarcely at all, unless by some German practitioners. It may be given for the same purposes and in the same manner as chamomile. W.

MEL. *U. S., Lond., Ed., Dub.*

Honey.

A liquid prepared by Apis mellifica. *U. S.* Juice of flowers deposited in the comb, clarified. *Lond.* A saccharine secretion. *Ed., Dub.*

Miel, *Fr.;* Honig, *Germ.;* Miele, *Ital.;* Miel, *Span.*

Naturalists have not yet determined whether honey is a secretion of the bee, *Apis mellifica*, or whether it exists already formed in plants. It is certain that the nectaries of flowers contain a saccharine matter, which is extracted by the insect, and the fact is well known that the flavour and character of honey are very much affected by the nature of the plants which predominate in the vicinity of the hive; so much so, that when these plants are poisonous, the fluid sometimes partakes of their noxious qualities. Several cases of poisoning, from eating honey from a particular source, are recorded in the *New Jersey Med. Reporter* for November, 1852 (p. 46). Still, it probably undergoes some change in the organs of the bee; as the saccharine matter of the nectaries, so far as it has been possible to examine it, wants some of the characteristic properties of honey.

The finest honey is that which is allowed to drain from the comb. If obtained from hives that have never swarmed, it is called *virgin honey*. An inferior kind is procured by submitting the comb to pressure; and, if heat be employed previous to expression, the product is still more impure.

Honey is collected in different parts of the United States; but much also of that used in the shops is imported from the West Indies.

In the recent state honey is fluid; but, on being kept, it is apt to form a crystalline deposit, and to be ultimately converted into a soft granular mass. In the shops it is found of every consistence, from that of a viscid liquid like thin syrup or oil, to that of lard or soft suet. Its colour is sometimes white, but usually yellowish, and occasionally of a brown or reddish tinge. It has a peculiar agreeable odour, varying somewhat with the flowers from which it was collected, and a very sweet feebly aromatic taste, which is followed by a slight prick-

ling or sense of acrimony in the fauces. Its sp. gr. is about 1·333. (*Duncan.*) Cold water dissolves it readily, alcohol with less facility. It contains crystallizable sugar analogous to that of grapes, and, according to Soubeiran, two other kinds of sugar, one of which is changed by acids, and has the property of turning to the right the rays of polarized light; and the other, not acted on by acids, and possessed of a strong left-handed rotating power. The first of these two sugars is not always present in honey; as there is reason to believe that it is in time wholly changed by acid into granular sugar. It is especially abundant in the honey taken from the comb. The second variety is very similar to the uncrystallizable sugar produced by the reaction of acids on cane sugar, being identical with it in composition, and like it incapable of crystallizing, and very sensitive to the action of alkalies. But it is distinguished by the impossibility of converting it into granular sugar, and by having nearly twice the rotating power of common uncrystallizable sugar. (*Journ. de Pharm.*, 3*e sér.*, xvi. 252.) Honey contains, besides these saccharine principles, an aromatic principle, an acid, wax, and, according to Guibourt, a little mannite. The crystalline sugar may be obtained by treating granular honey with a small quantity of alcohol, which when expressed takes along with it the other ingredients, leaving the crystals nearly untouched. The same end may be attained by melting the honey, saturating its acid with carbonate of lime, filtering the liquid, then setting it aside to crystallize, and washing the crystals with alcohol. Inferior honey usually contains a larger proportion of uncrystallizable sugar and vegetable acid. Diluted with water, honey undergoes the vinous fermentation.

In warm weather, honey, if not very pure, sometimes ferments, acquiring a pungent taste and a deeper colour. Starch is said to be occasionally added to the inferior kinds to give them a white appearance. The adulteration may be detected by dilution with water, which dissolves the honey and leaves the starch at the bottom of the vessel. The nature of the deposit may be tested by the tincture of iodine. Water is said to be sometimes added to honey to increase its bulk. Its presence may be suspected from the greater thinness of the liquid, and its want of disposition to crystallize.

Medical Properties and Uses. Honey possesses the same medical properties with sugar, but is more disposed to run off by the bowels, and to occasion griping pain. Though largely consumed as an article of food, it is seldom employed medicinally, except as the vehicle of more active substances. Its taste and demulcent qualities render it a useful addition to gargles; and it is sometimes employed as an application to foul ulcers, and in the form of enema.

Off. Prep. Confectio Piperis; Confectio Rutæ; Linimentum Æruginis; Mel Boracis; Mel Despumatum; Mel Rosæ; Oxymel; Oxymel Scillæ; Pilulæ Quiniæ Sulphatis. W.

MELISSA *U. S. Secondary, Ed.*

Balm.

The herb of Melissa officinalis. *U. S., Ed.*

Melisse, *Fr.;* Garten-Melisse, *Germ.;* Melissa, *Ital.;* Torongil, *Span.*

MELISSA. *Sex. Syst.* Didynamia Gymnospermia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Calyx dry, nearly flat above; with the upper lip sub-fastigiate. *Corolla*, upper lip somewhat arched, bifid; lower lip with the middle lobe cordate. *Willd.*

Melissa officinalis. Willd. *Sp. Plant.* iii. 146; Woodv. *Med. Bot.* p. 334, t. 119. Balm has a perennial root, which sends up annually several erect, quadrangular stems, usually branched towards the base, and a foot or two in height.

The leaves are opposite, ovate or cordate, deeply serrate, pubescent; the lower on long footstalks, the uppermost nearly sessile. The flowers are white or yellowish, upon short peduncles, and in axillary whorls, surrounding only half the stem. The calyx is tubular, pentangular, and bilabiate, with the upper lip tridentate and flattened, the lower cut into two pointed teeth. The corolla is also tubular and bilabiate, the upper lip less convex and notched, the lower three-cleft. The plant is a native of the South of Europe. It has been introduced into this country, where it is cultivated in gardens, and grows wild along the fences of our roads and lanes. For medical use the herb should be cut before the appearance of the flowers, which begin to expand in July.

In the fresh state, it has a fragrant odour very similar to that of lemons; but is nearly inodorous when dried. The taste is somewhat austere, and slightly aromatic. The herb contains a minute proportion of a yellowish or reddish-yellow essential oil, which has its peculiar flavour in a very high degree. It contains also tannin, bitter extractive, and gum.

Medical Properties and Uses. Balm scarcely produces any remedial operation upon the system. The quantity of oil which it contains is not more than sufficient to communicate an agreeable flavour to the infusion, which forms an excellent drink in febrile complaints, and when taken warm tends to promote the operation of diaphoretic medicines. W.

MENTHA PIPERITA. *U. S., Lond., Ed., Dub.*

Peppermint.

The herb of Mentha piperita. *U. S., Ed., Dub.* The herb in flower, recent and dried. *Lond.*

Menthe poivrée, *Fr.;* Pfeffermünze, *Germ.;* Menta piperita, *Ital.;* Pimenta piperita, *Span.*

MENTHA. *Sex. Syst.* Didynamia Gymnospermia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Corolla nearly equal, four-cleft; the broader segment emarginate. *Stamens* upright, distant. *Willd.*

Mentha piperita. Willd. *Sp. Plant.* iii. 79; Woodv. *Med. Bot.* p. 336, t. 120; Carson, *Illust. of Med. Bot.* ii. 16, pl. 63. Peppermint is a perennial herbaceous plant, with a creeping root, and quadrangular, channeled, purplish, somewhat hairy stems, which are branched towards the top, and about two feet in height. The leaves are opposite, petiolate, ovate, serrate, pointed, smoother on the upper than the under surface, and of a dark-green colour, which is paler beneath. The flowers are small, purple, and disposed in terminal obtuse spikes, which are interrupted below. The calyx is tubular, furrowed, and five-toothed; the corolla is also tubular, with its border divided into four segments, of which the uppermost is broadest, and notched at its apex. The anthers are concealed within the tube of the corolla; the style projects beyond it, and terminates in a bifid stigma. The four-cleft germ is converted into four seeds, which are lodged in the calyx.

This species of mint is a native of Great Britain, whence it has been conveyed to the continent of Europe and to this country. In some parts of the United States, especially in New England, the western part of New York, Ohio, and New Jersey, it is largely cultivated for the sake of its volatile oil. We occasionally find it growing wild along the fences of our villages. The cultivators of this herb have observed that, in order to maintain its flavour in perfection, it is necessary to transplant the roots every three years. It should be cut for medical use in dry weather, about the period of the expansion of the flowers. These appear in August.

For some interesting remarks in relation to the cultivation of peppermint in England, the reader is referred to the *Am. Journ. of Pharm.* (xxiii. 239).

The herb, both in the recent and dried state, has a peculiar, penetrating, grateful odour. The taste is aromatic, warm, pungent, glowing, camphorous, bitterish, and attended with a sensation of coolness when air is admitted into the mouth. These properties depend on a volatile oil, which abounds in the herb, and may be separated by distillation with water. (See *Oleum Menthæ Piperitæ.*) The leaves are said to contain a little tannic acid. The virtues of the herb are imparted to water, and more readily to alcohol.

Medical Properties and Uses. Peppermint is a very grateful aromatic stimulant, much used for all the purposes to which medicines of this class are applied. To allay nausea, to relieve spasmodic pains of the stomach and bowels, to expel flatus, to cover the taste or qualify the nauseating or griping effects of other medicines, are among the most common of these purposes. The fresh herb, bruised and applied over the epigastrium, often allays sick stomach, and is especially useful in the cholera of children. The medicine may be given in infusion; but the volatile oil, either alone, or in some state of preparation, is almost always preferred.

Off. Prep. Aqua Menthæ Piperitæ; Oleum Menthæ Piperitæ; Spiritus Menthæ. W.

MENTHA VIRIDIS. *U. S., Lond., Ed., Dub.*

Spearmint.

The herb of Mentha viridis. *U. S., Ed., Dub.* The herb in flower, recent and dried. *Lond.*

Menthe a epi, *Fr.;* Grune Münze, *Germ.;* Menta Romana, *Ital.;* Yerba buena puntiaguda, *Span.*

MENTHA. See MENTHA PIPERITA.

Mentha viridis. Willd. *Sp. Plant.* iii. 76; Woodv. *Med. Bot.* p. 338, t. 121. Spearmint, sometimes called simply *mint*, differs from *M. piperita* chiefly in having sessile, or nearly sessile, lanceolate, naked leaves; elongated, interrupted, panicled spikes; setaceous bractes; and stamens longer than the tube of the corolla. Like the two preceding species, it is a native of Europe. In this country it is cultivated in gardens for domestic use, and in some places more largely for the sake of its oil. It also grows wild in low grounds in parts of the country which have been long settled. Its flowering season is August. According to Thomson, it should be cut in very dry weather, and, if intended for medical use, just as the flowers appear; if for obtaining the oil, after they have expanded.

The odour of spearmint is strong and aromatic, the taste warm and slightly bitter, less pungent than that of peppermint, but considered by some as more agreeable. These properties are retained for some time by the dried plant. They depend on a volatile oil, which rises on distillation with water, and is imparted to alcohol and water by maceration. (See *Oleum Menthæ Viridis.*)

Medical Properties. The virtues and applications of this plant are the same as those of peppermint.

Off. Prep. Aqua Menthæ Viridis; Infusum Menthæ Viridis; Oleum Menthæ Viridis. W.

MENYANTHES. *Ed.*

Buckbean.

Leaves of Menyanthes trifoliata. *Ed.*

Bog-bean; Menyanthe, Tréfle d'eau, *Fr.;* Bitterklee, *Germ.;* Trifogolio fibrino, *Ital.;* Trifolio palustre, *Span.*

MENYANTHES. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Gentianaceæ. *Gen. Ch. Corolla* hirsute. *Stigma* bifid. *Capsule* one-celled. *Willd.*

Menyanthes trifoliata. Willd. *Sp. Plant.* i. 811; Bigelow, *Am. Med. Bot.* iii. 55. The *buckbean* or *marsh trefoil* has a perennial, long, round, jointed, horizontal, branching, dark-coloured root or rhizoma, about as thick as the finger, and sending out numerous fibres from its under surface. The leaves are ternate, and stand upon long stalks, which proceed from the end of the root, and are furnished at their base with sheathing stipules. The leaflets are obovate, obtuse, entire or bluntly denticulate, very smooth, beautifully green on their upper surface, and paler beneath. The scape or flower stalk is erect, round, smooth, from six to twelve inches high, longer than the leaves, and terminated by a conical raceme of whitish somewhat rose-coloured flowers. The calyx is five-parted; the corolla funnel-shaped, with a short tube, and a five-cleft, revolute border, covered on the upper side with numerous long, fleshy fibres. The anthers are red and sagittate; the germ ovate, supporting a slender style longer than the stamens, and terminating in a bifid stigma. The fruit is an ovate, two-valved, one-celled capsule, containing numerous seeds.

This beautiful plant is a native both of Europe and North America, growing in boggy and marshy places which are always moist, and occasionally overflowed with water. It prevails, in the United States, from the northern boundary to Virginia. In this country the flowers appear in May, in England not till June or July. All parts of it are efficacious, but the leaves only are officinal.

The taste of buckbean is intensely bitter and somewhat nauseous, the odour of the leaves faint and disagreeable. Its virtues depend on a bitter principle, denominated *menyanthin*, which may be obtained sufficiently pure for use by treating the spirituous extract of the plant with hydrated oxide of lead, removing the lead by hydrosulphuric acid, filtering and evaporating the liquor, exhausting the residue with alcohol, and again evaporating with a gentle heat. It has a pure bitter taste, is soluble in alcohol and water, but not in pure ether, and is chemically neuter. (*Pharm. Cent. Blatt*, A. D. 1843, p. 24.)

Medical Properties and Uses. With the ordinary properties of the bitter tonics, menyanthes unites a cathartic power, and in large doses is apt to vomit. It was formerly held in high esteem in Europe as a remedy in numerous complaints, among which were intermittents, rheumatism, scrofula, scurvy, dropsy, jaundice, and various cachectic and cutaneous affections. In most of these it was administered under a vague impression of its alterative powers. It is little employed in this country; but, as it is a native plant, and applicable to cases where a combined tonic and purgative effect is demanded, it is desirable that our country practitioners should be aware of its properties.

The dose of the powdered leaves or root as a tonic is from twenty to thirty grains; of an infusion, prepared with half an ounce to a pint of boiling water, from one to two fluidounces; and of the extract ten or fifteen grains, to be repeated three or four times a day. A drachm of the powder, or a gill of the strong decoction generally purges, and often occasions vomiting. W.

MEZEREUM. *U. S., Lond.*

Mezereon.

The bark of Daphne Mezereum and Daphne Gnidium. *U. S.* Daphne Mezereum. Bark of the root. *Lond.*

Off. Syn. MEZEREON. Root-bark of Daphne Mezereon. *Ed., Dub.*

Bois gentil, *Fr.;* Kellerhals, *Germ.;* Mezereo, *Ital.;* Mecereon, *Span.*

DAPHNE. *Sex. Syst.* Octandria Monogynia.—*Nat. Ord.* Thymelaceæ.

Gen. Ch. Calyx none. *Corolla* four-cleft, withering, enclosing the stamens. *Drupe* one-seeded. *Willd.*

All the species of Daphne are possessed of active properties; but two only are officinal—*D. Mezereum* and *D. Gnidium*—the former of which is recognised in the British Pharmacopœias, the latter in the French Codex, and both in the Pharmacopœia of the United States.

1. *Daphne Mezereum.* Willd. *Sp. Plant.* ii. 415; Woodv. *Med. Bot.* p. 717, t. 245; Carson, *Illust. of Med. Bot.* ii. 26, pl. 72. This is a very hardy shrub, three or four feet high, with a branching stem, and a smooth dark-gray bark, which is very easily separable from the wood. The leaves spring from the ends of the branches, are deciduous, sessile, obovate-lanceolate, entire, smooth, of a pale-green colour, somewhat glaucous beneath, and about two inches long. They are preceded by the flowers, which appear very early in spring, and sometimes bloom even amidst the snow. These are of a pale rose colour, highly fragrant, and disposed in clusters, each consisting of two or three flowers, forming together a kind of spike at the upper part of the stem and branches. At the base of each cluster are deciduous floral leaves. The fruit is oval, shining, fleshy, of a bright red colour, and contains a single round seed. Another variety produces white flowers and yellow fruit.

This species of Daphne is a native of Great Britain and the neighbouring continent, in the northern parts of which it is particularly abundant. It is cultivated in Europe both for medicinal purposes and as an ornamental plant, and is occasionally found in our own gardens. It flowers in February, March, or April, according to the greater or less mildness of the climate.

2. *D. Gnidium.* Willd. *Sp. Plant.* ii. 420. In this species, called *garou* or *sain-bois* by the French, the leaves are linear-lanceolate, acute, entire, smooth, and irregularly but closely set upon the branches. The flowers are white, downy, odoriferous, and disposed in terminal panicled racemes. The fruit is globular, dry, at first green, but ultimately black. *D. Gnidium* grows in dry uncultivated places in the South of Europe, and flowers in June. In France its bark is used indiscriminately with that of the former species.

Besides the officinal species above described, *Daphne Laureola* or *spurge laurel*, is said to furnish a portion of the mezereon of commerce; but its product is inferior in acrimony, and consequently in medicinal activity.

The bark of the root was the part formerly directed by the U. S. Pharmacopœia, as it now is by the British Colleges; and it is said to be exclusively employed in Great Britain. But the mezereon with which our markets are now supplied is evidently the bark of the stem; and the Pharmacopœia at present, therefore, very properly directs the bark, without designating the part from which it must be taken. British writers state that the bark of the root is the most active. The berries and leaves of the plant are also active; and the former have sometimes proved fatal to children who have been attracted by their beautiful colour. Pallas states that they are used as a purgative by the Russian peasants, and that thirty berries are required to produce this effect. The French authors observe that fifteen are sufficient to kill a Frenchman. Mezereon is brought to us chiefly from Germany.

Properties. Mezereon, as it comes to us, is usually in strips, from two to four feet long and an inch or less in breadth, sometimes flat, sometimes partially rolled, and always folded in bundles, or wrapped in the shape of balls. It is covered externally with a grayish or reddish-brown wrinkled epidermis, very thin and easily separable from the bark. Beneath the epidermis is a soft greenish tissue. The inner bark is tough, pliable, fibrous, striated, and of a whitish colour. When fresh it has a nauseous smell, but in the dry state is nearly inodorous. Its taste is at first sweetish, but afterwards highly acrid and even corrosive. It yields its virtues to water by decoction. Vauquelin ascertained the presence of a peculiar

principle in the bark of *Daphne Alpina*. This has subsequently been discovered in other species, and has received the name of *daphnin*. Gmelin and Bär found it in the bark of *D. Mezereum*, associated with wax, an acrid resin, a yellow colouring matter, a reddish-brown extractive matter, an uncrystallizable and fermentable sugar, a gummy matter containing azote, ligneous fibre, malic acid, and several malates. *Daphnin* is in prismatic crystals grouped together, colourless, transparent, brilliant, slightly soluble in cold water, very soluble in boiling water, ether and alcohol, without odour, and of a bitter, somewhat austere taste. It is obtained by treating the alcoholic extract of the bark with water, decanting the solution, precipitating with subacetate of lead, filtering, decomposing the excess of the subacetate by sulphuretted hydrogen, again filtering, evaporating to dryness, submitting the residue to the action of anhydrous alcohol, and evaporating the alcoholic solution to the point of crystallization. Though daphnin is probably not inactive, it is not the principle upon which the virtues of mezereon chiefly depend. Vauquelin thinks that in the recent plant these reside in an essential oil, which by time and exposure is changed into a resin, without losing its activity. The acrid resin observed by Gmelin and Bär is probably the characteristic principle to which the bark owes its vesicating properties. It is obtained separate by boiling mezereon in alcohol, allowing the liquor to cool in order that it may deposit some wax which it has taken up, then distilling off the alcohol, and treating the residue with water, which leaves the resin. This is of a dark-green, almost black colour, hard and brittle, and of an exceedingly acrid and permanent taste. In the isolated state it is slightly soluble in water, and much more so when combined with the other principles of the bark. It appears, however, not to be a pure proximate principle, but rather a resinoid combination of an acrid vesicating fixed oil with another substance. The acrid principle of mezereon is partially given off by decoction with water, as proved by the irritating character of the vapour when inhaled; but none of it appears to escape when the bark is boiled with alcohol. (Squire, *Pharm. Transact.* i. 395.)

Medical Properties and Uses. The recent bark applied to the skin produces inflammation followed by vesication, and has been popularly used as an epispastic from time immemorial in some of the southern countries of Europe. The dried bark, though less active, is possessed of a similar property, and is occasionally employed in France by regular practitioners for the purpose of forming issues. A small square piece of the bark, moistened with vinegar, is applied to the skin, and renewed twice a day till a blister is formed, and occasionally afterwards in order to maintain the discharge. It is slow in its operation, generally requiring from twenty-four to forty-eight hours to vesicate. An irritant ointment is prepared from mezereon, which answers for application to blistered surfaces in order to maintain the discharge, and may be applied advantageously to obstinate, ill-conditioned, indolent ulcers. (See *Unguentum Mezerei.*) The alcoholic extract of mezereon has also been employed to communicate irritant properties to issue peas.

Internally administered, mezereon is a stimulant capable of being directed to the skin or kidneys, and in large doses apt to excite purging, nausea, and vomiting. In overdoses it produces the fatal effects of the acrid poisons; and a case of apparently severe narcotic effects has been recorded. (*Am. Journ. of Med. Sci.*, xxi. 518.) It had at one time much reputation as a remedy in the secondary stages of the venereal disease, and still enters as an ingredient into the officinal compound decoction of sarsaparilla. It has also been thought to act favourably as an alterative in scrofulous affections, chronic rheumatism, and obstinate diseases of the skin. For this purpose it is usually administered in decoction. (See *Decoctum Mezerei.*) Dr. Withering cured a case of difficult swallowing, arising from paralysis, by directing the patient to chew frequently small pieces of the root. The affection, which had continued three years, was

removed in a month. The dose of the bark in substance may be stated at ten grains, though it is seldom used in this way.

Off. Prep. Decoctum Mezerei; Decoctum Sarsaparillæ Compositum; Extractum Sarsaparillæ Fluidum; Unguentum Mezerei. W.

MONARDA. *U. S.*

Horsemint.

The herb of Monarda punctata. *U. S.*

MONARDA. *Sex. Syst.* Diandria Monogynia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Calyx five-toothed, cylindric, striate. *Corolla* ringent, with a long cylindric tube; *upper lip* linear, nearly straight and entire, involving the filaments; *lower lip* reflected, broader, three-lobed, the middle lobe longer. *Nuttall.*

Monarda punctata. Willd. *Sp. Plant.* i. 126; *Am. Med. Recorder*, vol. ii. p. 496. This is an indigenous perennial or biennial plant, with herbaceous, obtusely angled, downy, whitish, branching stems, which rise one or two feet in height, and are furnished with oblong-lanceolate, remotely serrate, smooth, punctate leaves. The flowers are yellow, spotted with red or brown, and are disposed in numerous whorls, provided with lanceolate, coloured bractes, longer than the whorl.

The horsemint grows in light gravelly or sandy soils from New Jersey to Louisiana, and flowers from June to September. The whole herb is employed. It has an aromatic smell, and a warm, pungent, bitterish taste; and abounds in a volatile oil, which may be separated by distillation with water.

Medical Properties and Uses. Horsemint is stimulant and carminative; but is seldom used in regular practice. In the state of infusion it is occasionally employed in families as a remedy for flatulent colic and sick stomach, and for other purposes to which the aromatic herbs are applied. It was introduced into the primary catalogue of the United States Pharmacopœia on account of the volatile oil which it affords. (See *Oleum Monardæ.*)

Off. Prep. Oleum Monardæ. W.

MORI SUCCUS. *Lond.*

Mulberry Juice.

Morus nigra. The juice of the fruit. *Lond.*

Mures, *Fr.;* Schwarze Maulbeeren, *Germ.;* Morone, *Ital.;* Moras, *Span.*

MORUS. *Sex. Syst.* Monœcia Tetrandria.—*Nat. Ord.* Urticaceæ.

Gen. Ch. MALE. *Calyx* four-parted. *Corolla* none. FEMALE. *Calyx* four-leaved. *Corolla* none. *Styles* two. *Calyx* berried. *Seed* one. *Willd.*

Morus nigra. Willd. *Sp. Plant.* iv. 36; Woodv. *Med. Bot.* p. 712, t. 243. This species of mulberry is distinguished by its cordate-ovate or lobed, unequally toothed, and scabrous leaves. It is a tree of middle size, supposed to have been brought originally from Persia into Italy, and thence spread over Europe and America. Its leaves afford food for the silk-worm; and the bark of the root, which is bitter and slightly acrid, has been employed as a vermifuge, especially in cases of the tape-worm, in the dose of two drachms infused in eight ounces of boiling water. The juice of the fruit is the officinal portion.

The fruit is oblong-oval, of a dark reddish-purple almost black colour, and consists of numerous minute berries united together and attached to a common receptacle, each containing a single seed, the succulent envelope of which is formed by the calyx. It is inodorous, has a sweet, mucilaginous, acidulous

taste, and abounds in a deep-red juice. The sourish taste is owing, according to Hermbstadt, to the presence of tartaric acid.

Medical Properties and Uses. Mulberries are refreshing and laxative, and serve to prepare a grateful drink well adapted to febrile cases. A syrup is made from their juice, and used as an agreeable addition to gargles in inflammation of the throat. They are, however, more used as food than medicine. Our native mulberry, the fruit of *Morus rubra*, is quite equal to that of the imported species. *Morus alba*, originally from China, and now extensively cultivated as a source of food for the silk-worm, bears a white fruit, which is sweeter and less grateful than the others.

Off. Prep. Syrupus Mori. W.

MOSCHUS. *U.S., Lond., Ed., Dub.*

Musk.

A peculiar concrete substance obtained from Moschus moschiferus. *U. S.* A concrete substance found in the follicle of the prepuce. *Lond.* Inspissated secretion in the follicles of the prepuce. *Ed., Dub.*

Musc, *Fr.;* Bisam, *Germ.;* Muschio, *Ital.;* Almizcle, *Span.*

Moschus. *Class* Mammalia. *Order* Pecora.

Gen. Ch. Horns none. *Fore teeth* eight in the lower jaw. *Tusks* one on each side in the upper jaw, projecting out of the mouth.

Moschus moschiferus. Gmelin, *Syst. Nat.* i. 172; Reese's *Cyclopædia.* This animal bears a close resemblance to the deer in shape and size. It is usually less than three feet in length, with haunches considerably more elevated than the shoulders. From its upper jaw two tusks project downwards out of the mouth, each about two inches long, curved backwards, and serving to extract the roots which are used as food by the animal. The ears are long and narrow, and the tail very short. The fleece, which consists of strong, elastic, undulated hairs, varies in colour with the season, the age of the animal, and perhaps the place which it inhabits. The general colour is a deep iron-gray. The individual hairs are whitish near the root, and fawn-coloured or blackish towards the tip. The musk is contained in an oval, hairy, projecting sac, found only in the male, situated between the umbilicus and the prepuce, from two to three inches long, and from one to two broad, communicating externally by a small hairy orifice at its anterior part, and marked posteriorly by a groove or furrow which corresponds with the opening of the prepuce. It is lined internally by a smooth membrane, which is thrown into a number of irregular folds forming incomplete partitions. In the vigorous adult animal, the sac sometimes contains six drachms of musk; but in the old seldom more than two drachms, and none in the young. The musk is secreted by the lining membrane, and in the living animal forms a consistent mass, which, on the outside, is compact, and marked with the folds of the membrane, but is less firm towards the centre, where there is sometimes a vacant space. As first secreted it is probably in the liquid state, and a portion is occasionally forced out by the animal, to which it communicates its odour.

The musk deer inhabits the vast mountainous regions of central Asia, extending from India to Siberia, and from the country of the Turcomans to China. It is an active and timid animal, springing from rock to rock with surprising agility, and frequenting the snowy recesses, and most inaccessible crags of the mountains. Concealing itself during the day, it chooses the night for roaming in search of food; and, though said to be abundant in its native regions, is taken with difficulty. It is hunted for its hide, as well as for the musk. As soon as the animal is killed, the sac is cut off, and dried with its contents; and in this state is sent into the market.

Musk varies in quality with the country inhabited by the animal. That procured from the mountains on the southern borders of Siberia, and brought into the market through Russia, is comparatively feeble. The best is imported from China, and is said to be the product of Tonquin. A variety intermediate between these is procured in the Himalaya Mountains and Thibet, and sent to Calcutta. We derive our chief supply from Canton, though portions are occasionally brought hither from Europe.

Two varieties are distinguished in the market, the Chinese and Russian. Both come in sacs, convex and hairy on one side, flat and destitute of hair on the other. The hairs are brownish-yellow, grayish, or whitish, stiff and short, and arranged concentrically around the orifice of the sac. The Chinese, which is the most highly valued, is in bags of a rounder shape, covered with brownish-yellow or reddish-brown hairs, and containing at most a drachm and a half of large-grained, dark, strong-scented musk, having an ammoniacal odour. The Russian, which is contained in longer and larger bags, is small-grained, of a light yellowish-brown colour, of a weaker and more fetid odour, with less smell of ammonia.

Properties. Musk is in grains or lumps concreted together, soft and unctuous to the touch, and of a reddish-brown or ferruginous colour, resembling that of dried blood. Some hairs of the pod are generally mixed with it. The odour is strong, penetrating, and so powerfully diffusive, that one part of musk communicates its smell to more than 3000 parts of inodorous powder. (*Fée.*) In some delicate individuals it produces headache and other disagreeable symptoms, and has even given rise to convulsions. The taste is bitter, disagreeable, and somewhat acrid. The colour of the powder is reddish-brown. Musk is inflammable, burning with a white flame, and leaving a light spongy charcoal. It yields, upon analysis, a great number of proximate principles. Guibourt and Blondeau obtained water, ammonia, stearin, olein, cholesterin, an oily acid combined with ammonia, volatile oil, muriate of ammonia, chlorides of potassium and calcium, an uncertain acid combined with ammonia, potassa and lime, gelatin, albumen, fibrin, a highly carbonaceous matter soluble in water, a soluble calcareous salt with a combustible acid, carbonate and phosphate of lime, hair, and sand. (*Annal. de Chim. et de Phys.*, ix. 327.) Besides these principles, Geiger and Reinman found a peculiar bitter resin, osmazome, and a peculiar substance in part combined with ammonia. According to Guibourt and Blondeau, it contains 47 per cent. of volatile matter, thought by some to be chiefly ammonia, by others to be a compound of ammonia and volatile oil. Theimann obtained only from 10 to 15 per cent. But the quantity of volatile as well as of soluble matter varies exceedingly in different specimens. Thus, Theimann found from 80 to 90 per cent. of matter soluble in water, Buchner, only 54·5 per cent., and other chemists intermediate proportions. The proportion soluble in alcohol, as ascertained by different experimenters, varies from 25 to 62 per cent. Ether is a good solvent. The watery infusion has a yellowish-brown colour, a bitterish taste, a strong smell of musk, and an acid reaction. The alcoholic tincture is transparent, and of a reddish-brown colour, with the peculiar odour of the medicine. The action of potassa upon musk is accompanied with the extrication of ammonia, and an increase of its peculiar odour. By the influence of heat and moisture long continued, ammonia is developed, which acts upon the fatty matter, producing a substance resembling adipocire, but, according to Guibourt, without diminishing the activity of the medicinal principles. The correctness, however, of this opinion, is perhaps questionable; and it is advisable to preserve the musk as much as possible unaltered. When kept in glass bottles, in a situation neither moist nor very dry, it remains for a great length of time without material change. The odour of musk is very much diminished by mixing it with emulsion or syrup of bitter almonds, or cherry-laurel water. From the experiments of Wimmer, it appears that musk loses its odour when rubbed with kermes mineral, or golden

sulphur of antimony, and reacquires it on the addition of a little solution of ammonia to the mixture. (*Pharm. Cent. Blatt*, A. D. 1843, p. 406.) Camphor rubbed up with musk is also said to have the effect of destroying its odour. (*Am. Journ. of Pharm.*, xxiii. 85.)

Adulterations. The price of this medicine is so high, and its sources so limited, as to offer strong temptations to adulteration; and little of the genuine unmixed musk is to be found in the market. The sophistication commences with the Chinese, and is completed in Europe and this country. A common practice in the East is to open the sac, and to supply the place of the musk with an adulterated mixture. Sometimes the scrotum of the animal is filled with this mixture, and not unfrequently the sacs are manufactured out of the skin. Dried blood, from its resemblance in appearance to musk, is among the most common adulterations; but, besides this, sand, lead, iron-filings, hair, animal membrane, tobacco, the dung of birds, wax, benzoin, storax, asphaltum, and other substances are introduced. These are mixed with a portion of musk, the powerful odour of which is diffused through the mass, and renders the discovery of the fraud sometimes difficult. It is said that the Chinese sometimes mix the musk of Tonquin with that of Siberia. The bags containing the drug should have the characters before described as belonging to the natural sac, and should present no evidence of having been opened. The slit is sometimes carefully sewed up, sometimes glued together. The former condition may be discovered by close inspection, the latter by immersion in hot water. When the bag is made from any other portion of the skin, the difference may be detected, according to Mr. Neligan, by a microscope which magnifies 300 diameters. The genuine hairs exhibit innumerable cells, which are wanting in the spurious. (*Chem. Gaz.*, Feb. 1846, p. 79.) Musk which burns with difficulty, which has a feeble odour, and a colour either pale or entirely black, which feels gritty to the finger, is very moist, or contains obvious impurities, should be rejected. The Russian musk is said never to be adulterated before leaving Russia.

Medical Properties and Uses. Musk is stimulant and antispasmodic, increasing the vigour of the circulation, and exalting the nervous energy, without producing, either as an immediate or secondary effect, any considerable derangement of the purely cerebral functions. Its medical uses are such as may be inferred from its general operation. In almost all spasmodic diseases, so far as mere relaxation of spasm is desirable, it is more or less efficacious; but peculiar advantage may be expected from it in those cases in which a prostrate condition of the system, attended with great nervous agitation, or irregular muscular action, calls for the united influence of a highly diffusible stimulant and powerful antispasmodic. Such are very low cases of typhous disease, accompanied with subsultus tendinum, tremors, and singultus. Such also are many instances of gout in the stomach, and other spasmodic affections of that organ. In very obstinate hiccough we have found it more effectual than any other remedy; and have seen great advantage from its use in those alarming and dangerous convulsions of infants which have their origin in spasm of the intestines. It is said to have done much good, combined with opium, and administered in very large doses, in tetanus. Epilepsy, hysteria, asthma, pertussis, palpitations, cholera, and colic, are among the numerous spasmodic affections in which circumstances may render the employment of musk desirable. The chief obstacles to its general use are its high price, and the uncertainty in regard to its purity. Musk was unknown to the ancients. Aëtius was the first writer who noticed it as a medicine. It was introduced into Europe through the Arabians, from whose language its name was derived.

It may be given in the form of pill or emulsion. The medium dose is ten grains, to be repeated every two or three hours. In the cases of children it may be given with great advantage in the form of enema. W.

MUCUNA. *U. S. Secondary, Lond., Ed.*

Cowhage.

The bristles of the pods of Mucuna pruriens. *U. S.* Bristles of the fruit. *Lond.* Hairs from the pod. *Ed.*

Off. Syn. DOLICHOS. Mucuna pruriens. The hairy down of the pod. *Dub.* Pois a gratter, *Fr.;* Kuhkrätze, *Germ.;* Dolico Scottante, *Ital.*

MUCUNA. *Sex. Syst.* Diadelphia Decandria.—*Nat. Ord.* Fabaceæ or Leguminosæ.

Gen. Ch. Calyx campanulate, bilabiate; the lower lip trifid, with acute segments, the middle one longest; the upper lip broader, entire, obtuse. *Corolla* with the vexillum ascending, shorter than the wings and keel; the wings oblong, equal to the keel in length; the keel oblong, straight, acute. *Stamens* diadelphous, with five anthers oblong-linear, and five ovate, hirsute. *Legume* oblong, torose, bivalvular, with cellular partitions. *Seeds* roundish, surrounded circularly by a linear hilum. (*De Candolle.*)

Mucuna pruriens. De Cand. *Prodrom.* ii. 405; Lindley, *Flor. Med.* p. 254.—*Dolichos pruriens.* Willd. *Sp. Plant.* iii. 1041; Woodv. *Med. Bot.* p. 422.—*Stizolobium pruriens.* Persoon. This is a perennial climbing plant, with an herbaceous branching stem, which twines round the trees in its vicinity, and rises to a considerable height. The leaves are pinnately trifoliate, and stand on long footstalks, placed alternately on the stem at the distance of a foot from each other. The leaflets are acuminate, smooth on their upper surface, and hairy beneath. The lateral leaflets are oblique at the base, the middle one somewhat rhomboidal. The flowers, which resemble those of the pea in form, are large, of a red or purplish colour, usually placed in threes on short peduncles, and hang from the axils of the leaves in pendent spikes about a foot in length. The fruit is a coriaceous pod, shaped like the Italic letter *f*, about four inches long, and covered with brown bristly hairs, which easily separate, and when handled stick in the fingers, producing an intense itching sensation. The plant is a native of the West Indies, and other parts of tropical America. It has been supposed to grow also in the East Indies; but the plant of that region is now considered a distinct species, and entitled *Mucuna prurita.* The part usually imported is the pod, of which the hairs are the officinal portion.

Medical Properties and Uses. The spicula are said to be possessed of powerful vermifuge properties, and are thought to act mechanically, by penetrating the worms. That they do act in this manner is evinced as well by the result of direct experiment upon worms out of the body, as by the fact that neither the tincture nor decoction is in the slightest degree anthelmintic. The medicine was first employed as a vermifuge by the inhabitants of the West Indies, and thence passed into British practice. The testimony in its favour is too strong to admit of any reasonable doubt as to its efficiency. It has been chiefly employed against the round worm; but all the different species which infest the alimentary canal have been expelled by its use. It is best administered mixed with some tenacious vehicle. The usual mode of preparing it is to dip the pods into syrup or molasses, and scrape off the hairs with the liquid, which is in a proper state for administration when it has attained the consistency of thick honey. The dose of this preparation is a tablespoonful for an adult, a teaspoonful for a child three or four years old, to be given every morning for three days, and then followed by a brisk cathartic. M. Blatin has proposed to employ cowhage as an external irritant; seven grains being mixed with an ounce of lard, and seven or eight grains of the ointment rubbed for ten, fifteen, or twenty minutes

on the skin. A stinging and burning sensation is produced, followed by white elevations, which soon disappear, leaving no unpleasant effect. (See *Am. Journ. of Med. Sci.*, N. S., xxvi. 191.)

The root of M. pruriens (*M. prurita*) is said by Ainslie to be employed in the East Indies in the treatment of cholera; and both this part and the pods have been thought to possess diuretic properties. W.

MYRISTICA. *U. S., Lond., Ed., Dub.*

Nutmeg.

The kernels of the fruit of Myristica moschata. *U. S., Dub.* Myristica officinalis. The seed deprived of the testa. *Lond.* Kernel of the fruit of Myristica officinalis. *Ed.*

Noix muscade, *Fr.;* Muskatnuss, *Germ.;* Noce moschata, *Ital.;* Nuez moscada, *Span.*

MYRISTICÆ ADEPS. *Ed.*

Concrete Oil of Nutmeg.

Concrete expressed oil from the kernel of the fruit of Myristica officinalis. *Ed.*

Off. Syn. MYRISTICÆ OLEUM. Myristica officinalis. Concrete oil expressed from the seed. *Lond.*

MACIS. *U. S. Secondary.*

Mace.

The arillus of the fruit of Myristica moschata. *U. S.*

Macis, *Fr.;* Muskatblüthe, *Germ.;* Macis, *Ital.;* Macias, *Span.*

Myristica. *Sex. Syst.* Diœcia Monadelphia.—*Nat. Ord.* Myristicaceæ.

Gen. Ch. Male. *Calyx* none. *Corolla* bell-shaped, trifid. *Filament* columnar. *Anthers* six or ten united. Female. *Calyx* none. *Corolla* bell-shaped, trifid, deciduous. *Style* none. *Stigmas* two. *Drupe* with a nut involved in an arillus with one seed. *Willd.*

Myristica moschata. Willd. *Sp. Plant.* iv. 869; Woodv. *Med. Bot.* p. 698, t. 238.—*M. officinalis.* Linn. *Suppl.* 265; Lindley, *Flor. Med.* p. 21. The nutmeg tree is about thirty feet high, with numerous branches, and an aspect somewhat resembling that of the orange tree. The leaves stand alternately on short footstalks, are oblong-oval, pointed, entire, undulated, obliquely nerved, bright green and somewhat glossy on their upper surface, whitish beneath, and of an aromatic taste. The flowers are male and female upon different trees. The former are disposed in axillary, peduncled, solitary clusters; the latter are single, solitary, and axillary; both are minute and of a pale-yellowish colour. The fruit, which appears on the tree mingled with the flowers, is round or oval, of the size of a small peach, with a smooth surface, at first pale-green, but yellow when ripe, and marked with a longitudinal furrow. The external covering, which is at first thick and fleshy, and abounds in an austere, astringent juice, afterwards becomes dry and coriaceous, and separating into two valves from the apex, discloses a scarlet reticulated membrane or arillus, commonly called *mace*, closely investing a thin, brown, shining shell, which contains the kernel or *nutmeg*. Not less than eight varieties of this species are said by Crawford to be cultivated in the East Indies.

Myristica moschata is a native of the Moluccas and other neighbouring islands, and abounds especially in that small cluster distinguished by the name of Banda,

whence the chief supplies of nutmegs were long derived. But the plant is now cultivated in Sumatra, Java, Singapore, Penang, and other parts of the East Indies; and has been introduced into the Isle of France and Bourbon, Cayenne, and some of the West India islands.

The tree is produced from the seed. It does not flower till the eighth or ninth year; after which it bears flowers and fruit together, without intermission, and is said to continue bearing for seventy or eighty years. Little trouble is requisite in its cultivation. A branch of the female tree is grafted into all the young plants when about two years old, so as to insure their early fruitfulness. In the Moluccas the tree yields three crops annually. The fruit is gathered by the hand, and the outside covering rejected. The mace is then carefully separated, so as to break it as little as possible, is flattened, and dried in the sun, and afterwards sprinkled with salt water, with the view of contributing to its preservation. Its fine red colour is much impaired by drying. The nuts are dried in the sun or by ovens, and exposed to smoke, till the kernel rattles in the shell. They are then broken open; and the kernels, having been removed and steeped for a short time in a mixture of lime and water, probably in order to preserve them from the attack of worms, are next cleaned, and packed in casks or chests for exportation. Dr. Lumsdaine has found them to keep better if rubbed over with dry lime than when prepared in the moist way. (See *Am. Journ. of Sci. and Arts*, Nov. 1851.)

Nutmegs are brought to this country either directly from the East Indies, or indirectly through England and Holland. They are also occasionally imported in small quantities from the West Indies.

Properties. The nutmeg (*nux moschata*) is of a roundish or oval shape, obtuse at the extremities, marked with vermicular furrows, of a grayish colour, hard, smooth to the touch, yielding readily to the knife or the grater, but not very pulverulent. When cut or broken it presents a yellowish surface, varied with reddish-brown, branching, irregular veins, which give to it a marbled appearance. These dark veins abound in oily matter, upon which the medicinal properties depend. The odour of nutmeg is delightfully fragrant, the taste warm, aromatic, and grateful. Its virtues are extracted by alcohol and ether. M. Bonastre obtained from 500 parts, 120 of a white insoluble oily substance, 38 of a coloured soluble oil (olein), 30 of volatile oil, 4 of acid, 12 of fecula, 6 of gum, 270 of lignin; and 20 parts were lost. The *volatile oil* is obtained by distillation with water. (See *Oleum Myristicæ.*) By pressure with heat an oily matter is procured from the kernels, which becomes solid on cooling, and is commonly though erroneously called *oil of mace.*

It is said that nutmegs are often punctured and boiled in order to extract their essential oil, and the orifice afterwards closed so carefully as not to be discoverable unless by breaking the kernel. The fraud may be detected by their greater levity. They are also apt to be injured by worms, which, however, attack preferably those parts which are least impregnated with the volatile oil. We are told that the Dutch heat them in a stove in order to deprive them of the power of germinating, and thus prevent the propagation of the tree. The small and round nutmegs are preferred to those which are large and oval. They should be rejected when very light, with a feeble taste and smell, worm eaten, musty, or marked with black veins.

A kind of nutmeg is occasionally met with, ascribed by some to a variety of *M. moschata*, by others to a different species, which is distinguished from that just described by its much greater length, its elliptical shape, the absence of the dark-brown veins, and its comparatively feeble odour, and disagreeable taste. It has been called *male* or *wild nutmeg*, the other being designated as the *female* or *cultivated nutmeg.*

The *concrete* or *expressed oil of nutmeg* (Myristicæ Adeps, *Ed.* Myristicæ Oleum, *Lond.*), commonly called *oil of mace*, is obtained by bruising nutmegs, exposing them in a bag to the vapour of water, and then compressing them strongly between heated plates. A liquid oil flows out, which becomes solid when it cools. Nutmegs are said to yield from 10 to 12 per cent. of this oil. The best is imported from the East Indies in stone jars. It is solid, soft, unctuous to the touch, of a yellowish or orange-yellow colour more or less mottled, with the odour and taste of nutmeg. It is composed, according to Schrader, of 52·09 per cent. of a soft oily substance, yellowish or brownish, soluble in cold alcohol and ether; 43·75 of a white, pulverulent, inodorous substance, insoluble in these liquids; and 4·16 of volatile oil. The pulverulent constituent, which received from Playfair the name of *myristicin*, has a silky lustre, melts at 88°, and yields in saponification glycerin and *myristicic acid*. An inferior kind is prepared in Holland, and sometimes found in the shops. It is in hard, shining, square cakes, lighter coloured than that from the East Indies, and with less smell and taste. It is supposed to be derived from nutmegs previously deprived of most of their volatile oil by distillation. An artificial preparation is sometimes sold for the genuine oil. It is made by mixing various fatty matters, such as suet, palm oil, spermaceti, wax, &c., adding some colouring substance, and giving flavour to the mixture by the volatile oil of nutmeg.

Mace (Macis, *U. S.*) is in the shape of a flat membrane irregularly slit, smooth, soft, flexible, of a reddish or orange-yellow colour, and an odour and taste resembling those of nutmeg. It consists, according to M. Henry, of a volatile oil in small quantity; a fixed oil, odorous, yellow, soluble in ether, insoluble in boiling alcohol; another fixed oil, odorous, red, soluble in alcohol and ether in every proportion; a peculiar gummy matter, analogous to amidin and gum, constituting one-third of the whole; and a small proportion of ligneous fibre. Mace yields a volatile oil by distillation, and a fixed oil by pressure. Neumann found the former heavier than water. The latter is less consistent than the fixed oil of nutmeg. Mace is inferior when it is brittle, less than usually divided, whitish or pale-yellow, or with little taste and smell.

Medical Properties and Uses. Nutmeg unites with the medicinal properties of the ordinary aromatics, considerable narcotic power. In the quantity of two or three drachms it has been known to produce stupor and delirium; and dangerous if not fatal consequences are said to have followed its free use in India. It is employed to cover the taste or correct the operation of other medicines, but more frequently as an agreeable addition to farinaceous articles of diet, and to various kinds of drink in cases of languid appetite and delicate stomach. It is usually given in substance, and is brought by grating to the state of a powder. *Mace* possesses properties essentially the same with those of nutmeg; and, like that medicine, has been known, when taken in excess, to produce alarming sensorial disturbance. (G. C. Watson, *Prov. Med. and Surg. Journ.*, Jan. 26, 1848.) It is, however, less used as a medicine. The dose of either is from five to twenty grains. As the virtues of nutmeg depend chiefly if not exclusively on the volatile oil, the latter may be substituted, in the dose of two or three drops. The expressed oil is occasionally used as a gentle external stimulant, and is an ingredient in the *Emplastrum Picis* of the London and Edinburgh Pharmacopœias.

The ancients were wholly unacquainted with the nutmeg; and Avicenna is said to be the first author by whom it is noticed.

Off. Prep. of Nutmeg. Acetum Opii; Confectio Aromatica; Electuarium Catechu; Oleum Myristicæ; Pulvis Aromaticus; Pulvis Catechu Compositus; Pulvis Cretæ Compositus; Spiritus Armoraciæ Comp.; Spiritus Lavandulæ Comp.; Spiritus Myristicæ; Syrupus Rhei Aromaticus; Trochisci Cretæ; Trochisci Magnesiæ.

Off. Prep. of the Concrete Oil. Emplastrum Picis. W.

MYRRHA. *U. S., Lond., Ed., Dub.*

Myrrh.

The concrete juice of Balsamodendron Myrrha. *U. S.* Gum-resin exuded from the bark. *Lond.* Gummy resinous exudation. *Ed., Dub.*

Myrrhe, *Fr., Germ.;* Mirra, *Ital., Span.;* Murr, *Arab.;* Bowl, *Hindoost.*

Though myrrh has been employed from the earliest periods of history, the plant which yields it was not certainly known till a very recent date. The *Amyris Kataf* of Forskhal, seen by that traveller in Arabia, was supposed by him to be the myrrh tree, but without sufficient evidence. More recently Ehrenberg, a German traveller, met on the frontiers of Arabia Felix with a plant, from the bark of which he collected a gum-resin precisely similar to the myrrh of commerce. From specimens of the plant taken by Ehrenberg to Germany, Nees von Esenbeck referred it to the genus Balsamodendron of Kunth, and named it *Balsamodendron Myrrha.* This genus was formed by Kunth from *Amyris,* and includes the *Amyris Kataf* of Forskhal, which may possibly also produce a variety of myrrh. The new genus differs from *Amyris,* chiefly in having the stamens beneath instead of upon the germ. It was not thought by De Candolle sufficiently distinct.

Balsamodendron Myrrha. Fée, *Cours d'Hist. Nat. Pharm.* i. 641; Carson, *Illust. of Med. Bot.* i. 28, pl. 20. This is a small tree, with a stunted trunk, covered with a whitish-gray bark, and furnished with rough abortive branches terminating in spines. The leaves are ternate, consisting of obovate, blunt, smooth, obtusely denticulate leaflets, of which the two lateral are much smaller than the one at the end. The fruit is oval-lanceolate, pointed, longitudinally furrowed, of a brown colour, and surrounded at its base by the persistent calyx. The tree grows in Arabia Felix, in the neighbourhood of Gison, in dwarfish thickets, interspersed among the Acaciæ and Euphorbiæ. The juice exudes spontaneously, and concretes upon the bark.

Formerly the best myrrh was brought from the shores of the Red Sea by way of Egypt and the Levant, and hence received the name of *Turkey myrrh;* while the inferior qualities were imported from the East Indies, and commonly called *India myrrh.* These titles have ceased to be applicable; as myrrh of all qualities is now brought from the East Indies, whither it is carried from Arabia and the north-eastern coast of Africa. Aden in the former region, and Berbera in the latter would appear, from the statements of Mr. James Vaughan, to be the chief entrepots of the trade. (*Pharm. Journ. and Trans.,* xii. 226.) It is usually imported in chests containing between one and two hundred weight. Sometimes the different qualities are brought separate; sometimes more or less mingled. Only the best kind should be selected for medical use.

Properties. Myrrh is in small irregular fragments or tears, or in larger masses, composed apparently of agglutinated portions differing somewhat in their shade of colour. The pieces are exceedingly irregular in shape and size, being sometimes not larger than a pea, and sometimes, though rarely, almost as large as the fist. They are often powdery upon the surface. When of good quality, myrrh is reddish-yellow or reddish-brown and translucent, of a strong peculiar somewhat fragrant odour, and a bitter aromatic taste. It is brittle and pulverizable, presenting, when broken, a shining surface, which in the larger masses is very irregular, and sometimes exhibits opaque whitish or yellowish veins. In powder it is of a light yellowish colour. Under the teeth it is at first friable, but soon softens and becomes adhesive. It is inflammable, but does not burn vigorously, and is not fusible by heat. Its sp. gr. is stated at 1·36. The inferior kind, commonly called *India myrrh,* is in pieces much darker than those described, more opaque, less odorous, and often abounding with impurities. We have seen

pieces of India myrrh enclosing large crystals of common salt; as if the juice might have fallen from the tree and concreted upon the ground, where this mineral abounds. Pieces of *bdellium*, and other gummy or resinous substances of unknown origin, are often mixed with it. Among these is a product which may be called *false myrrh*. It is in pieces of irregular form, of a dirty reddish-brown colour, a vitreous brownish-yellow fracture, semitransparent, of a faint odour of myrrh, and a bitter balsamic taste. It is best to purchase myrrh in mass; as in powder it is very liable to adulterations not easily detected.

Myrrh is partially soluble in water, alcohol, and ether. Triturated with water it forms an opaque yellowish or whitish emulsion, which deposits the larger portion upon standing. Its alcoholic tincture is rendered opaque by the addition of water, but throws down no precipitate. According to Neumann, alcohol and water severally extract the whole of its odour and taste. By distillation a volatile oil rises, having the peculiar flavour of myrrh, and leaving the residue in the retort simply bitter. The gum-resin is soluble in solutions of the alkalies, and, when triturated with them in a crystalline state, forms a tenacious liquid. Hence carbonate of potassa may be used to facilitate its suspension in water. Braconnot found 2·5 per cent. of volatile oil, 23 of a bitter resin, 46 of soluble, and 12 of insoluble gum. (*Ann. de Chim.*, lxvii. 52.) Pelletier obtained 34 per cent. of resin, with a small proportion of volatile oil, and 66 per cent. of gum. A more recent analysis by Ruickoldt gave in 100 parts 2·183 of volatile oil, 44·760 of resin, 40·818 of gum or arabin, 1·475 of water, and 3·650 of carbonate of lime and magnesia, with some gypsum and sesquioxide of iron. The resin, which he calls *myrrhin*, is neuter, but acquires acid properties when kept for a short time in fusion. In the latter state, M. Ruickoldt proposes to call it *myrrhic acid*. (*Archiv. der Pharm.*, xli. 1.) According to MM. Bley and Diesel, myrrh which contains little volatile oil always has an acid reaction, which they ascribe to the oxidation of the oil. They found formic acid in the specimen examined by them. (*Ibid.*, xliii. 304.)

The same writers give as a test of myrrh the production of a transparent dirty-yellow liquid with nitric acid; while false myrrh affords a bright yellow solution in the same fluid, and bdellium is not dissolved, but becomes whitish and opaque. (See *Am. Journ. of Pharm.*, xviii. 228.) According to M. Righini, when powdered myrrh is rubbed for fifteen minutes with an equal weight of muriate of ammonia, and fifteen times its weight of water gradually added, if it dissolve quickly and entirely it may be considered pure. (*Journ. de Chim. Méd.*, 1844, p. 33.)

Medical Properties and Uses. Myrrh is a stimulant tonic, with some tendency to the lungs, and perhaps to the uterus. Hence it is employed as an expectorant and emmenagogue in debilitated states of the system, in the absence of febrile excitement or acute inflammation. The complaints in which it is usually administered are chronic catarrh, phthisis pulmonalis, other pectoral affections in which the secretion of mucus is abundant but not easily expectorated, chlorosis, amenorrhœa, and the various affections connected with this state of the uterine function. It is generally given combined with chalybeates or other tonics, and in amenorrhœa very frequently with aloes. It is used also as a local application to spongy gums, the aphthous sore mouth of children, and various kinds of unhealthy ulcers. The dose is from ten to thirty grains, and may be given in the form of powder or pill, or suspended in water, as in the famous antihectic mixture of Dr. Griffith, which has become officinal by the name of *Mistura Ferri Composita*. The infusion is also sometimes given, and an aqueous extract has been recommended as milder than myrrh in substance. The tincture is used chiefly as an external application.

A *plaster of myrrh* is made by rubbing together powdered myrrh, camphor, and balsam of Peru, of each an ounce and a half, then adding the mixture to

32 ounces of lead plaster previously melted, and stirring well until the plaster thickens on cooling. It is then to be formed into rolls. This plaster may be employed in all cases where a gentle and long continued stimulant or rubefacient effect is desired.

Off. Prep. Decoctum Alöes Compositum; Decoctum Myrrhæ; Mistura Ferri Comp.; Pilulæ Alöes et Myrrhæ; Pil. Assafœtidæ, *Ed.;* Pil. Ferri Comp.; Pil. Galbani Comp.; Pil. Rhei Comp.; Tinctura Myrrhæ. W.

NUX VOMICA. *U. S., Lond., Ed., Dub.*

Nux Vomica.

The seeds of Strychnos Nux vomica. *U. S., Lond., Ed., Dub.*

Noix vomique, *Fr.;* Krähenaugen, Brechnüsse, *Germ.;* Noce vomica, *Ital.;* Nuez vomica, *Span.*

Strychnos, *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Apocynaceæ.

Gen. Ch. Corolla five-cleft. *Berry* one-celled, with a ligneous rind. *Willd.*

Strychnos Nux vomica. Willd. *Sp. Plant.* i. 1052; Woodv. *Med. Bot.* p. 222, t. 79. This tree is of a moderate size, with numerous strong branches, covered with a smooth, dark-gray bark. The young branches are long, flexuous, very smooth, dark-green, and furnished with opposite, roundish-oval, entire, smooth, and shining leaves, having three or five ribs, and short footstalks. The flowers are small, white, funnel-shaped, and disposed in terminal corymbs. The fruit is a round berry, about as large as an orange, covered with a smooth, yellow or orange-coloured, hard, fragile rind, and containing many seeds embedded in a juicy pulp.

The tree is a native of the East Indies, growing in Bengal, Malabar, on the coast of Coromandel, in Ceylon, in numerous islands of the Indian Archipelago, in Cochin-china, and other neighbouring countries. The wood and root are very bitter, and are employed in the East Indies for the cure of intermittents. The *radices colubrinæ* and *lignum colubrinum* of the older writers, which have been long known in Europe as narcotic poisons, have been ascribed to this species of Strychnos, under the impression that it is identical with *Strychnos Colubrina*, to which Linnæus refers them. They have been ascertained by Pelletier and Caventou to contain a large quantity of strychnia. The bark is said by Dr. O'Shaughnessy to answer exactly to the description given by authors of the *false angustura*, and, like that, to contain a large quantity of brucia. The identity of the two barks has been confirmed by Dr. Pereira, from a comparison of specimens. (See *Angustura.*) The only officinal portion of the plant is the seeds.

These are circular, about three-quarters of an inch in diameter, and two lines in thickness, flat, or slightly convex on one side, and concave on the other. They are thickly covered with fine, silky, shining, ash-coloured or yellowish-gray hairs, attached to a thin fragile coating, which closely invests the interior nucleus or kernel. This is very hard, horny, usually whitish and semitransparent, sometimes dark-coloured and opaque, and of very difficult pulverization. The powder is yellowish-gray, and has a faint sweetish odour. The seeds are destitute of odour, but have an acrid very bitter taste, which is much stronger in the kernel than in the investing membrane. They impart their virtues to water, but more readily to diluted alcohol. Nux vomica has been analyzed by several chemists, but most accurately by Pelletier and Caventou, who discovered in it two alkaline principles, *strychnia* and *brucia*, united with a peculiar acid which they named *igasuric.* Its other constituents are a yellow colouring matter, a concrete oil, gum, starch, bassorin, and a small quantity of wax. M. Desnoix has recently announced the discovery of another alkaloid, which he denominates *igasuria.* These alkaloids are the active principles of nux vomica.

Strychnia was discovered by Pelletier and Caventou, A. D. 1818, both in the

nux vomica and bean of St. Ignatius, and received its name from the generic title of the plants (*Strychnos*), to which these two products belong. According to these chemists, it exists much more abundantly in the bean of St. Ignatius than in the nux vomica, the former yielding 1·2 per cent., the latter only 0·4 per cent. of the alkali. For an account of its properties and mode of preparation, see *Strychnia*, in the second part of this work.

Brucia was discovered by Pelletier and Caventou, first in the bark called *false angustura*, in combination with gallic acid, and subsequently, associated with strychnia in the form of igasurates, in the nux vomica and bean of St. Ignatius. It is crystallizable; and its crystals are said to contain 18·41 per cent. of water. It is without smell, but of a permanent, harsh, very bitter taste; soluble in 850 parts of cold, and 500 of boiling water; very soluble in alcohol, whether hot or cold; but insoluble in ether and the fixed oils, and only slightly dissolved by the volatile oils. It is permanent in the air, but melts at a temperature a little above that of boiling water, and on cooling congeals into a mass resembling wax. It forms crystallizable salts with the acids. Concentrated nitric acid produces with brucia or its salts an intense crimson colour, which changes to yellow by heat, and upon the addition of protochloride of tin becomes violet. These effects are peculiar to brucia, and, if produced with strychnia, evince the presence of the former alkali. According to MM. Larocque and Thibierge, the chloride of gold produces, with solutions of the salts of brucia, precipitates at first milky, then coffee-coloured, and finally chocolate-brown. (*Journ. de Chim. Méd.*, Oct. 1842.) Brucia is analogous in its operation to strychnia, but possesses, according to M. Andral, only about one-twelfth of its strength, when the latter principle is entirely pure. It is therefore seldom employed. It may be procured from false Angustura bark, in a manner essentially the same with that in which strychnia is procured from nux vomica; with this difference, that the alcoholic extract, obtained from the precipitate produced by lime or magnesia, should be treated with oxalic acid, and subsequently with a mixture of rectified alcohol and ether, which takes up the colouring matter, leaving the oxalate of brucia. This is decomposed by magnesia, and the brucia is separated by alcohol, which, by spontaneous evaporation, yields it in the state of crystals. According to Dr. Fuss and Professor Erdmann, brucia is not a distinct alkali, but merely a compound of strychnia and resin.

Igasuria is found in the mother waters from which strychnia and brucia have been precipitated by lime. It is readily crystallizable; more soluble in water and weak alcohol than the two other alkaloids; reddened by nitric acid even more intensely than brucia; rendered by sulphuric acid at first rose-coloured, and afterwards yellowish and greenish-yellow; dissolved by the diluted acids, which form with it easily crystallizable salts; precipitated from its solution by the alkalies, and redissolved by them in excess, especially by potassa; precipitated yellow by bichloride of platinum, and white by tannic acid; slowly precipitated by iodide of potassium in light reddish-yellow crystals; and thrown down as crystalline needles by bicarbonate of soda, in the presence of tartaric acid, in which property it resembles strychnia, but differs from brucia. M. Desnoix inferred from his experiments on animals that it is intermediate in power between the two other alkaloids of nux vomica. (See *Am. Journ. of Pharm.*, xxvi. 31.)

Medical Properties and Uses. Nux vomica is very peculiar in its action. In very small doses, frequently repeated, it is tonic, and is said to be diuretic, and occasionally diaphoretic and laxative. When it is given in larger doses, so as to bring the system decidedly under its influence, its action appears to be directed chiefly to the nerves of motion, probably through the medium of the spinal marrow. Its operation is evinced at first by a feeling of weight and weakness, with tremblings in the limbs, and some rigidity on attempting motion. There seems

to be a tendency to permanent involuntary muscular contraction, as in tetanus; but at the same time frequent starts or spasms occur, as from electric shocks. These spasms are at first brought on by some exciting cause, as by a slight blow or an attempt to move; but, if the medicine is persevered in, they occur without extraneous agency, and are sometimes frequent and violent. In severe cases there is occasionally general rigidity of the muscles. A sense of heat in the stomach, constriction of the throat and abdomen, tightness of the chest, and retention of urine are frequently experienced, to a greater or less extent, according to the quantity of the medicine administered. It sometimes, also, produces pain in the head, vertigo, contracted pupil, and dimness of vision. Sensations on the surface analogous to those attending imperfect palsy, such as formication, tingling, &c., are often experienced. The pulse is not materially affected, though sometimes slightly accelerated. In over-doses, the medicine is capable of producing fatal effects. Given to the inferior animals in fatal doses, it produces great anxiety, difficult and confined breathing, retching to vomit, universal tremors, spasmodic action of the muscles, and ultimately violent convulsions. Death is supposed to take place from a suspension of respiration, resulting from a spasmodic constriction of the muscles concerned in the process. Yet it poisons animals which have no lungs. (*Am. Journ. of Med. Sci.*, N. S., xviii. 369.) Upon dissection, no traces of inflammatory action are observable, unless large quantities of the nux vomica have been swallowed, when the stomach appears inflamed. A division of the spinal marrow near the occiput does not prevent the peculiar effects of the medicine, so that the intervention of the brain is not essential. That it enters the circulation, and is brought into contact with the parts upon which it acts, is rendered evident by the experiments of Magendie and others. Chloroform has been recommended in cases of poisoning from nux vomica. In an instance recorded by Dr. Dresbach, of Tiffin, Ohio, two drachms, administered to a patient alarmingly ill from the effects of three grains of strychnia, produced complete relief in less than fifteen minutes. (*Ibid.*, xix. 546, from the *Western Lancet*, Feb. 1850.) Strychnia, given to the inferior animals, has been observed strikingly to lessen the bulk of the spleen. (*Ibid.*, xviii. 373.)

Nux vomica has long been employed in India, and was known as a medicine to the Arabian physicians. On the continent of Europe, it has at various times been recommended as an antidote to the plague, and as a remedy in intermittents, dyspepsia, pyrosis, gastrodynia, dysentery, diarrhœa of debility, colica pictonum, worms, mania, hypochondriasis, hysteria, rheumatism, and hydrophobia. It is said to have effectually cured obstinate spasmodic asthma. Its peculiar influence upon the nerves of motion, to which the public attention was first called by Magendie, suggested to M. Fouquier, a French physician, the application of the remedy to paralytic affections; and his success was such as to induce him to communicate to the public the result of his experience. Others have subsequently employed it with variable success; but the experience in its favour so much predominates, that it may now be considered a standard remedy in palsy. It is a singular fact, that its action is directed more especially to the paralytic part, exciting contraction in this before it is extended to other muscles. The medicine, however, should be administered with judgment, and never given in cases depending on inflammation or organic lesion of the brain or spinal marrow, until after the removal of the primary affection by bleeding or other depletory measures. It has been found more successful in general palsy and paraplegia than in hemiplegia, and has frequently effected cures in palsy of the bladder, incontinence of urine from paralysis of the sphincter, amaurosis, and other cases of partial palsy, and has been employed with asserted success in prolapsus ani, spermatorrhœa, and impotence. Upon the same principles it is said to have proved useful in obstinate constipation from deficient contractility of the bowels;

and is thought to promote the action of cathartics, when added to them in small proportion. It has recently been recommended in neuralgia, in chorea, and in atonic dropsy.

Nux vomica may be given in powder in the dose of five grains, repeated three or four times a day, and gradually increased till its effects are experienced. In this form, however, it is very uncertain; and fifty grains have been given with little or no effect. It is most readily reduced to powder by filing or grating, and the raspings may be rendered finer by first steaming them, then drying them by stove heat, and lastly rubbing them in a mortar. The Edinburgh College directs that the seeds should be first well softened with steam, then sliced, dried, and ground in a coffee-mill. It has been recommended that, before being pulverized, they should be deprived of their exterior coating, which is easily done when they are exposed for a short time to the action of hot water.

The alcoholic extract is more convenient and more certain in its operation. From half a grain to two grains may be given in the form of pill, repeated as above-mentioned, and gradually increased. (See *Extractum Nucis Vomicæ.*) The watery extract is comparatively feeble.

Strychnia has recently been much used, and possesses the advantage of greater certainty and uniformity of action. Its effects are precisely similar. With the exception of prussic acid, it is perhaps the most violent poison in the catalogue of medicines, and should, therefore, be administered with great caution. The dose is one-twelfth of a grain, repeated twice or three times a day, and gradually increased. Even the quantity mentioned sometimes produces spasmodic symptoms, and these generally occur when the dose is augmented to half a grain three times a day. The system is not so soon habituated to its impression as to that of the narcotics generally; so that, after its effects are experienced, it is unnecessary to go on increasing the dose. Strychnia has been applied externally with advantage in amaurosis. It should be sprinkled upon a blistered surface near the temples, in the quantity of half a grain or a grain, morning and evening; and the quantity may be gradually augmented. The best form of administration is that of pill, in consequence of the excessive bitterness of the solution. Strychnia may, however, be given, dissolved in alcohol, or in water by the intervention of an acid.

Brucia may be used for the same purposes with strychnia in the dose of one grain twice or three times a day. Dr. Bardsley found that the quantity of two grains, three or four times a day, was seldom exceeded without the occurrence of the characteristic effects of the medicine. Magendie has found this alkali very useful in small doses as a tonic. He employed for this purpose one-eighth of a grain frequently repeated. It is very important, in reference to the dose, that it should contain no strychnia.

Off. Prep. Extractum Nucis Vomicæ; Strychnia; Tinctura Nucis Vomicæ.

W.

OLEA.

Oils.

These are liquid or solid substances, characterized by an unctuous feel, inflammability, and the property of leaving a greasy stain upon paper. They are divided into two classes, the *fixed* and *volatile*, distinguished, as their names imply, by their different habitudes in relation to the vaporizing influence of caloric.

1. OLEA FIXA. *Fixed Oils.*

These are sometimes termed *expressed oils*, from the mode in which they are procured. Though existing in greater or less proportion in various parts of

plants, they are furnished for use exclusively by the fruit; and, as a general rule, are most abundant in the dicotyledonous seeds. They are obtained either by submitting the bruised seeds to pressure in hempen bags, or by boiling them in water, and skimming off the oil as it rises to the surface. When pressure is employed, it is customary to prepare the seeds for the press by exposing them to a moderate heat, so as to render the oil more liquid, and thus enable it to flow out more readily.

The consistence of the fixed oils varies from that of tallow to perfect fluidity; but by far the greater number are liquid at ordinary temperatures. They are somewhat viscid, transparent, and usually of a yellowish colour, which disappears when they are treated with animal charcoal. When pure they have little taste or smell. They are lighter than water, varying in specific gravity from 0·913 to 0·936. (*Berzelius.*) They differ very much in their point of congelation, olive oil becoming solid a little above 32° F., while linseed oil remains fluid at 4° below zero. They are not volatilizable without decomposition. At about 600° they boil, and are converted into vapour, which, when condensed, is found to contain a large proportion of oleic and margaric acids, together with benzoic acid, another volatile acid, and an empyreumatic oil. Exposed to a red heat, in close vessels, they yield, among other products of the destructive distillation of vegetables, a large quantity of the combustible compounds of carbon and hydrogen. Heated in the open air they take fire, burning with a bright flame, and producing water and carbonic acid. When kept in air-tight vessels, they remain unchanged for a great length of time; but, exposed to the atmosphere, they attract oxygen, and ultimately become concrete. Some, in drying, lose their unctuous feel, and are converted into a transparent, yellowish, flexible solid. These are called *drying oils.* Others, especially such as contain mucilaginous impurities, become rancid, acquiring a sharp taste and unpleasant smell. This change is owing to the formation of an acid, from which the oil may be freed by boiling it for a short time with hydrate of magnesia and water. The fixed oils are insoluble in water, but are miscible with that fluid by means of mucilage, forming mixtures which are called emulsions. They are in general very sparingly soluble in alcohol, but readily dissolved by ether, which serves to separate them from other vegetable proximate principles. By the aid of heat they dissolve sulphur and phosphorus. Chlorine and iodine are converted by them into muriatic and hydriodic acids, which, reacting upon the oils, increase their consistence, and ultimately render them as hard as wax. The stronger acids decompose them, giving rise, among other products, to the oleic and margaric acids. Boiled with diluted nitric acid, they are converted into malic and oxalic acids, besides other substances usually resulting from the action of this acid upon vegetable matter. Several acids are dissolved by them without producing any sensible change. They combine with salifiable bases; but at the moment of combination undergo a change, by which they are resolved into a peculiar substance called glycerin, and into the oleic and margaric acids, which unite with the base employed. The compounds of these acids with potassa and soda are called soaps. (See *Sapo* and *Emplastrum Plumbi.*) The fixed oils dissolve many of the organic alkalies, the volatile oils, resin, and other proximate principles of plants. They consist of two distinct substances, one of which is liquid at ordinary temperatures, and therefore called *olëin*, the other solid, and called *margarin.* The more solid ingredient of the vegetable oils was originally called *stearin*, the name applied to the analogous ingredient of the animal oils, with which it was supposed by Chevreul, the discoverer of this complex constitution of oleaginous substances, to be identical. It has, however, been found to be essentially different, yielding margaric acid in the process of saponification, while stearin yields stearic acid. For the mode of separating the liquid from the solid principles of oils, as well

as for an account of their distinctive properties, the reader is referred to the article *Adeps*. Margarin is distinguished from stearin by its greater fusibility, and by its solubility in cold ether; and the two principles may be separated by the action of boiling ether, which dissolves both, but deposits the stearin upon cooling, while it retains the margarin, and yields it by evaporation. These principles, however, are thought by Berzelius not to be absolutely identical in the different oils, as they have different points of congelation and liquefaction, according to the substance from which they are derived.* By the action of nitric acid or nitrous acid fumes, olein is converted into a deep-yellow butyraceous mass. If this be treated with warm alcohol, a deep orange-red oil is dissolved, and a peculiar fatty matter remains, called *elaïdin*. It is white, fusible at 97°, insoluble in water, sparingly soluble in alcohol, readily soluble in ether, and converted, in the process of saponification by the alkalies, into a peculiar acid, denominated *elaïdic acid*, and into glycerin. (*Kane's Chemistry.*) The view now taken of the nature of olein, margarin, stearin, elaïdin, and other similar fatty matters, is that they are compounds of the oleic, margaric, stearic, elaidic acids, &c., with glycerin; and in the process of saponification, the alkali takes the oily acid and sets glycerin free. The ultimate constituents of the fixed oils are carbon, hydrogen, and oxygen; the hydrogen being in much larger proportion than is necessary to saturate the oxygen. Those which are least fusible contain most carbon and least oxygen; and, according to De Saussure, their solubility in alcohol is greater in proportion to their amount of oxygen. (*Berzelius.*) Some of them contain a very minute proportion of nitrogen.

2. OLEA VOLATILIA. *Volatile Oils.*

These are sometimes called *distilled oils*, from the mode in which they are usually procured; sometimes *essential oils*, from the circumstance that they possess, in a concentrated state, the properties of the plants from which they are derived.

They exist in all odoriferous vegetables, sometimes pervading the whole plant, sometimes confined to a single part; in some instances contained in distinct cellules, and preserved after desiccation, in others formed upon the surface, as in many flowers, and exhaled as soon as they are formed. Occasionally two or more are found in different parts of the same plant. Thus the orange tree produces one volatile oil in its leaves, another in its flowers, and a third in the rind of its fruit. In a few instances, when existing in distinct cellules, they may be obtained by pressure, as from the rind of the lemon and orange; but they are generally procured by distillation with water. (See *Olea Destillata.*) Some volatile oils, as those of bitter almonds and mustard, are formed during the process of distillation, out of substances of a different nature pre-existing in the plant.

* Some interesting results in relation to the fixed oils were obtained by MM. Pelouze and Boudet, and published in the *Journ. de Pharm.*, xxiv. 385. According to these chemists, the variable fusibility of the margarin and stearin of fixed oils, which has induced some chemists to believe that they are severally not entirely identical as obtained from different oils, is owing to the existence of definite combinations of margarin and stearin respectively with olein; and each of these principles, in a state of purity, is probably the same from whatever source derived, whether from vegetable or from animal oils. Thus they found the same margarin in palm oil and in human fat. But there appear to be two distinct kinds of olein, one existing in the *drying oils*, as linseed oil, the oil of poppies, &c., the other in the oils which are not drying, as in olive oil, almond oil, human fat, and lard. These two forms of olein are different in their solubility in different menstrua, and in the circumstances that one is drying and the other not so, that one remains liquid under the action of nitrous acid, while the other is converted by it into a solid substance called *elaïdin*, and finally that the former contains much less hydrogen than the latter. Besides, the oleic acid formed in the process of saponification from these two kinds of olein is decidedly different, inasmuch as, in the one case, it is converted by nitrous acid into *elaïdic* acid, and in the other is not thus changed.—*Note to the fourth edition.*

The volatile oils are usually yellowish, but often brown, red, green, or blue, and occasionally colourless. There is reason, however, to believe that, in all instances, the colour depends on foreign matter dissolved in the oils. They have a strong odour, resembling that of the plants from which they were procured, though generally less agreeable. Their taste is hot and pungent, and, when they are diluted, is often gratefully aromatic. The greater number are lighter than water; some are heavier; and their sp. gr. varies from 0·847 to 1·17. They partially rise in vapour at ordinary temperatures, diffusing their peculiar odour, and are completely volatilized by heat. Their boiling point is various, generally as high as 320° F., and sometimes higher; but most of them rise readily with the vapour of boiling water. When distilled alone, they almost always undergo partial decomposition. They differ also in their point of congelation. A few are solid at ordinary temperatures, several become so at 32° F., and many remain liquid considerably below this point. Heated in the open air, they take fire, and burn with a bright flame attended with much smoke. Exposed at ordinary temperatures, they absorb oxygen, assume a deeper colour, become thicker and less odorous, and are ultimately converted into resin. This change takes place most rapidly under the influence of light. Before the alteration is complete, the remaining portion of oil may be recovered by distillation. Some of them form well characterized acids by combination with oxygen.

The volatile oils are very slightly soluble in water. Agitated with this fluid they render it milky; but separate upon standing, leaving the water impregnated with their odour and taste. This impregnation is more complete when water is distilled with the oils, or from the plants containing them. Trituration with magnesia or its carbonate renders them much more soluble, probably in consequence of their minute division. The intervention of sugar also greatly increases their solubility, and affords a convenient method of preparing them for internal use. Most of them are very soluble in alcohol, and in a degree proportionate to its freedom from water. The oils which contain no oxygen are scarcely soluble in diluted alcohol, and, according to De Saussure, their solubility generally in this liquid is proportionate to the quantity of oxygen which they contain. They are readily dissolved by ether.

The volatile oils dissolve sulphur and phosphorus with the aid of heat, and deposit them on cooling. By long boiling with sulphur they form brown, unctuous, fetid substances, formerly called *balsams of sulphur*. They absorb chlorine, which converts them into resin, and then combines with the resin. Iodine produces a similar effect. They are decomposed by the strong mineral acids, and unite with several of those from the vegetable kingdom. When treated with a caustic alkali, they are converted into resin, which unites with the alkali to form a kind of soap. Several of the metallic oxides, and various salts which easily part with oxygen, convert them into resin. The volatile oils dissolve many of the proximate principles of plants and animals, such as the fixed oils and fats, resins, camphor, and several of the organic alkalies. Exposed to the air and light they acquire a decolorizing property, analogous to that of chlorine, which is ascribed by Faraday to their combination with the ozone of the atmosphere. For some interesting observations on this property of the volatile oils the reader is referred to papers by Dr. J. L. Plummer, of Richmond, Indiana, in the *Am. Journ. of Pharm.* (xxv. 398 and 508).

The volatile, like the fixed oils, consist of distinct principles, which are congealed at different temperatures, and may be separated by compressing the frozen oil between folds of bibulous paper. The solid matter remains within the folds; and the fluid is absorbed by the paper, from which it may be separated by distillation with water. The name of *stearoptene* has been proposed for the former, that of *eleoptene* for the latter. The solid crystalline substances deposited by

certain volatile oils upon standing are also called stearoptenes. Some of these are isomeric with the oils in which they are formed, others are oxides. Some oils, under the influence of water, deposit crystalline bodies which appear to be hydrates of the respective oils.

The ultimate constituents of the volatile oils are usually carbon, hydrogen, and oxygen. Some, as the oils of turpentine and copaiba, in their purest state, contain only carbon and hydrogen. Several have nitrogen in their composition; and the oils of horse-radish and mustard contain sulphur.

The volatile oils are often sophisticated. Among the most common adulterations are fixed oils, resinous substances, and alcohol. The presence of the fixed oils may be known by the permanent greasy stain which they leave on paper, while that occasioned by a pure volatile oil disappears entirely when exposed to heat. They may also in general be detected by their comparative insolubility in alcohol. Both the fixed oils and resins are left behind when the adulterated oil is distilled with water. If alcohol is present, the oil becomes milky when agitated with water, and, after the separation of the liquids, the water occupies more space and the oil less than before. The following method of detecting alcohol has been proposed by M. Beral. Put twelve drops of the suspected oil in a perfectly dry watch-glass, and add a piece of potassium about as large as the head of a pin. If the potassium remain for twelve or fifteen minutes in the midst of the liquid, there is either no alcohol present, or less than four per cent. If it disappear in five minutes, the oil contains more than four per cent. of alcohol; if in less than a minute twenty-five per cent. or more. M. Borsarelli employs chloride of calcium for the same purpose. This he introduces in small pieces, well dried and perfectly free from powder, into a small cylindrical tube, closed at one end, and about two-thirds filled with the oil to be examined, and heats the tube to 212°, occasionally shaking it. If there be a considerable proportion of alcohol, the chloride is entirely dissolved, forming a solution which sinks to the bottom of the tube; if only a very small quantity, the pieces lose their form, and collect at the bottom in a white adhering mass; if none at all, they remain unchanged. (*Journ. de Pharm.*, xxvi. 429.) J. J. Bernoulli proposes as a test dry acetate of potassa, which remains unaffected in a pure oil, but is dissolved if alcohol is present, and forms a distinct liquid. (See *Am. Journ. of Pharm.*, xxv. 82.) Sometimes volatile oils of little value are mixed with those which are costly. The taste and smell afford in this case the best means of detecting the fraud. The specific gravity of the oils may also serve as a test of their purity. When two oils, of which one is lighter and the other heavier than water, are mixed, they are separated by long agitation with this fluid, and will take a place corresponding to their respective specific gravities; but it sometimes happens that an unadulterated oil may thus be separated into two portions. The difference of apparent effect produced by iodine with the several oils has been proposed as a test. According to Liebig, when this element is made to act on a volatile oil, a portion of it combines with the hydrogen of the oil forming hydriodic acid, while another portion takes the place of the lost hydrogen. Oil of turpentine may be detected by remaining in part undissolved, when the suspected oil is treated with three or four times its volume of alcohol of the sp. gr. 0 84; or, according to M. Mero, by causing the suspected oil, when agitated with an equal measure of poppy oil, to remain transparent, instead of becoming milky, as it would do if pure. The latter test will not apply to the oil of rosemary. (*Journ. de Pharm.*, 3e *sér.*, vii. 303.)

Volatile oils may be preserved without change in small well-stopped bottles, entirely filled with the oil, and excluded from the light. W.

OLEUM AMYGDALÆ. *U. S.*

Oil of Almonds.

The fixed oil of the kernels of the fruit of Amygdalus communis. *U. S.*

Off. Syn. AMYGDALÆ OLEUM. Amygdalus communis, *vars. amara et dulcis.* The oil expressed from the seed. *Lond.*

Huile d'amandes, *Fr.;* Mandelöl, *Germ.;* Olio di mandorle, *Ital.;* Aceyte de almendras, *Span.*

See AMYGDALA.

This oil is obtained equally pure from sweet and bitter almonds. In its preparation, the almonds, after having been deprived of a reddish-brown powder adhering to their surface, by rubbing them together in a piece of coarse linen, are ground in a mill resembling a coffee-mill, or bruised in a stone mortar, and then submitted to pressure in canvas sacks between plates of iron slightly heated. The oil, which is at first turbid, is clarified by rest and filtration. Sometimes the almonds are steeped in very hot water, deprived of their cuticle, and dried in a stove previously to expression. The oil is thus obtained free from colour, but in no other respect better. Bitter almonds, when treated in this way, are said to impart a smell of hydrocyanic acid to the oil. M. Boullay obtained 54 per cent. of oil from sweet almonds, Vogel 28 per cent. from bitter almonds.

Oil of almonds is clear and colourless, or slightly tinged of a greenish-yellow, is nearly inodorous, and has a bland sweetish taste. It remains liquid at temperatures considerably below the freezing point of water. Its sp. gr. is from 0·917 to 0·92. From the statement of Braconnot, it appears to contain 76 per cent. of olein and 24 of margarin.

It may be used for the same purposes with olive oil; and, when suspended in water by means of mucilage or the yolk of eggs and loaf sugar, forms a very pleasant emulsion, useful in pulmonary affections attended with cough. From a fluidrachm to a fluidounce may be given at a dose.

Off. Prep. Unguentum Aquæ Rosæ. W.

OLEUM AMYGDALÆ AMARÆ. *U. S.*

Oil of Bitter Almonds.

The oil obtained by distilling with water the kernels of the fruit of Amygdalus communis—variety *amara. U. S.*

When bitter almonds are expressed, they yield a bland fixed oil; and the residuary cake, reduced to powder by grinding, and submitted to distillation with water, gives over a volatile oleaginous product, commonly called oil of bitter almonds. This does not pre-exist in the almond, but is produced by the reaction of water upon the amygdalin contained in it, through the intervention of another of its constituents denominated emulsin. (See *Amygdala Amara.*) It is obtained also by the distillation of the leaves of the cherry-laurel, and of various products of the genera Amygdalus, Cerasus, Prunus, and others. (See *note, page* 92.) Mr. Whipple obtained, as an average of twenty operations, from the ground bitter almond cake 1·35 per cent. of the oil. (*Pharm. Journ. and Trans.*, x. 297.)

Oil of bitter almonds has a yellowish colour, a bitter, acrid, burning taste, and the peculiar odour of the kernels in a high degree. It is heavier than water, soluble in alcohol and ether, slightly soluble in water, and deposits, upon standing, a white crystalline substance consisting chiefly of benzoic acid. Besides a peculiar volatile oil, it contains also hydrocyanic acid, with a small proportion

of benzoic acid, and of a concrete principle called benzoïne. It may be obtained pure by agitating it strongly with hydrate of lime and a solution of protochloride of iron, submitting the mixture to distillation, and drying the oil which comes over by digestion with chloride of calcium. Thus purified it is colourless, but still retains its peculiar odour, with a burning, aromatic taste; and is destitute of the poisonous properties possessed by the oil in its original state, dependent on hydrocyanic acid. The odour of the oil of bitter almonds has been erroneously ascribed to this acid, which, on examination, will be found to smell very differently and more feebly. Like most other volatile oils, it is capable of producing deleterious effects if taken in very large quantities. Hippuric acid is found in the urine of animals to which it has been given freely. (*Chem. Gaz.*, vi. 230.) The sp. gr. of the crude oil varies from 1·052 to 1·082, and is greater when the oil is distilled from salt water than in the ordinary mode. (Redwood, *Pharm. Journ. and Trans.*, xi. 486.) That of the purified oil is 1·043, and its boiling point 356°. Wöhler and Liebig have shown that it probably consists of a compound radical called *benzyle* ($C_{14}H_5O_2$) with one eq. of hydrogen, and is therefore a *hydruret of benzyle*. This radical is capable of uniting with other bodies, and forming a long series of compounds. The benzoic acid which the oil of bitter almonds deposits on standing does not pre-exist in the oil, but results from the absorption of oxygen. The concrete substance above referred to by the name of *benzoïne* is isomeric with the oil, crystallizable in colourless shining prisms, without smell or taste, fusible at 248°, and volatilizable unchanged at a higher temperature. It is formed abundantly in the original impure oil by the reaction of alkalies; but cannot be produced in it when deprived of hydrocyanic acid.*

Zeller mentions as characteristics of the officinal oil, by which its genuineness and purity may be known, its peculiar odour and high specific gravity; its ready solubility in sulphuric acid, with the production of a reddish-brown colour, but without visible decomposition; the slow action of nitric acid; the slow and partial solution of iodine without further reaction; the want of action of chromate of potassa upon it; and the production of crystals when it is dissolved in an alcoholic solution of potassa. (See *Pharm. Journ. and Trans.*, ix. 575.) Mr. Redwood states that a very small proportion of alcohol may be detected in the oil, by the effervescence, with disengagement of nitrous vapours, which ensues when the oil, thus contaminated, is mixed with an equal volume of nitric acid of the sp. gr. 1·5. With pure oil no other effect is obvious than a slight change of colour. (*Ibid.*, xi. 486.) If sulphuric acid produce with the oil a bright-red, instead of a brownish-red colour, it indicates that the oil has probably been distilled with salt water, in which case it is apt, according to Mr. Jos. Ferris, to deposit a blood-red matter, occasionally complained of by druggists. (*Ibid.*, p. 565.)

Medical Properties and Uses. The unpurified volatile oil of bitter almonds, which is the product directed by the Pharmacopœia, operates upon the system in

* *Nitrobenzole*, or *artificial oil of bitter almonds*. This substance was discovered by Mitscherlich, who obtained it by the reaction of nitric acid on *benzole*, a carbohydrogen originally procured by distilling benzoic acid with lime. (See *Appendix.*) It is characterized by having an odour closely resembling that of the oil of bitter almonds, for which it has recently been substituted to a considerable extent in perfumery, in consequence of the discovery of benzole among the products of the distillation of coal tar, and the facility thus offered for preparing the nitrobenzole cheaply. In its preparation a large glass worm is used, bifurcated at its upper end, so as to form two funnel-shaped tubes. Into one of these concentrated nitric acid is poured, and into the other benzole, and the two, meeting at the point of junction of the tubes, form the compound in question, which is cooled as it passes through the worm, and is afterwards fitted for use by washing it with water, or dilute solution of carbonate of soda. Large quantities of it are said to be consumed, in London, for scenting soap, in confectionery, and for culinary purposes, to which it is even better adapted than the proper oil of bitter almonds, because free from hydrocyanic acid. (See *Pharm. Journ. and Trans.*, xi. 421.)—*Note to the tenth edition.*

a manner closely analogous to that of hydrocyanic acid. A single drop is sufficient to destroy a bird, and four drops have occasioned the death of a dog of middle size. It might probably be substituted with advantage for medicinal hydrocyanic acid; as the acid contained in the oil is much less liable to decomposition, remaining for several years unaltered, if the oil is preserved in well stopped bottles. According to Schrader, 100 parts of the oil contain sufficient acid for the production of 22·5 parts of Prussian blue. From this fact it may be inferred that the oil is about four times as strong as our officinal hydrocyanic acid, and may therefore be given in the dose of from a quarter of a drop to a drop, to be gradually and cautiously increased till some effect upon the system is observed. It may be administered in emulsion with gum Arabic, loaf sugar, and water. It has been employed externally, dissolved in water in the proportion of one drop to a fluidounce, in prurigo senilis and other cases of troublesome itching. To facilitate the solution in water, the oil may be previously dissolved in spirit.

Off. Prep. Aqua Amygdalæ Amaræ. W.

OLEUM BERGAMII. *U. S.*

Oil of Bergamot.

The volatile oil of the rind of the fruit of Citrus Limetta. (*De Candolle.*) *U. S.*

Off. Syn. BERGAMOTÆ OLEUM. Volatile oil of the rind of the fruit of Citrus Limetta. *Ed.*

Huile de bergamotte, *Fr.;* Bergamottöl, *Germ.;* Oleo di bergamotta, *Ital.*

CITRUS. See AURANTII CORTEX.

Citrus Limetta. De Cand. *Prodrom.* i. 539. The bergamot tree has been ranked by botanists generally among the lemons; but is now considered as a variety of the Citrus Limetta of Risso, and is so placed by De Candolle. It has oblong-ovate, dentate, acute, or obtuse leaves, somewhat paler on the under than the upper surface, and with footstalks more or less winged or margined. The flowers are white, and usually small; the fruit pyriform or roundish, terminated by an obtuse point, with concave receptacles of oil in the rind.

The pulp of the fruit is sourish, somewhat aromatic, and not disagreeable to the taste. The rind is shining, and of a pale-yellow colour, and abounds in a very grateful volatile oil. This may be obtained by expression or distillation. In the former case, it preserves the agreeable flavour of the rind, but is somewhat turbid; in the latter, it is limpid but less sweet. The mode of procuring it by expression is exactly that used for oil of lemons. (See *Oleum Limonis.*) It is brought from the South of France, Italy, and Portugal.

The oil of bergamot, often called *essence of bergamot*, has a sweet, very agreeable odour, a bitter aromatic pungent taste, and a pale greenish-yellow colour. Its sp. gr. is 0·885, and its composition the same as that of the oil of lemons. It is distinguished from the lemon and orange oils by readily dissolving in *liquor potassæ*, and forming with it a clear solution. (*Zeller.*) Though possessed of the excitant properties of the volatile oils in general, it is employed chiefly, if not exclusively, as a perfume.

Off. Prep. Unguentum Sulphuris Compositum. W.

OLEUM BUBULUM. *U. S.*

Neats-foot Oil.

The oil prepared from the bones of Bos domesticus. *U. S.*

Huile de pied de bœuf, *Fr.;* Ochsenfussefett, *Germ.*

Neats-foot oil is obtained by boiling in water for a long time the feet of the

ox, previously deprived of their hoofs. The fat and oil which rise to the surface are removed, and introduced into a fresh portion of water heated nearly to the boiling point. The impurities having subsided, the oil is drawn off, and, if required to be very pure, is again introduced into water, which is kept for twenty-four hours sufficiently warm to enable the fat which is mixed with the oil to separate from it. The liquid being then allowed to cool, the fat concretes, and the oil is removed and strained, or filtered through layers of small fragments of charcoal free from powder.

The oil is yellowish, and, when properly prepared, inodorous and of a bland taste. It thickens or congeals with great difficulty, and is, therefore, very useful for greasing machinery in order to prevent friction.

It was introduced into the officinal catalogue of the United States Pharmacopœia as an ingredient of the ointment of nitrate of mercury. It has recently been used as a substitute for cod-liver oil in scrofulous diseases, and, according to Dr. C. R. Hall, of England, with very happy effects, especially in cases in which the latter does not agree with the stomach. It is apt to be laxative, and in certain cases proves useful in this way. It is given in the same dose as the cod-liver oil. (See *Am. Journ. of Med. Sci.*, N. S., xxiv. 498.)

Off. Prep. Unguentum Hydrargyri Nitratis. W.

OLEUM CAJUPUTI. *U. S. Secondary.*

Cajeput Oil.

The volatile oil of the leaves of Melaleuca Cajuputi. *U. S.*

Off. Syn. CAJUPUTI. Melaleuca minor. Oil distilled from the leaves. *Lond.;* CAJUPUTI OLEUM. Volatile oil of the leaves of Melaleuca minor. *Ed.;* CAJEPUTUM. Melaleuca Cajeputi. Volatile oil of the leaves. *Dub.*

Huile de cajéput, *Fr.;* Kajeputöl, *Germ.;* Olio di cajeput, *Ital.;* Kayuputieh, *Malay.*

MELALEUCA. *Sex. Syst.* Polyadelphia Icosandria.—*Nat. Ord.* Myrtaceæ.

Gen. Ch. Calyx five-parted, semi-superior. *Corolla* five-petaled. *Stamens* about forty-five, very long, conjoined in five bodies. *Style* single. *Capsule* three-celled. *Seeds* numerous. *Roxburgh.*

It was long supposed that the oil of cajeput was derived from *Melaleuca leucadendron;* but from specimens of the plant affording it, sent from the Moluccas, and cultivated in the botanical garden of Calcutta, it appears to be a distinct species, which has received the name of *M. Cajuputi.* It corresponds with the *arbor alba minor* of Rumphius, and is a smaller plant than *M. leucadendron.* It is possible, however, that the oil may be obtained from different species of Melaleuca; as M. Stickel, of Jena, succeeded in procuring from the leaves of *M. hypericifolia*, cultivated in the botanical garden of that place, a specimen of oil not distinguishable from the cajeput oil of commerce, except by a paler green colour. (*Annal. der Pharm.*, xix. 224.)

Melaleuca Cajuputi. Rumphius, *Herbar. Amboinense*, tom. ii. tab. 17; Roxburgh, *Trans. Lond. Med. Bot. Soc.* A. D. 1829; *Journ. of the Phil. Col. of Pharm.* vol. i. p. 193.—*Melaleuca minor.* De Candolle. This is a small tree, with an erect but crooked stem, and scattered branches, the slender twigs of which droop like those of the weeping willow. The bark is of a whitish-ash colour, very thick, soft, spongy, and lamellated, throwing off its exterior layer from time to time in flakes, like the birch tree. The leaves have short footstalks; are alternate, lanceolate, when young sericeous, when full grown smooth, deep-green, three and five-nerved, slightly falcate, entire, from three to five inches long, from one-half to three-quarters of an inch broad; and when bruised exhale a strong aromatic odour. The flowers, which are small, white, inodorous, and sessile, are disposed in terminal and axillary downy spikes, with solitary,

lanceolate, three-flowered bractes. The filaments are three or four times longer than the petals, and both are inserted in the rim of the calyx.

This species of Melaleuca is a native of the Moluccas, and other neighbouring islands. The oil is obtained from the leaves by distillation. It is prepared chiefly in Amboyna and Bouro, and is exported from the East Indies in glass bottles. The small proportion yielded by the leaves, and the extensive use made of it in India, render it very costly.

Properties. Cajeput oil is very fluid, transparent, of a fine green colour, a lively and penetrating odour analogous to that of camphor and cardamom, and a warm pungent taste. It is very volatile and inflammable, burning without any residue. The sp. gr., according to Dr. Thomson, varies from 0·914 to 0·9274. The oil is wholly soluble in alcohol. When it is distilled, a light colourless liquid first comes over, and afterwards a green and denser one. The green colour has been ascribed to a salt of copper, derived from the vessels in which the distillation is performed; and Guibourt obtained two grains and a half of oxide of copper from a pound of the commercial oil. But neither Brande nor Gœrtner could detect copper in specimens which they examined; and M. Lesson, who witnessed the process for preparing the oil at Bouro, attributes its colour to chlorophylle, or some analogous principle, and states that it is rendered colourless by rectification. Guibourt, moreover, obtained a green oil by distilling the leaves of a Melaleuca cultivated at Paris. A fair inference is that the oil of cajeput is naturally green; but that, as found in commerce, it sometimes contains copper, either accidentally present, or added with a view of imitating or maintaining the fine colour of the oil. The proportion of copper, however, is not so great as to interfere with the internal use of the oil; and the metal may be readily separated by distillation with water, or agitation with a solution of ferrocyanuret of potassium. (*Guibourt.*)

The high price of cajeput oil has led to its occasional adulteration. The oil of rosemary, or that of turpentine, impregnated with camphor and coloured with the resin of milfoil, is said to be employed for the purpose. The best test, according to Zeller, is iodine, which, after a moderately energetic reaction, with little increase of temperature, and but a slight development of orange vapours, occasions immediate inspissation into a loose coagulum, which soon becomes a dry, greenish-brown, brittle mass.

Medical Properties and Uses. This oil is highly stimulant, producing when swallowed a sense of heat, with an increased fulness and frequency of pulse, and exciting in some instances profuse perspiration. It is much esteemed by the Malays and other people of the East, who consider it a universal panacea. They are said to employ it with great success in epilepsy and palsy. (*Ainslie.*) The complaints to which it is best adapted are probably chronic rheumatism, and spasmodic affections of the stomach and bowels, unconnected with inflammation. It has been extolled as a remedy in spasmodic cholera, and has been used also as a diffusible stimulant in low fevers. Diluted with an equal proportion of olive oil, it is applied externally to relieve gouty and rheumatic pains. Like most other highly stimulating essential oils, it relieves toothache, if introduced into the hollow of the carious tooth. The dose is from one to five drops, given in emulsion, or upon a lump of sugar. W.

OLEUM CINNAMOMI. *U. S., Dub.*

Oil of Cinnamon.

The volatile oil of the bark of Cinnamomum Zeylanicum, and Cinnamomum aromaticum. *U. S.* Of Cinnamomum Zeylanicum. *Dub.*

Off. Syn. CINNAMOMI OLEUM. Cinnamomum Zeylanicum. Oil distilled

from the bark. *Lond.;* CINNAMOMI OLEUM. Volatile oil of the bark of Cinnamomum Zeylanicum. CASSIÆ OLEUM. Volatile oil of the bark of Cinnamomum Cassia. *Ed.*

Huile de cannelle, *Fr.;* Zimmtöl, *Germ.;* Olio di cannella, *Ital.;* Aceyte de cannela, *Span.*

See CINNAMOMUM.

The U. S. Pharmacopœia includes, under the name of *Oil of Cinnamon*, both the oil procured from the Ceylon cinnamon, and that from the Chinese cinnamon or cassia. As these oils, though very different in price, and slightly in flavour, have the same medical properties, are used for the same purposes, are often sold by the same name, and are not unfrequently mixed together, there does not seem to be sufficient ground for maintaining any officinal distinction between them. Nevertheless, the Edinburgh College has given them distinct names, designating the one as oil of cinnamon, and the other as oil of cassia.

Oil of cinnamon of Ceylon is prepared in that island from the inferior kinds of cinnamon, which are of insufficient value to pay the export duty. The following account of the method of extraction is given by Marshall. The bark, having been coarsely powdered, is macerated for two days in sea-water, and then submitted to distillation. A light and a heavy oil come over with the water, the former of which separates in a few hours, and swims upon the surface, the latter falls to the bottom of the receiver, and continues to be deposited for ten or twelve days. In future distillations, the saturated cinnamon water is employed in connexion with sea-water to macerate the cinnamon. Eighty pounds of the freshly prepared bark yield about two and a half ounces of the lighter oil, and five and a half of the heavier. From the same quantity kept for several years in store, about half an ounce less of each oil is obtained. The two kinds are probably united in the oil of commerce.

Recently prepared oil of cinnamon is of a light-yellow colour, becoming deeper by age, and ultimately red. Pereira states that the London druggists redistil the red oil, and thus obtain two pale yellow oils, one lighter and the other heavier than water, with a loss of about ten per cent. in the process. The oil has the flavour of cinnamon in a concentrated state. When applied undiluted to the tongue, it is excessively hot and pungent. According to Dr. Duncan, it sometimes has a peppery taste, ascribable to an admixture of the leaves with the bark in the preparation of the oil.

Chinese oil of cinnamon (*oil of cassia*) is imported from Canton and Singapore. Like the former variety it is pale-yellow, becoming red with age. Its flavour is similar to that of the Ceylon oil, though inferior; and it commands a much less price. Zeller states that it is heavier, less liquid, and sooner rendered turbid by a reduction of temperature; that in the Ceylon oil iodine dissolves rapidly, with a considerable increase of heat, and the production of a tough residue, like extract; while in oil of cassia the reaction is slow, quiet, and with little heat, and the residue is soft or liquid. The following remarks apply to both oils.

Oil of cinnamon has the sp. gr. of about 1·035. Alcohol completely dissolves it; and, as it does not rise in any considerable quantity at the boiling temperature of that liquid, it may be obtained by forming a tincture of cinnamon and distilling off the menstruum. When exposed to the air, it absorbs oxygen, and is said to be slowly converted into a peculiar acid denominated *cinnamic* or *cinnamonic* acid, two distinct resins, and water. *Cinnamic acid* is colourless, crystalline, of a sourish taste, volatilizable, slightly soluble in water, readily dissolved by alcohol, and convertible by nitric acid with heat into benzoic acid. It is sometimes seen in crystals in bottles of the oil which have been long kept. Like benzoic acid, it is said when swallowed to occasion the elimination of hippuric acid by urine. (*Journ. de Pharm.*, 3e *sér.*, iii. 64.) It may be obtained by distilling the balsam of Tolu. Of the two resins, one is soluble both in hot and cold alcohol; the other readily in the former, but sparingly in the latter. Oil

of cinnamon is almost wholly converted by nitric acid, slowly added, into a crystalline mass, which is supposed to be a compound of the oil and acid. The researches of Dumas and Peligot have led to the opinion, that there exists in the oil a compound radical, named *cinnamyle* ($C_{18}H_7O_2$), which unites with one eq. of hydrogen to form oil of cinnamon, and with one of oxygen to form anhydrous cinnamic acid. Crystallized cinnamic acid contains, in addition, one eq. of water.

Oil of cinnamon is said to be frequently adulterated with oil of cloves, which, according to Ulex, cannot be detected by the smell or taste. When thus sophisticated, it is stated, on the same authority, to evolve a very acrid vapour when a drop is heated on a watch-glass, to swell up and evolve red vapours if treated with fuming nitric acid, to remain liquid with concentrated caustic potassa, and to assume an indigo-blue colour when protochloride of iron is added to its alcoholic solution; none of which events happens when the oil is pure. (*Archiv. der Pharm.*, Jan. 7, 1853.) It is said also to be frequently adulterated with alcohol and fixed oil, for the mode of detecting which, see the general observations on volatile oils (*page* 497).

Medical Properties and Uses. This oil has the cordial and carminative properties of cinnamon, without its astringency; and is much employed as an adjuvant to other medicines, the taste of which it corrects or conceals, while it conciliates the stomach. As a powerful local stimulant, it is sometimes prescribed in gastrodynia, flatulent colic, and languor from gastric debility. The dose is one or two drops, and may be most conveniently administered in the form of emulsion. Mitscherlich found six drachms to kill a moderate-sized dog in five hours, and two drachms in forty hours. Inflammation and corrosion of the gastric and intestinal mucous membrane were observed after death.

Off. Prep. Aqua Cinnamomi; Essentia Cinnamomi; Mistura Spiritûs Vini Gallici; Spiritus Ammoniæ Aromaticus; Spiritus Cinnamomi. W.

OLEUM LIMONIS. *U. S.*

Oil of Lemons.

The volatile oil of the rind of the fruit of Citrus Limonum. *U. S.*

Off. Syn. LIMONUM OLEUM. Citrus Limonum. Volatile oil expressed from the rind of the fruit. *Lond.* Volatile oil of the rind of the fruit of Citrus medica. *Ed.;* CITRUS LIMONUM. The volatile oil. *Dub.*

Huile de citron, *Fr.;* Citronenöl, *Germ.;* Olio di limone, *Ital.;* Aceyte de limon, *Span.*

See LIMON.

The exterior rind of the lemon abounds in an essential oil, which, as it is contained in distinct cellules, may be separated by simple expression. The rind is first grated from the fruit, and then submitted to pressure in a bag of fine cloth. The oil thus obtained is allowed to stand till it becomes clear, when it is decanted, and preserved in stopped bottles. By a similar process, the oil called by the French *huile de cedrat* is procured from the citron. (See *Oleum Bergamii* and *Limon.*) These oils may also be obtained by distillation; but thus procured, though clearer, and, in consequence of the absence of mucilage, less liable to change on keeping, they have less of the peculiar flavour of the fruit; and the mode by expression is generally preferred. They are brought originally from Italy, Portugal, or the South of France.

Properties. Oil of lemons is a very volatile fluid, having the odour of the fruit, and a warm, pungent, aromatic taste. As ordinarily procured it is yellow, and has the specific gravity 0·8517; but by distillation it is rendered colourless, and, if three-fifths only are distilled, its sp. gr. is reduced to 0·847, at 71° F. It is soluble in all proportions in anhydrous alcohol. When pure, it consists exclusively of carbon and hydrogen, and is identical in composition with pure oil of turpentine, or camphene; its formula being $C_{10}H_8$. In this state it is capable

of absorbing almost half its weight of muriatic acid gas, by which it is converted into a crystalline substance, and a yellow oily fuming liquid. The crystalline substance is analogous to the artificial camphor produced by the action of muriatic acid upon oil of turpentine, and is a compound of the oil and acid. The oil of lemons is said to consist of two isomeric oils.

It is often adulterated by the fixed oils and by alcohol. (See *page* 497.) But in this country the most frequent sophistication is with the oil of turpentine, which is difficult of detection from its similar composition and specific gravity. Perhaps the best means of ascertaining the presence of this oil is the terebinthinate smell produced when the adulterated oil is evaporated from heated paper. Oil of lemons, procured by expression, is apt to let fall a deposit, and to undergo chemical change. Mr. J. S. Cobb has found no method so effectual to obviate this result, and at the same time to retain unimpaired the flavour of the oil, as to shake it with a little boiling water, and allow the mixture to stand. A mucilaginous matter separates and floats on the surface of the water, from which the purified oil may be decanted. (*Annals of Pharm.*, ii. 86.)

Medical Properties and Uses. Oil of lemons has the stimulant properties of the aromatics; but is chiefly used to impart a pleasant flavour to other medicines. It has been commended as an application to the eye in certain cases of ophthalmia.

Off. Prep. Liquor Potassæ Citratis; Spiritus Ammoniæ Aromaticus; Syrupus Acidi Citrici; Trochisci Acidi Tartarici; Unguentum Veratri Albi. W.

OLEUM LINI. *U. S.*

Flaxseed Oil.

The oil of the seeds of Linum usitatissimum. *U. S.*

Off. Syn. LINI OLEUM. Linum usitatissimum. Oil expressed from the seeds. *Lond., Ed.* LINUM USITATISSIMUM. The Oil expressed from the seeds. *Dub.*

Linseed oil; Huile de lin, *Fr.;* Leinöl, *Germ.;* Olio di lino, *Ital.;* Aceyte de linaza, *Span.*

See LINUM.

This oil is obtained by expression from the seeds of *Linum usitatissimum*, or common flax. In its preparation on a large scale, the seeds are usually roasted before being pressed, in order to destroy the gummy matter contained in their exterior coating. The oil is thus obtained more free from mucilage, but more highly-coloured and more acrid than that procured by cold expression. For medical use, therefore, it should be prepared without heat; and, as it is apt to become rancid quickly on exposure to the air, it should be used as recently expressed as possible. It may, however, be rendered sweet again by agitation with warm water, rest, and decantation. Flaxseed oil has a yellowish-brown colour, a disagreeable odour, and a nauseous somewhat acrid taste; is of the sp. gr. 0·932; boils at 600° F.; does not congeal at zero; dissolves in forty parts of cold and five of boiling alcohol, and in one part and a half of ether (*Christison's Dispensatory*); and has the property of drying, or becoming solid on exposure to the air. Its acrimony is owing to the presence of a small proportion of an acrid oleo-resin. On account of its drying property, it is highly useful in painting, and the formation of printers' ink.

Medical Properties and Uses. It is laxative in the dose of a fluidounce; but on account of its disagreeable taste is seldom given internally. It has, however, been highly recommended as a cure for piles in the dose of two ounces of the fresh oil morning and evening. It is sometimes added to purgative enemata; but its most common application is externally to burns, usually in combination with lime-water.

Off. Prep. Ceratum Resinæ Compositum; Linimentum Calcis. W.

OLEUM MORRHUÆ. *U. S., Dub.*

Cod-liver Oil.

A fixed oil obtained from the liver of Gadus Morrhua. *U. S.* Morrhua vulgaris. The oil obtained from the liver. *Dub.*

Off. Syn. MORRHUÆ OLEUM. Gadus Morrhua. The oil obtained from the liver. *Lond.*

Oleum jecoris Aselli; Huile de morue, *Fr.;* Stockfischleberthran, *Germ.*

GADUS. *Class* Pisces. *Order* Jugulares. *Linn.* Malacopterygii Subbrachiati. *Family* Gadidæ. *Cuvier.*

Gen. Ch. Recognised by the ventrals attached under the throat, and attenuated to a point.

Gadus Morrhua. Linn. *Syst. Nat. ed. Gmelin*, i. p. 1162; Cuvier, *Règne Animale*, ii. 212; Bloch. *Ichthyologie*, pl. lxiv.—*Morrhua vulgaris.* Storer. *Synops. of Fishes of N. Am.* p. 216. The *common cod* is usually between two and three feet long, with brown or yellowish spots on the back. The body is moderately elongated and somewhat compressed, and covered with soft rather small scales, of which the head is destitute. Of the fins, which are soft, there are three on the back, two anal, and a distinct caudal; and the fin under the throat is narrow and pointed. The jaws are furnished with pointed irregular teeth, in several ranks. The gills are large with seven rays. This species of cod inhabits the Northern Atlantic, and is especially abundant on the banks of Newfoundland, where it finds food adapted to its wants.

Besides the common cod, several other species of Gadus, frequenting the seas of Northern Europe and America, contribute to furnish the cod-liver oil of commerce. Among these De Jongh mentions *Gadus callarias* or *dorsch* (*Morrhua Americana* of Storer), *G. carbonarius* or *coal-fish*, and *G. pollachius* or *pollock*, as affording the oil on the coast of Norway; while, from information obtained by Professor Procter, there is reason to believe that, on our own coast, in addition to the pollock above mentioned, it is obtained also from the *hake* (*G. merluccius*) and the *haddock* (*G. Æglifinus*).

Preparation. Fishermen have long been in the habit of collecting this oil, which is largely consumed in the arts, particularly in the preparation of leather. Upon the coasts of Newfoundland, Nova Scotia, and New England, the boats which fish near the shore, being small, soon obtain a load, and running in to land, deliver their cargoes to persons whose business it is to cleanse and salt the fish. The oil is prepared either in the huts of the fishermen, or more largely at establishments to which the livers are conveyed in quantities. These are put into a boiler with water, and heated until they are broken up into a pultaceous mass, which is thrown upon a strainer covering the top of a cask or tub. The liquid portion passes, and upon standing separates into two parts, the oil rising to the surface of the water. The oil is then drawn off, and, having been again strained, is prepared for the market. Another and improved method, which has come into use since the extensive employment of the oil as a medicine, is to heat the livers in a large tin vessel by means of steam externally applied. The pultaceous mass resulting is drained as before mentioned; the livers themselves containing, besides oil, a considerable portion of watery fluid, which passes off with it in the form of emulsion, and separates on standing. The oil thus procured is called *shore oil*, and is the purest kind. The crews of the larger boats, which fish upon the banks far from land, cleanse the fish on board, and throwing the offal into the sea, put the livers into barrels or other receptacles, where they undergo a gradual putrefactive decomposition, the oil rising to the surface as it

escapes from the disintegrating tissue. The oil which first rises, before putrefaction has very decidedly commenced, approaches in purity to the shore oil, but is somewhat darker and less sweet. This is sometimes drawn off, constituting the *straits* oil of the fishermen. The remaining mass, or the whole, if the portion which first rises be not separated, remains exposed a variable length of time to the heat of the sun, undergoing putrefaction, until the boat, having completed her cargo, returns to port. The contents of the casks are then put into boilers, heated with water, and treated as already described. Before being finally put into barrels, the oil is heated to expel all its water. Thus prepared, it is denominated *banks oil*, and is of the darkest colour, and most offensive to the taste and smell. Much of the oil prepared by the fisherman is collected by the wholesale dealers, who keep it in very large reservoirs of masonry in their cellars, where it becomes clarified by repose, and is pumped into barrels as wanted for sale. By the further exposure, however, which it thus undergoes, it acquires a still more offensive odour; while that which has been orignally introduced into barrels, and thus kept excluded from the air, is better preserved. The above facts in relation to the collection of cod-liver oil have been mainly derived from a very interesting paper by Professor Procter in the *Am. Journ. of Pharm.* (xxiii. 97). To the same journal (xxvi. 1) the reader is referred for an account by Dr. E. H. Robinson, of Nova Scotia, of the method in which the oil is prepared by the fishermen of that Province.

The oil is sometimes procured by expression. Mr. Donovan recommends the following plan, which affords a very fine oil. The livers, perfectly sound and fresh, are to be placed in a clean iron pot over a slow fire, and stirred until they assume the condition of a pulp, care being taken that the mass be not heated beyond 192°. When this temperature is attained, the pot is to be removed from the fire, and its contents introduced into a canvas bag, through which water and oil will flow into a vessel beneath. After twenty-four hours, the oil is to be decanted and filtered through paper. In this state it is pale-yellow, with little odour, and a bland not disagreeable taste.

Properties. Three varieties of cod-liver oil are known in the market, the *white* or *pale-yellow*, the *brownish-yellow*, and the *dark-brown*, corresponding to the three commercial varieties already alluded to. These differ in no essential character, but simply from the mode of preparation; the pale being prepared from fresh sweet livers, the dark-brown from livers in a state of putrefaction, and the brownish-yellow from those in an intermediate state; and the three varieties run together by insensible shades. The colour of the pale is from the slightest tint of transparent yellow, to a fine golden yellow, that of the light-brown very similar to the colour of Malaga wine, that of the dark-brown what its name implies, with opacity in mass, but transparency in thin layers. They are of the usual consistence of lamp-oil, and have a peculiar odour and taste by which they may be distinguished from all other oils. This smell and taste are familiar to most persons, being very similar to those of shoe-leather, at least as prepared in this country, where the curriers make great use of the cod-liver oil. We regard these sensible properties as the most certain test of the genuineness of the oil. They are much less distinguishable in the pale than in the dark-brown varieties, but we have met with no specimen which did not possess them in some degree. In the purest they are scarcely repulsive, in the dark-brown they are very much so. When a decided smell of ordinary fish-oil is perceived, the medicine may always be suspected. It is quite distinct from that peculiar to the cod-liver oil. The taste of all the varieties is more or less acrid, and in the most impure is bitterish and somewhat empyreumatic. The sp. gr. at 72° F., as ascertained by Prof. Procter, varied from 0·915 to 0·9195; the first being that of the *hake* oil, the second that of the *haddock*, while the sp. gr. of the

purest oil from the common cod was 0·917. De Jongh found the sp. gr., at 63° F., of the pale 0·923, of the light-brown 0·924, of the dark-brown 0·929.

From an analysis of the oil by De Jongh, it appears to consist of a peculiar substance named gaduin; oleic and margaric acids with glycerin; butyric and acetic acids; various biliary principles, as fellinic, cholic, and bilifellinic acids, and bilifulvin; a peculiar substance soluble in alcohol; a peculiar substance insoluble in water, alcohol, or ether; iodine, chlorine, and traces of bromine; phosphoric and sulphuric acids, phosphorus, lime, magnesia, soda, and iron. These were found in all the varieties, though not in equal proportion in all; yet it is quite uncertain whether the difference had any relation to their degree of efficacy. *Gaduin* is obtained by saponifying the oil with soda, decomposing the soap by acetate of lead, and treating the resulting lead soap with ether, which dissolves the oleate of lead and gaduin, leaving the margarate of lead behind. The ethereal solution, which is dark-brown, is decomposed by sulphuric acid, which liberates the brown oleic acid. This owes its colour to gaduin, to separate which soda is added in excess; the resulting oleate of soda, which is insoluble in an excess of the alkali, is dissolved in alcohol; and the alcoholic solution is cooled below 32°, by which means the oleate of soda is separated, the gaduin remaining in solution. This is precipitated from its solution by the addition of sulphuric acid. Gaduin is a dark-brown substance, brittle and pulverizable when dry, without odour or taste, quite insoluble in water, and in great measure soluble in ether and alcohol. It is insoluble in nitric and muriatic acids, but is dissolved by sulphuric acid, giving a blood-red colour to the solution, from which it is precipitated by water and the alkalies. It is soluble in alkaline solutions. Chlorine decolorizes it. Its formula is $C_{35}H_{23}O_9$. Gaduin itself is yellow, but becomes brown by exposure to the air. It has not been ascertained to be in any degree connected with the virtues of the oil. It is not improbable that the biliary principles associated with the oil are concerned in its peculiar influences; as it is by their presence mainly that this differs from other oils. It has been thought that gaduin itself is of biliary origin. Winckler has inferred from his researches that cod-liver oil is an organic whole, differing from all other fixed oils. Thus, it yields no glycerin upon saponification, but, in place of it a peculiar body which he denominates oxide of propyle. The fatty acids generated are the oleic and margaric. By reaction with ammonia in distillation, the oil yields a peculiar volatile alkali, called *propylamin*, which has a strong pungent odour, recalling that of herring-pickle, of which the same alkali is an ingredient. No other officinal fatty oil yields a similar product. (See *Am. Journ. of Pharm.*, xxiv. 343.) Some have been disposed to ascribe the virtues of the oil to its iodine and bromine; but these are in too small proportion for much effect, and the oil has produced results which have never been obtained from iodine and bromine themselves. The presence of iodine cannot be detected by the usual tests. It is necessary to convert the oil into a soap, and to carbonize this before it will give evidence of iodine. The proportion never exceeds 0·05 per cent. or 1 part in 2000. The oil is capable of dissolving a larger proportion; and, if any specimen contain more, there is reason to suppose that it has been fraudulently added.

Tests of Purity. In consequence of the great demand for this oil it has not unfrequently been adulterated with other fixed oils, and occasionally others have been fraudulently substituted for it. The importance, therefore, is obvious of ascertaining some mode of testing its purity and genuineness. There is reason to believe that all the oils from the livers of the Gadidæ have analogous properties. They have been indiscriminately used; and upon the results of their employment is based, in part, the present reputation of the medicine. They may, therefore, be considered as in fact one oil, so far as their medicinal use is concerned. Unfortunately chemistry has yet discovered no perfectly reliable test. The

furthest that it has yet gone is to point out certain reactions which may be considered as evidences of the presence of biliary principles in the oil, thus indicating its hepatic origin. Among these probably the most characteristic is that of sulphuric acid, a drop of which, added to fresh cod-liver oil, causes a fine violet colour, soon passing into yellowish or brownish-red. Sometimes, instead of assuming the violet hue, the colour immediately becomes a clear red, or dark brownish-red. This is said to be especially the case with those specimens of the oil which have been prepared by boiling the livers with water. Strong nitric acid produces instantly, when agitated with the oil, a pinkish colour, which soon becomes brown. According to Winckler, the oil should afford the smell of herring-pickle when heated with potassa, lime, and muriate of ammonia. But the most reliable tests are the sensible properties of odour and taste. If there be none of the peculiar shoe-leather smell and taste, or if a strong lamp-oil odour is perceptible, the oil may be suspected. Little of importance can be inferred from the colour. Some have been disposed to prefer the dark offensive oil; but our own experience accords with that of those who have found the pale or light-brown equally efficient; and for facility of administration and acceptability to the stomach the latter is greatly preferable.

It is important that the oil should be secluded from the air, which effects a gradual change, no doubt impairing its efficiency. Hence, the vessels containing it should be full; and apothecaries ought to keep it in bottles well stopped, holding about the quantity generally wanted for use at one time.

Medical Properties and Uses. Cod-liver oil has been long popularly employed in Northern Europe in rheumatic and strumous diseases. It was first brought to the notice of the profession generally by German practitioners, and had acquired great reputation on the continent before it was used to any extent in Great Britain. At Manchester, in England, it was employed by the medical profession in the treatment of chronic rheumatism and gout, as early as 1766. But it was not until the appearance of the treatise of Professor Bennet, of Edinburgh, in 1841, that it came into general notice in Great Britain and the United States. It is at present one of the most esteemed remedies in the catalogue of the Materia Medica. The diseases in which it has proved most efficient are chronic rheumatism and gout, and the various morbid affections connected with a scrofulous diathesis, such as external glandular scrofula, diseases of the joints and spine, carious ulcers, tabes mesenterica, rickets, and phthisis. It has been found useful also in chronic cutaneous eruptions, lupus, ulcers of the mouth, some varieties of palsy, chronic pectoral complaints not tuberculous, obstinate constipation, intestinal worms, and incontinence of urine; and may be employed with the hope of good in all chronic cases in which the disease appears to consist mainly in impaired digestion, assimilation, and nutrition. In another publication, one of the authors has stated that he had employed the oil occasionally in phthisis, but with no other observable effect than to nauseate the stomach. This unfavourable experience was owing to a too hasty abandonment of the medicine, after a trial in each case of only two or three weeks. His opinion of its virtues has since changed; and he is now prepared to say that it has far exceeded in efficacy, in his hands, any other remedy or combination of remedies that he has hitherto employed in phthisis. It is necessary, however, to persevere for four or six weeks before looking for any decidedly favourable result, though the change does often begin earlier. In most cases remarkable temporary relief is afforded; in many, the disease is favourably modified, and its fatal termination postponed; and in some, cures appear to have been effected. Time, however, is yet wanted fully to determine its merits.

As to its mode of action, there has been much difference of opinion. Some consider it merely as a nutritive agent, having the advantage over other oleagi-

nous substances of a readier entrance into the system, and more easy assimilation. But we cannot agree with this opinion. Other oleaginous substances, certainly not less nutritious, have not been equally efficient, though taken in much larger quantities. If this be the true explanation, persons living chiefly on milk which abounds in oil, or on fat pork, ought to show a special exemption from scrofulous complaints. The probability appears to us to be that, in consequence of some peculiar principle or principles it contains, it exercises a stimulant and alterative impression on the processes of assimilation and nutrition; thereby causing the production of healthy tissue, instead of that abortive material which is deposited by the blood-vessels in scrofula and phthisis. With our views of the modus operandi of cod-liver oil, it would of course be contra-indicated in all cases where there is existing plethora, or a strong tendency to it. The medicine has been accused of having occasionally produced serious congestion of the lungs.

The dose is a tablespoonful three or four times a day for adults, a teaspoonful repeated as frequently for children, which may be gradually increased as the stomach will permit, and continued for a long time. It may be taken alone, or mixed with some vehicle calculated to conceal its taste, and obviate nauseating effects. For this purpose recourse may be had to any of the aromatic waters, to the aromatic tinctures, as the tincture of orange peel, diluted with water, or to a bitter infusion, as that of quassia. It may be given floating on the vehicle, or mixed with it by means of gum and sugar, in the form of an emulsion. Perhaps the best vehicle, when not contra-indicated, is the froth of porter. Let a tablespoonful of porter be put into the bottom of a glass, upon the surface of this the oil, and over all some of the froth of the porter. It is recommended to chew a small piece of orange-peel before and after taking the medicine. The oil is sometimes applied externally by friction, and, in cases of ascarides or lumbricoides, is injected into the rectum. It has been recommended locally in chronic articular affections, paralysis, various chronic cutaneous eruptions, and opacity of the cornea, after the subsidence of inflammation. In the last-mentioned affection, one or two drops of the oil are applied by means of a pencil to the cornea, and diluted, if found too stimulating, with olive or almond oil. It is said, when long used internally, to occasion sometimes an exanthematous or eczematous eruption. W.

OLEUM MYRISTICÆ. *U. S., Dub.*

Oil of Nutmeg.

The volatile oil of the kernels of the fruit of Myristica moschata. *U. S.* From the seeds or fruit. *Dub.*

Off. Syn. MYRISTICÆ OLEUM. Volatile oil from the kernels of the fruit of Myristica officinalis. *Ed.*

See MYRISTICA.

This oil is obtained from powdered nutmegs by distillation with water. It is colourless or of a pale straw colour, limpid, lighter than water, soluble in alcohol and ether, with a pungent spicy taste, and a strong smell of nutmeg. It consists of two oils, which may be separated by agitation with water, one rising to the surface, the other sinking to the bottom. Upon standing it deposits a crystalline stearoptene, which is called by John *myristicin*. The oil may be used for the same purposes as nutmeg, in the dose of two or three drops; but is not often employed.

Off. Prep. Spiritus Ammoniæ Aromaticus. W.

OLEUM OLIVÆ. *U. S., Dub.*

Olive Oil.

The oil of the fruit of Olea Europœa. *U. S.* Oil obtained from the pericarp. *Dub.*

Off. Syn. OLIVÆ OLEUM. Olea Europœa. Oil expressed from the fruit. *Lond.* Expressed oil of the pericarp. *Ed.*

Huile d'olive, *Fr.;* Olivenöl, *Germ.;* Olio delle olive, *Ital.;* Aceyte de olivas, *Span.*

OLEA. *Sex. Syst.* Diandria Monogynia.—*Nat. Ord.* Oleaceæ.

Gen. Ch. Corolla four-cleft, with subovate segments. *Drupe* one-seeded. *Willd.*

Olea Europœa. Willd. *Sp. Plant.* i. 44; Woodv. *Med. Bot.* p. 280, t. 98. This valuable tree is usually from fifteen to twenty feet in height, though it sometimes attains a much greater size, particularly in Greece and the Levant. It has a solid, erect, unequal stem, with numerous straight branches, covered with a grayish bark. The leaves, which stand opposite to each other on short footstalks, are evergreen, firm, lanceolate, entire, two or three inches in length, with the edges somewhat reverted, smooth and of a dull-green colour on their upper surface, whitish and almost silvery beneath. The flowers are small, whitish, and disposed in opposite axillary clusters, which are about half as long as the leaves, and accompanied with small, obtuse, hoary bractes. The fruit or olive is a smooth, oval drupe, of a greenish, whitish, or violet colour, with a fleshy pericarp, and a very hard nut of a similar shape. Clusters of flowers containing not less than thirty yield only two or three ripe olives.

The olive tree, though believed by some to have been originally from the Levant, flourishes at present in all the countries bordering on the Mediterranean, and has been cultivated from time immemorial in Spain, the South of France, and Italy. It begins to bear fruit after the second year, is in full bearing at six years, and continues to flourish for a century. There are several varieties, distinguished by the form of the leaves, and the shape, colour, and size of the fruit. The variety *longifolia* of Willdenow is said to be chiefly cultivated in Italy and the South of France, and the *latifolia* in Spain. The latter bears much larger fruit than the former; but the oil is less esteemed.

The leaves and bark of the olive tree have an acrid and bitterish taste, and have been employed as substitutes for cinchona, though with no great success. In hot countries, a substance resembling the gum-resins exudes spontaneously from the bark. It was thought by the ancients to possess useful medicinal properties, but is not now employed. Analyzed by Pelletier, it was found to contain resin, a little benzoic acid, and a peculiar principle analogous to gum, which has received the name of *olivile.* But the fruit is by far the most useful product of the tree. In the unripe state it is hard and insupportably acrid; but, when macerated in water or an alkaline solution, and afterwards introduced into a solution of common salt, it loses these properties, and becomes a pleasant and highly esteemed article of diet. The pericarp, or fleshy part of the ripe olive, abounds in a fixed oil, which constitutes its greatest value, and for which the tree is chiefly cultivated in the South of Europe. The oil is obtained by first bruising the olives in a mill, and then submitting them to pressure. The product varies much, according to the state of the fruit, and the circumstances of the process. The best oil, called *virgin oil,* is obtained from the fruit picked before perfect maturity, and immediately pressed. It is distinguished by its greenish hue. The common oil used for culinary purposes, and in the manufacture of the finest soaps, is procured from very ripe olives, or from the pulp

of those which have yielded the virgin oil. In the latter case, the pulp is thrown into boiling water, and the oil removed as it rises. An inferior kind, employed in the arts, especially in the preparation of the coarser soaps, plasters, unguents, &c., is afforded by fruit which has been thrown into heaps, and allowed to ferment for several days, or by the *marc* left after the expression of the finer kinds of oil, broken up, exposed to the fermenting process, and again introduced into the press.

Olive oil is imported in glass bottles, or in flasks surrounded by a kind of network made of grass, and usually called Florence flasks. The best comes from the South of France, where most care is exercised in the selection of the fruit.

Properties. The pure oil is an unctuous liquid, of a pale-yellow or greenish-yellow colour, with scarcely any smell, and a bland, slightly sweetish taste. Its sp. gr. is 0·9153. It is soluble in twice its volume of ether, but is only partially soluble in alcohol, at least unless this liquid be in very large proportion. It begins to congeal at 38° F. At a freezing temperature a part of it becomes solid, and the remainder, retaining the liquid consistence, may be separated by pressure, or by the agency of cold alcohol, which dissolves it. The concrete portion has been found by MM. Pelouze and Boudet to be a definite compound of margarin and olein; the liquid portion is uncombined olein. According to Braconnot, the oil contains 72 per cent of olein, and 28 of margarin. Olive oil is solidified by nitrous acid and by nitrate of mercury, and converted into a peculiar fatty substance, which has received the name of *elaïdin*. The olein of all oils which have not the drying property undergoes the same change, when acted on by nitrous acid; and the singular fact is stated by MM. Pelouze and Boudet, that the margarin of olive oil, combined as it is with olein, is converted by that acid into elaïdin, while the same principle, in a state of purity, is not affected by it. (*Journ. de Pharm.*, xxiv. 391.)

Olive oil, when exposed to the air, is apt to become rancid, acquiring a disagreeable smell, a sharp taste, a thicker consistence, and a deeper colour; and the change is promoted by heat. It is frequently adulterated with the cheaper fixed oils, especially with that of poppies; but the adulteration may be easily detected by reducing the temperature to the freezing point. As other oils are less readily congealed than the olive oil, the degree of its purity will be indicated by the degree of concretion. Another mode has been indicated by M. Poutet, founded on the property possessed by the supernitrate of mercury of solidifying the oil of olives, without a similar influence upon other oils. Six parts of mercury are dissolved at a low temperature in seven and a half parts of nitric acid of the sp. gr. 1·35; and this solution is mixed with the suspected oil in the proportion of one part to twelve, the mixture being occasionally shaken. If the oil is pure, it is converted after some hours into a yellow solid mass; if it contains a minute proportion, even so small as a twentieth of poppy oil, the resulting mass is much less firm; and a tenth prevents a greater degree of consistence than oils usually acquire when they concrete by cold. M. Gobel has invented an instrument which he calls the elaïometer, by which the smallest quantity of poppy oil can be detected. (See *Am. Journ. of Pharm.*, xvi. 24.) M. Diesel states that pure olive oil is coloured green by common nitric acid; whereas, if mixed with rape oil, it is rendered of a yellowish-gray colour. (*Arch. der Pharm.*, xlvi. 287.) According to M. Behrens, whose statement is confirmed by MM. Guibourt and Reveil, the presence of oil of sesamum is known by the beautiful deep-green colour immediately produced, when the suspected oil is added, in equal weight, to a mixture composed of equal parts of sulphuric and nitric acids; which acids cause with the pure oil, at first, a bright-yellow colour. (*Journ. de Pharm.*, 3*e sér.*, xxiv. 351.) Immense quantities of lard oil are said to be exported from this country to France, and employed in the adulteration of olive

oil. The reaction with nitric acid would probaby serve to detect this adulteration, which, however, in a pharmaceutical point of view, is of little inconvenience.

Medical Properties and Uses. Olive oil is nutritious and mildly laxative, and is occasionally given in cases of irritable intestines, when the patient objects to more disagreeable medicines. Taken into the stomach in large quantities, it serves to involve acrid and poisonous substances, and mitigate their action. It has also been recommended as a remedy for worms, and is a very common ingredient in laxative enemata. Externally applied, it is useful in relaxing the skin, and sheathing irritated surfaces from the action of the air; and is much employed as a vehicle or diluent of more active substances. In the countries bordering on the Mediterranean, it is thought, when smeared over the skin, to afford some protection against the plague; and applied warm, by means of friction over the surface, is said to be useful as a remedy in the early stages of that complaint. But the most extensive use of olive oil is in pharmacy, as a constituent of liniments, ointments, cerates, and plasters.

The dose as a laxative is from one to two fluidounces.

Off. Prep. Enema Catharticum. W.

OLEUM RICINI. *U. S., Dub.*

Castor Oil.

The oil of the seeds of Ricinus communis. *U. S., Dub.*

Off. Syn. RICINI OLEUM. Ricinus communis. Oil obtained from the seeds by heat or pressure. *Lond.* Expressed oil of the seeds. *Ed.*

Huile de ricin, *Fr.;* Ricinusöl, *Germ.;* Olio di ricino, *Ital.;* Aceyte de ricino, *Span.*

RICINUS. *Sex. Syst.* Monœcia Monadelphia.—*Nat. Ord.* Euphorbiaceæ.

Gen. Ch. MALE. *Calyx* five-parted. *Corolla* none. *Stamens* numerous. FEMALE. *Calyx* three-parted. *Corolla* none. *Styles* three, bifid. *Capsules* three-celled. *Seed* one. *Willd.*

Ricinus communis. Willd. *Sp. Plant.* iv. 564; Woodv. *Med. Bot.* p. 624, t. 221. The castor oil plant, or *palma Christi*, attains in the East Indies and Africa the character of a tree, and rises sometimes thirty or forty feet in height. In the temperate latitudes of North America and Europe it is an annual plant; though it is stated by M. Achille Richard that, in the South of France, in the vicinity of Nice, on the seacoast, he saw a small wood consisting entirely of this species of Ricinus. The following description applies to the plant as cultivated in cool latitudes. The stem is of vigorous growth, erect, round, hollow, smooth, glaucous, somewhat purplish towards the top, branching, and from three to eight feet or more in height. The leaves are alternate, peltate or supported upon footstalks inserted into their lower disk, palmate with seven or nine pointed serrate lobes, smooth on both sides, and of a bluish-green colour. The flowers are monœcious, stand upon jointed peduncles, and form a pyramidal terminal raceme, of which the lower portion is occupied by the male flowers, the upper by the female. Both are destitute of corolla. In the male flowers the calyx is divided into five oval, concave, pointed, reflected, purplish segments; and encloses numerous stamens, which are united into fasciculi at their base. In the female the calyx has three or five narrow lanceolate segments; and the ovary, which is roundish and three-sided, supports three linear, reddish stigmas, forked at their apex. The fruit is a roundish glaucous capsule, with three projecting sides, covered with tough spines, and divided into three cells, each containing one seed, which is expelled by the bursting of the capsule.

This species of Ricinus is a native of the East Indies and Northern Africa, has become naturalized in the West Indies, and is cultivated in various parts of

the world, in no country perhaps more largely than in the United States. New Jersey, Virginia, North Carolina, and the States upon the right bank of the Ohio, are the sections in which it is most abundant. The flowers appear in July, and the seeds ripen successively in August and September. A decoction of the leaves is said to be employed effectively, in the Cape Verde Islands, as a local application to the breast, for the purpose of promoting lactation. The officinal part is the fixed oil extracted from the seeds.

1. The Seeds. These are about as large as a small bean, oval, compressed, obtuse at the extremities, very smooth and shining, and of a grayish or ash colour, marbled with reddish-brown spots and veins. At one end of the seed is a small yellowish tubercle, from which an obscure longitudinal ridge proceeds to the opposite extremity, dividing the side upon which it is situated into two flattish surfaces. In its general appearance the seed is thought to resemble the insect called the *tick*, the Latin name of which has been adopted as the generic title of the plant. Its variegated colour depends upon a very thin pellicle, closely investing a hard, brittle, blackish, tasteless, easily separable shell, within which is the kernel, highly oleaginous, of a white colour, and a sweetish taste succeeded by a slight degree of acrimony. The seeds easily become rancid, and are then unfit for the extraction of the oil, which is acrid and irritating. In 100 parts of the seeds Geiger found, exclusive of moisture, 23·82 parts of envelope, and 69·09 of kernel. These 69·09 parts contained 46·19 of fixed oil, 2·40 of gum, 20·00 of starch and lignin, and 0·50 of albumen.

Taken internally the seeds are powerfully cathartic, and often emetic. Two or three are sufficient to purge, and seven or eight act with great violence. This property depends upon an acrid principle, which has by some been thought to exist exclusively in the integuments, by others in the embryo. But it is now satisfactorily ascertained that the integuments are inert; and Guibourt maintains that the principle alluded to pervades the whole kernel, in connexion with the oil. This principle is considered by some as volatile, and is said to be dissipated by the heat of boiling water. According to MM. Soubeiran and Mialhe, it is of a resinous character. (*Journ. de Pharm.*, 3*e sér.*, vi. 225.) M. Calloud, however, considers it neither oily nor resinous; having found the residue of the seeds, after expression of the oil, and treatment with pure alcohol, to be powerfully emetic in the quantity of thirty grains, taken in two doses. (*Ibid.*, xiv. 190.) M. Parola states that ether also is incapable of extracting the acrid emetic principle from the seeds. At a temperature much above 212° the oil itself becomes altered, and acquires acrid properties.

2. The Oil. This may be extracted from the seeds in three ways; 1. by decoction, 2. by expression, and 3. by the agency of alcohol.

The process by decoction, which has been practised in the East and West Indies, consists in bruising the seeds, previously deprived of their husk, and then boiling them in water. The oil, rising to the surface, is skimmed or strained off, and afterwards again boiled with a small quantity of water to dissipate the acrid principle. To increase the product it is said that the seeds are sometimes roasted. The oil is thus rendered brownish and acrid; and the same result takes place in the second boiling, if care is not taken to suspend the process soon after the water has been evaporated. Hence it happens that the West India oil has generally a brownish colour, an acrid taste, and irritating properties.

The oil is obtained, in this country, by expression. The following, as we have been informed, are the outlines of the process usually employed by those who prepare it on a large scale. The seeds, having been thoroughly cleansed from the dust and fragments of the capsules with which they are mixed, are conveyed into a shallow iron reservoir, where they are submitted to a gentle heat insufficient to scorch or decompose them, and not greater than can be readily borne by the

hand. The object of this step is to render the oil sufficiently liquid for easy expression. The seeds are then introduced into a powerful screw press. A whitish oily liquid is thus obtained, which is transferred to clean iron boilers, supplied with a considerable quantity of water. The mixture is boiled for some time, and, the impurities being skimmed off as they rise to the surface, a clear oil is at length left upon the top of the water, the mucilage and starch having been dissolved by this liquid, and the albumen coagulated by the heat. The latter ingredient forms a whitish layer between the oil and the water. The clear oil is now carefully removed; and the process is completed by boiling it with a minute proportion of water, and continuing the application of heat till aqueous vapour ceases to rise, and till a small portion of the liquid, taken out in a vial, preserves a perfect transparency when it cools. The effect of this last operation is to clarify the oil, and to render it less irritating by driving off the acrid volatile matter. But much care is requisite not to push the heat too far, as the oil then acquires a brownish hue, and an acrid peppery taste. After the completion of the process, the oil is put into barrels, and thus sent into the market. There is reason, however, to believe that much of the American oil is prepared by merely allowing it to stand for some time after expression, and then drawing off the supernatant liquid. One bushel of good seeds yields five or six quarts, or about twenty-five per cent. of the best oil. If not very carefully prepared, it is apt to deposit a sediment upon standing; and the apothecary often finds it necessary to filter it through coarse paper before dispensing it. Perhaps this may be owing to the plan just alluded to of purifying the oil by rest and decantation.* We have been told that the oil in barrels occasionally deposits a copious whitish sediment in cold weather, which it redissolves when the temperature rises. A large proportion of the drug consumed in the eastern section of the Union is derived, by way of New Orleans, from Illinois and the neighbouring States, where it is so abundant that it has sometimes been used for burning in lamps.

The process for obtaining castor oil by means of alcohol has been practised in France; but the product is said to become rancid more speedily than that procured in the ordinary mode. Such a preparation has been employed in Italy, and is asserted to be less disagreeable to the taste, and more effective than the common oil obtained by expression. According to M. Parola, an ethero-alcoholic extract, and an ethereal or alcoholic tincture of the seeds, operate in much smaller doses than the oil, and with less disposition to irritate the bowels or to cause vomiting. (See *Am. Journ. of Med. Sci.*, N. S., xiii. 143.)

Properties. Pure castor oil is a thick, viscid, colourless liquid, with little or no odour, and a mild though somewhat nauseous taste, followed by a slight sense of acrimony. As found in the shops it is often tinged with yellow, and has an unpleasant smell; and parcels are sometimes though rarely met with, of a brownish colour, and hot acrid taste. It does not readily congeal by cold. When exposed

* We find the following sentence in Christison's Dispensatory, p. 793. "If the statement made above on the authority of Boutron-Charlard, be correct [that no margarin is deposited by castor oil previously heated to 212°], this circumstance [the deposition of a crystalline matter by castor oil in cold weather], instead of being an objection, is strong proof of the American oil being really cold drawn, and not prepared by dry heat and ebullition as Drs. Wood and Bache have represented." In reply to this observation we have only to say, that we have ourselves witnessed the arrangements above described, and had the account of the steps of the process from the manufacturers, as it was at the time conducted in this city. But it may be observed that we do not state that the oil is prepared by dry heat; the warmth first employed, merely to render the oil fluid, not deserving to be so called. That American castor oil is also prepared by mere expression, rest, and decantation, we have stated in the text; but we are disposed to give the preference to that prepared by the former process, as freer from impurities, and therefore likely to keep better, and as milder in its action in consequence of the volatilization of a portion of the acrid principle.

to the air it slowly thickens, without becoming opaque, and it ranks among the drying oils. It is heavier than most of the other fixed oils, from which it differs also in being soluble in all proportions in cold absolute alcohol. Weaker alcohol, of the sp. gr. 0·8425, takes up about three-fifths of its weight. It has been supposed that adulterations with other fixed oils might thus be detected, as the latter are much less soluble in that fluid; but Pereira has shown that castor oil has the property of rendering a portion of other fixed oils soluble in alcohol; so that the test cannot be relied on. (*Pharm. Journ. and Trans.*, ix. 498.) Such adulterations, however, are seldom practised in this country. Castor oil is also soluble in sulphuric ether. Its proximate composition is but imperfectly understood. When distilled, it yields, according to MM. Bussy and Lecanu, 1. a colourless, highly odorous volatile oil, which crystallizes by cold, 2. two oleaginous acids, denominated ricinic and ricin-oleic, which are excessively acrid and nearly concrete, and 3. a solid spongy residue, amounting to two-thirds of the oil employed. Supposing these acids to be developed by heat, we can readily account for the injurious influence of too high a temperature in the preparation of the oil. By the action of nitrous acid, it is converted into a peculiar oleaginous substance called *palmin*, which yields *palmic acid* and glycerin when saponified. Alkalies unite with castor oil forming soaps, and determine the formation of three acids, the *ricinic*, *ricin-oleic*, and *ricino-stearic acids*, which can be obtained separate. Hence it has been inferred that the oil consists of three principles, for which the names of *ricin*, *ricinolein*, and *ricino-stearin* have been proposed. (*Kane's Chemistry.*) These principles, however, have not been isolated. M. Lefort gives the formula $C_{56}H_{52}O_8$ as representing the composition of castor oil. (*Journ. de Pharm.*, 3*e sér.*, xxiii. 348.) Its purgative property is supposed by MM. Bussy and Lecanu to belong essentially to the oil itself, and not to reside in any distinct principle which it may hold in solution.

Castor oil which is acrid to the taste may sometimes be rendered mild by boiling it with a small proportion of water. If turbid, it should be clarified by filtration through coarse paper. On exposure to the air, it is apt to become rancid, and is then unfit for use.

Medical Properties and Uses. Good castor oil is a mild cathartic, speedy in its action, usually operating with little griping or uneasiness, and evacuating the contents of the bowels without much increasing the alvine secretions. Hence, it is particularly applicable to cases of constipation from collections of indurated feces, and to those cases in which acrid substances have been swallowed, or acrid secretions have accumulated in the bowels. From its mildness it is also especially adapted to diseases attended with irritation or inflammation of the bowels, as colic, diarrhœa, dysentery, and enteritis. It is habitually resorted to in cases of pregnant and puerperal women; and is decidedly, as a general rule, the best and safest cathartic for children. Infants usually require a larger relative dose than adults, probably because they digest a larger proportion of the oil.

The dose for an adult is about a fluidounce, for an infant from one to three or four fluidrachms. It is sometimes of exceedingly difficult administration, not so much from any peculiarly disagreeable taste, as from the recollection of former nausea, or other uneasiness which it may have produced, and from its clamminess and unpleasant adhesiveness to the mouth. In a few cases, the disgust which it excites is utterly unconquerable by any effort of resolution. It is desirable, therefore, to obviate this inconvenience as far as possible by the mode of exhibition. A common method is to give it floating on the surface of mint or cinnamon water; but that which we have found upon the whole the least offensive, is to mix it with a cup of hot sweetened coffee, by which it is rendered more fluid, and its taste considerably disguised. Some take it in wine, or spirituous liquors, or the froth of porter; but these are often contra-indicated in the cases to which the medicine

is applicable. When the stomach is unusually delicate, the oil may be made into an emulsion with mucilage or the yolk of an egg, loaf sugar, and some aromatic water. Tragacanth has been recommended as producing a better emulsion than gum Arabic. Laudanum may be added to the mixture in cases of intestinal irritation. M. De Rudder proposes to give the oil in the air-bladders of fishes, which may be preserved in alcohol for the purpose. Castor oil may also be beneficially used as an enema, in the quantity of two or three fluidounces, mixed with some mucilaginous liquid. It has been recommended as a local application to the breasts of nursing women, to promote the secretion of milk.

Though apt to become rancid by itself, it loses much of this susceptibility when mixed with lard; and some apothecaries are said to use it as a substitute for olive oil in unguents and cerates. But the slightly irritating properties of even the mildest castor oil render it unfit for those preparations which are intended to alleviate irritation.

Off. Prep. Pilulæ Calomelanos Compositæ. W.

OLEUM ROSÆ. *U. S., Dub.*

Oil of Roses.

The volatile oil of the petals of Rosa centifolia. *U. S., Dub.*

Off. Syn. ROSÆ OLEUM. Volatile oil of the petals of Rosa centifolia. *Ed.* See ROSA CENTIFOLIA.

This is commonly called *attar, otto,* or *essence of roses.* It is prepared on a large scale in Egypt, Persia, Cashmere, India, and other countries of the East, by distilling the petals of the rose with water. The oil concretes and floats upon the surface of the water when it cools. The precise species of rose from which the oil is extracted is not in all instances certainly known; but it is said to be obtained from *R. damascena* in Northern India, *R. moschata* in Persia, and *R. centifolia* (*provincialis*) in the North of European Turkey. It is furnished in very minute proportion; not more than three drachms having been obtained by Colonel Polier, in Hindostan, from one hundred pounds of the petals. It is usually imported in small bottles, and is very costly.

Oil of roses is said to be prepared in Macedonia by crushing the petals in mills, expressing the fluid part, filtering it, and then exposing it to the sun in small glass vessels. The oil gradually collects on the surface of the liquid, and is removed. (*Pharm. Cent. Blatt,* 1847, p. 783.)

Landerer states that, at Damascus and other parts of Asia Minor, the oil is prepared by dry distillation. The buds being collected before sunrise are placed in a glass retort; and the distillation is effected by a salt-water bath, care being taken so to regulate the heat as not to scorch the petals. The water of the fresh roses and their oil come over together, and the latter, floating on the top, is separated in the usual mode. (See *Am. Journ. of Pharm.*, xxiii. 336.)

Oil of roses is nearly colourless, or presents some shade of green, yellow, or red; but, according to Polier, the colour is no criterion of its value. It is concrete below 80°, and becomes liquid between 84° and 86°. Its odour is very powerful and diffusive. At 90° its sp. gr. is 0·832. Alcohol dissolves it, though not freely when cold. It consists of two oils, one liquid, the other concrete at ordinary temperatures. These may be separated by freezing the oil, and compressing it between folds of blotting paper, which absorbs the liquid oil or eleoptene, and leaves the concrete or stearoptene. The latter consists exclusively of carbon and hydrogen; the former, of these and oxygen.

Sandal-wood oil, other volatile oils, fixed oils, spermaceti, &c., are said to be added as adulterations. The volatile additions may be detected by not being

concrete; the fixed, by the greasy stain they leave on paper when heated. Guibourt has offered certain tests by which he thinks the purity of the oil may be determined. The reader may find an account of them in the *American Journal of Pharmacy* (xxi. 318). It is said that the oil of one of the sweet-scented Pelargoniums, perhaps the *rose-geranium*, is much employed in Turkey for the purpose of adulteration, to which it is adapted by its odour, and by the circumstance that it concretes like the oil of roses. (*N. Y. Journ. of Pharm.*, i. 47.)

Oil of roses may be added, as a very grateful perfume, to various spirituous preparations for internal use, and to cerates and ointments.

Off. Prep. Aquæ Rosæ. W.

OLEUM SESAMI. *U. S. Secondary.*

Benne Oil.

The oil of the seeds of Sesamum Indicum and Sesamum orientale. *U. S.*
See SESAMI FOLIA.

OLEUM TEREBINTHINÆ. *U. S., Dub.*

Oil of Turpentine.

The volatile oil distilled from the turpentine of Pinus palustris and other species of Pinus. *U. S.* From the turpentine of Pinus sylvestris. *Dub.*

Off. Syn. TEREBINTHINÆ OLEUM. Pinus palustris, and P. Tœda? Oil distilled from the turpentine and rectified. *Lond.* Volatile oil of the liquid resinous exudation of various species of Pinus and Abies. *Ed.*

Huile volatile de térébenthine, *Fr.;* Terpenthinöl, *Germ.;* Olio della trementina, *Ital.;* Aceyte de trementina, *Span.*

See TEREBINTHINA.

This oil is commonly called *spirits* or *spirit of turpentine.* It is prepared by distillation from our common turpentine, though equally afforded by other varieties. It may be distilled either with or without water; but in the latter case a much higher temperature is required, and the product is liable to be empyreumatic. To obtain it absolutely pure it should be redistilled from a solution of caustic potassa. The turpentine of the *Pinus palustris* is said to yield about 17 per cent. of oil; while the common turpentine of Europe affords 24 per cent. Large quantities of the oil are distilled in North Carolina for exportation.

Pure oil of turpentine is perfectly limpid and colourless, of a strong, penetrating, peculiar odour, and a hot, pungent, bitterish taste. It is much lighter than water, having the sp. gr. 0·86 at 72° F.; is highly volatile and inflammable; boils at a temperature somewhat higher than 300°; is very slightly soluble in water, less soluble in alcohol than most other volatile oils, and readily soluble in sulphuric ether. Boiling alcohol dissolves it with facility, but deposits most of the oil upon cooling. One hundred parts of alcohol of 0·84 dissolve 13·5 parts of the oil at 72°. As found in commerce, it always contains oxygen; but, when perfectly pure, it consists exclusively of carbon and hydrogen, and is thought to be isomeric with the radical of camphor. Hence it has been denominated camphene. (See *page* 162.) According to Blanchet and Sell, it consists of two distinct isomeric oils, which, by the absorption of oxygen, are converted into two distinct resins, corresponding to those found by Unverdorben in colophony. (*Journ. de Pharm.*, xx. 226.) But there is reason to believe that these oils are the results of chemical reaction; as, when isolated, they have boiling points higher than that of the original oil. Heated in close vessels to 482° F., oil of

turpentine undergoes certain changes in properties, without any discoverable change of composition. (*Ibid.*, 3*e sér.*, xxiv. 428.) It absorbs muriatic acid, forming with it two compounds, one a red dense liquid, the other a white crystalline substance resembling camphor, and hence called *artificial camphor*. The latter consists of the unaltered oil (camphene) combined with the acid, and is therefore muriate of camphene. In the former the oil appears to have undergone some molecular change, being converted into an oil isomeric with the oil of turpentine, but differing from it in its action on polarized light, and in forming a liquid compound with muriatic acid. If the muriate of camphene be distilled with lime, the acid is retained, and an oil comes over, differing from pure oil of turpentine in having no action on polarized light, and from the oil just mentioned in forming a solid compound with muriatic acid. These three oils are said to be isomeric. (Soubeiran and Capitaine, *Journ. de Pharm.*, xxvi. 11.) Nitric acid converts oil of turpentine into resin, and by long boiling into *turpentinic acid*. Mixed with water and chloride of lime, and submitted to distillation, the oil yields a liquid which M. Chautard found to be identical with chloroform. (*Journ. de Pharm.*, 3*e sér.*, xxi. 88.) On exposure to the air and light, it deposits a white solid matter in acicular crystals, which are without taste or smell, insoluble in cold water, but soluble in ether and alcohol. (Boissenot, *Journ. de Chim. Méd.*, ii. 143.) White crystals of stearoptene, heavier than water and fusible at 20°, separate from the oil at the temperature of 18° below zero. These are probably a hydrate of the oil.

Exposed to the air the oil absorbs oxygen, becomes thicker and yellowish, and loses much of its activity, owing to the formation of resin. A small proportion of formic acid is said also to be generated. Hence the Edinburgh College directs a process for the rectification of the oil, consisting in distilling it with about four measures of water. But the process is difficult, in consequence of the great inflammability of the vapour, and its rapid formation, which causes the liquid to boil over. In this country it is scarcely necessary; as the recent oil can be obtained at an expense less than that which would be incurred by its redistillation on a small scale. Another mode of purifying the oil is to agitate it with one-eighth of alcohol, which dissolves the resinous portion. About one-fifth of the alcohol is retained by the oil, but is readily separated by agitation with water.

Medical Properties and Uses. Oil of turpentine is stimulant, diuretic, occasionally diaphoretic, anthelmintic, in large doses cathartic, and externally rubefacient. When swallowed in moderate quantities it produces a sense of warmth in the stomach, accelerates the circulation, and increases the heat of the skin, without especially affecting the functions of the brain. In small doses, frequently repeated, it stimulates the kidneys, augmenting the secretion of urine, and often producing, especially if long continued, painful irritation of the urinary passages, amounting sometimes to violent strangury. At the same time it imparts the odour of violets to the urine; and this effect is also produced by its external application, or even by breathing the air of an apartment impregnated with its vapours. In large doses it occasions slight vertigo, or a sense of fulness in the head, sometimes amounting to intoxication, attended frequently with nausea, and succeeded generally, though not always, by speedy and brisk catharsis. When this effect is experienced, the oil is carried out of the bowels, and, no time being allowed for absorption, is less apt to irritate the kidneys and bladder than when taken in small and repeated doses. In some constitutions it produces, even when taken internally, an erythematic eruption on the skin. Persons who inhale its vapour are liable to strangury and even bloody urine. The author has seen cases of hæmaturia in seamen from on board vessels loaded with turpentine.

The oil is employed in numerous diseases. As a stimulant it is useful in low

forms of fever, particularly in cases where there is reason to suspect ulceration of the mucous membranes. There is a particular state of fever usually attended with much danger, in which we have found this remedy almost uniformly successful. The condition of things alluded to, is one which occurs in the latter stages of typhoid fever, or lingering remittents, in which the tongue, having more or less completely thrown off its load of fur in patches, has suddenly become dry and brownish. The skin is at the same time dry, the bowels distended with flatus, and the patient sometimes affected with stupor or delirium. Under the use of small doses of oil of turpentine frequently repeated, the tongue becomes moist and again coated, the tympanitic state of the bowels disappears, and the patient goes on to recover as in a favourable case of fever. We have also found it extremely useful in the advanced stages of typhoid fever when the tongue is dry, independently of the special condition referred to; and are disposed to ascribe the effect to a healthy change produced by the oil in the ulcerated surface of the intestines. The medicine has been recommended as a counter-irritant in yellow and puerperal fevers; and may undoubtedly be given with advantage in the latter stages of these diseases, and in other instances of gastric and enteric inflammations, which require a resort to stimulation. In chronic rheumatism, particularly sciatica and lumbago, the oil has often been given with great benefit. It has also been much extolled as a remedy in neuralgia, in epilepsy and tetanus, in passive hemorrhages, particularly from the bowels, in disordered conditions of the alimentary canal attended with sallow countenance, foul tongue, tumid abdomen, sour or fetid eructations, and general depravation of health, in obstructions of the bowels, in chronic dysentery and diarrhœa, in obstinate gleets and leucorrhœa, in suppression of urine and retention and incontinence of urine from debility, and in chronic nephritic and calculous affections. In certain cases of dysentery whether acute or chronic, when the tongue is quite dry, and smooth as if from defect of the papillary structure, no remedy has proved so efficient in our hands as oil of turpentine. We have seen it also very beneficial in hæmoptysis. As a vermifuge it is highly esteemed, especially in cases of tænia. It appears, by its poisonous operation, to destroy or debilitate the worm, which, losing its hold upon the bowels, is then easily discharged. In cases of worms in the stomach it is often very useful. The worms, in this instance, are destroyed and digested as any other dead animal matter. In dropsies with feeble action the oil may sometimes be advantageously given as a diuretic; and in amenorrhœa from torpor of the uterine vessels it is occasionally useful. As a local stimulant or carminative it may be given beneficially in some instances of flatulent colic, and gout in the stomach.

The dose for ordinary purposes is from five to thirty drops, repeated every hour or two in acute, and three or four times a day in chronic diseases. In rheumatism it is recommended by some in the dose of a fluidrachm every four hours. As a remedy for the tape-worm it is given in the quantity of one or two fluidounces, and should be followed by castor oil if it do not operate in three or four hours. It has also proved successful in tænia in the dose of half a drachm, twice a day, continued for a considerable time. In ordinary cases of worms, the usual dose may be given. It may be administered on sugar, or in emulsion with gum Arabic, loaf sugar, and cinnamon or mint water.

In the form of enema, the oil has been employed in amenorrhœa, and to promote uterine contraction in child-birth, and is highly useful in cases of ascarides, obstinate constipation, and distension of the bowels from accumulation of air. No remedy is more effectual in tympanites than injections of the oil of turpentine. From half a fluidounce to two fluidounces may be administered in this way, suspended by the yolk of eggs in half a pint or a pint of water, or some mucilaginous fluid.

Externally applied, the oil of turpentine irritates and speedily inflames the skin; and, in low forms of fever with coldness of the surface, is when heated one of the most efficacious rubefacients. It is also used as a liniment in rheumatic and paralytic affections, and various internal inflammations. It should generally, in mild cases, be diluted with olive oil; and in some constitutions, even in this state, produces such violent inflammation of the skin, with extensive eruptions, as to render its external use in any shape improper. Mixed with some mild oil and introduced on cotton into the ear, it is sometimes beneficial in deafness arising from a deficient or unhealthy secretion of wax. Applied to recent burns, it is thought by some to be highly useful in allaying the burning pain, and promoting a disposition to heal. For this purpose, however, it is usually mixed with the resin cerate (*basilicon ointment*), so as to form a liniment capable of being spread upon linen rags. (See *Linimentum Terebinthinæ.*)*

Oil of turpentine has been recommended in the form of bath, in affections in which its constitutional impression is desired. For this purpose Dr. T. Smith, of Cheltenham, England, employs from five to ten fluidounces of the oil, with half a fluidounce of the oil of rosemary, and two pounds of carbonate of soda in each bath. The breath becomes strongly impregnated with the terebinthinate odour. (*Braithwaite's Retrospect*, xxi. 355.) Baths of the vapour of turpentine are stated to be very beneficial in chronic rheumatism. They are said to be borne well, for twenty-five minutes, at a temperature from 140° to 160° F. (*Arch. Gén.*, 4*e sér.*, xxviii. 80.)

Off. Prep. Confectio Terebinthinæ; Emplastrum Hydrargyri; Enema Terebinthinæ; Linimentum Cantharidis; Linimentum Crotonis; Linimentum Terebinthinæ; Oleum Terebinthinæ Purificatum. W.

OLEUM TIGLII. *U. S.*

Croton Oil.

The oil of the seeds of Croton Tiglium. *U. S.*

Off. Syn. TIGLII OLEUM. Croton Tiglium. Oil expressed from the seeds. *Lond.;* CROTONIS OLEUM. Expressed oil of the seeds of Croton Tiglium. *Ed.;* CROTON OIL. Croton Tiglium. The expressed oil of the seeds. *Dub.*

Huile de Croton, *Fr.;* Crotonöl, *Germ.;* Nervalum unnay, *Tamool.*

CROTON. See Cascarilla.

Croton Tiglium. Willd. *Sp. Plant.* iv. 543; Woodv. *Med. Bot.* 3d ed., vol. 5, p. 71. This species of Croton is a small tree or shrub, with a few spreading branches, bearing alternate petiolate leaves, which are ovate, acuminate, serrate, smooth, of a dark-green colour on the upper surface, paler beneath, and furnished with two glands at the base. The flowers are in erect terminal racemes, scarcely as long as the leaf—the lower being female, the upper male, with straw-coloured petals. The fruit is a smooth capsule, about the size of a filbert, with three cells, each containing a single seed.

The tree is a native of Hindostan, Ceylon, the Moluccas, and other parts of continental and insular India. It is pervaded throughout by an acrid purgative principle, which is probably analogous to that found in other plants belonging to the family of Euphorbiaceæ. Rumphius says that the root is employed in Amboyna, in the dose of a few grains, as a drastic purge in dropsy; and, ac-

* The following is the formula adopted by the Philadelphia College of Pharmacy for the preparation of the rubefacient liniment, so much sold under the name of *British oil.* ℞. Olei Terebinth. f℥viij, Olei Lini f℥viij, Olei Succini f℥iv, Olei Juniperi f℥iv, Petrolei Barbadensis f℥iij, Petrolei Americani (Seneca oil) f℥j. Misce. (*Journ. of the Phil. Col. of Pharm.*, v. 29.)

cording to the same author, the leaves are so acrid that, when chewed and swallowed, they excite inflammation in the lips, mouth, throat, and along the whole course of the alimentary canal. The wood is said in small doses to be diaphoretic, in larger, purgative and emetic. But the seeds are the most active portion of the plant. These have been long employed in India as a powerful purgative, and were introduced so early as the year 1630 into Europe, where they were known by the names of *Grana Molucca* and *Grana Tiglia*. But in consequence of their violent effects they passed into neglect, and had ceased to be ranked among medicines, when, at a recent period, attention was again called to them by the writings of some English physicians in India. They are now imported for the sake of their oil, which is the only product of the plant considered officinal.

These seeds are rather larger than a grain of coffee, of an oblong form, rounded at the extremities, with two faces, the external considerably more convex than the internal, separated from each other by longitudinal ridges, and each divided by a similar longitudinal ridge, so that the whole seed presents an irregular quadrangular figure. Sometimes, as in the grain of coffee, their internal surface is flat with a longitudinal groove, owing to the presence of only two seeds in the capsule, the groove being produced by the central column or axis. The shell is covered with a soft yellowish-brown epidermis, beneath which the surface is black and smooth; and, as the epidermis is often partially removed by friction during their carriage, the seeds as they come to us are frequently of a mottled appearance, and sometimes nearly black. The kernel or nucleus is of a yellowish-brown colour, and abounds in oil. In India the seeds are prepared for use by submitting them to slight torrefaction, by which the shell is rendered more easily separable. In the dose of one or two grains the kernel purges with great activity.

The oil is obtained by expression from the seeds, previously deprived of the shell. It may also be separated by decoction in water, or by the action of ether, which dissolves the oil, and leaves it behind when evaporated. Guibourt recommends, after the first expression, to digest the residue with alcohol at a temperature of 120° to 140° F., and then submit it to a new expression. The alcohol is to be separated by distillation from the oil, which is then to be mixed with the first product. According to Dr. Nimmo, the seeds consist of 64 parts of kernel, and 36 of envelope in the hundred. From the seeds imported into England, about 22 per cent. of oil is obtained by simple expression. Guibourt, by his process, obtained 52 per cent. from the kernels, equivalent to about 35 per cent. of the seeds. Croton seeds yielded to Brandes upon analysis, independently of the shell, traces of a volatile oil, fixed oil, a peculiar fatty acid called *crotonic acid*, an alkaloid which he called *crotonin*, resin, stearin, wax, extractive, sugar, starch, gum, albumen, gluten, lignin, and salts. The crotonin has been subsequently found to be nothing more than a magnesian soap with an alkaline reaction. The *crotonic acid* is the most interesting ingredient, is thought to be the active principle of the seeds, and is separated along with the oil in expression. It may be obtained by treating the oil with solution of potassa, decomposing the resulting soap by tartaric acid, filtering and distilling the solution, neutralizing the product with baryta water, evaporating to dryness, decomposing the salt of baryta with strong phosphoric acid, and again distilling. (*Christison's Dispensatory.*) The acid solidifies at 23° F., is highly volatile, has a very acrid taste, is very irritating to the nostrils, and forms salts with alkaline bases called crotonates. It is this principle, probably, which causes the dust and exhalation from the croton seeds sometimes to excite excessive irritation in the mucous surfaces of those who prepare them for expression, or otherwise work among them.

Properties. Croton oil, as found in the shops, varies from a pale yellow to a dark reddish-brown. That imported from India is usually pale, that expressed in

Europe dark like the deepest coloured sherry. Its consistence is rather viscid, and is increased by time. Its smell is faint, but peculiar, its taste hot and acrid, leaving in the mouth a disagreeable sensation which continues for many hours. The oil is wholly soluble in sulphuric ether and oil of turpentine. Its relations to pure alcohol differ somewhat with the variety of the oil. That obtained by expression in England is wholly and readily soluble, forming a solution which is permanent at ordinary temperatures; while the India or pale oil forms an opaque mixture, which becomes clear and uniform upon being heated, but separates on standing into two portions, one consisting of alcohol somewhat diminished in bulk, the other of the oil correspondingly increased in bulk by retaining a portion of the alcohol. It is probable that the difference in colour, and in their relations to alcohol, between the India and English oils, is owing to a change in the kernels from being kept.

Some croton oil examined by M. Dublanc, of Paris, when agitated with ten times its weight of alcohol, was separated into two parts, one of which amounting to 6 per cent. was dissolved by the alcohol, the other remained undissolved, but retained 50 per cent. of alcohol. The latter, upon being repeatedly treated with alcohol, lost all its acrimony; while the portion dissolved was extremely acrid. From these observations it would appear that the acrid and probably active principle of the oil is dissolved by the alcohol; while a bland fixed oil, which constitutes the chief part of it, is not taken up by that liquid. (See *Am. Journ. of Pharm.*, xxv. 56.) It is difficult to reconcile the different results here stated, without supposing that different kinds of oil were employed.

It is thought that croton oil is often adulterated with other fixed oils. The Edinburgh College gives the following test of its purity. "When agitated with its own volume of pure alcohol and gently heated, it separates on standing, without having undergone any apparent diminution." This, however, is not true of the oil expressed in England. The test was intended to detect the presence of castor oil, which would be dissolved by the alcohol, and thus occasion a diminution of the bulk.

We were told by the late Dr. M. Burrough, who was for some time in India, that much of the oil there prepared for exportation, under the name of croton oil, is derived from the seeds of a plant different from the Croton Tiglium. From a parcel of these seeds presented to him by Dr. Burrough, Dr. R. E. Griffith produced a plant which proved to be the Jatropha Curcas, the seeds of which are known by the name of *Barbadoes nuts.* (See *Tapioca.*) This oil, though weaker than the genuine, was said by Dr. Burrough to be an efficient cathartic in the dose of three or four drops. It is stated by Dr. Hamilton that croton seeds are afforded by the *Croton Pavana*, growing in Ava and the Eastern parts of Bengal; and it is highly probable that a portion of the croton oil of commerce is obtained from these seeds. (*Trans. Lin. Soc.*, xiv. 257.) These facts may explain some of the discrepancies in reference to the effects of alcohol above mentioned.

Medical Properties and Uses. Croton oil is a powerful hydragogue purgative, acting, for the most part, when given in moderate doses, with ease to the patient, but in large doses apt to excite vomiting and severe griping pain, and capable, if immoderately taken, of producing fatal effects. It acts with great rapidity, frequently evacuating the bowels in less than an hour, and generally exciting a rumbling sensation in half that period. It possesses also great advantage in the minuteness of the dose, on account of which it may frequently be given when we should fail with more bulky medicines, as in mania, coma, and the cases of children. A drop placed on the tongue of a comatose patient will generally operate. Though long used in India, and known more than a century ago to the Dutch physicians, it did not attract general notice till about 1820, when it was introduced into England by Mr. Conwell. It is chiefly employed in cases of ob-

stinate constipation, in which it often produces the happiest effects after the failure of other medicines; but it may also be advantageously employed in almost all cases in which powerful and speedy purging is demanded. Dropsy, apoplexy, mania, and visceral obstructions, are among the complaints in which it has been particularly recommended. It has recently been employed with great asserted benefit in neuralgia, epilepsy, and spasm of the glottis, and has been supposed to have powers in these affections independent of its purgative property. The seeds are said to have been used with great success in India in amenorrhœa. Applied externally, the oil produces inflammation of the skin, attended with a pustular eruption, and has been used in this way in rheumatism, gout, neuralgia, glandular and other indolent swellings, and in laryngeal and pulmonary diseases. It should be diluted with three parts of olive oil, soap liniment, oil of turpentine, or other convenient vehicle, and applied as a liniment twice or oftener in the twenty-four hours. Sometimes the insusceptibility of the skin is such as to require its application undiluted. For further information on this subject the reader is referred to the *Amer. Journ. of Med. Sciences*, xv. 240. The oil may also be applied externally, in the form of a plaster, made by incorporating one part of it with four parts of lead plaster melted by a very gentle heat. Sometimes it appears to produce inflammation in parts distant from those to which it was directly applied. It has been said that four drops of the oil, applied externally by friction around the umbilicus, will produce a purgative effect; but this is denied by Dr. Barlai, of Tuscany, who states that it is only when the oil is applied to the skin divested of the cuticle that it will operate upon the bowels. (See *Journ. de Pharm.*, 3e *sér.*, xx. 298.)

The dose for an adult is one or two drops, and is most conveniently administered in the form of pill. A very safe and convenient plan is to make two drops into four pills with crumb of bread, and to give one every hour till they operate. The oil may also be given in emulsion. The form of tincture may be advantageously resorted to when a minute quantity of the medicine is required; as it affords the means of readily dividing the dose.

Off. Prep. Linimentum Crotonis. W.

OPIUM. *U. S., Lond., Ed., Dub.*

Opium.

The concrete juice of the unripe capsules of Papaver somniferum. *U. S., Ed., Dub.* Juice emitted from the unripe incised fruit, hardened in the air. *Lond.*

Opium, *Fr.;* Opium, Mohnsaft, *Germ.;* Oppio, *Ital.;* Opio, *Span.;* Affioni, *Turk.;* Ufyoon, *Arab.;* Sheerikhaskash, *Persian;* Ufeem, *Hindoo.*

Papaver. *Sex. Syst.* Polyandria Monogynia.—*Nat. Ord.* Papaveraceæ.

Gen. Ch. Corolla four-petaled. *Calyx* two-leaved. *Capsule* one-celled, opening by pores under the persistent stigma. *Willd.*

Opium is at present generally believed to be derived exclusively from the *Papaver somniferum;* though every species of poppy is capable of yielding it to a greater or less extent, and some authors have indicated the *Papaver orientale* as its real source. The British and French Pharmacopœias unite with our own in recognising only the first-mentioned species.

Papaver somniferum. Willd. *Sp. Plant.* ii. 1147; Woodv. *Med. Bot.* p. 376, t. 138. There are several varieties of this species, of which the two most prominent are distinguished by the titles of the white and black poppy, derived from the colour of their seeds. It is the former which is usually described as the proper opium plant. The *white poppy* is an annual plant, with a round, smooth, erect, glaucous, often branching stem, rising two or three feet in height, and

sometimes attaining five or even six feet in favourable situations. The leaves are large, variously lobed and toothed, and alternately disposed upon the stem, which they closely embrace. The flowers are terminal, very large, and of a white or silver gray colour. In India they appear in February, in Europe and the United States not earlier than June, July, or August. The calyx is smooth, and composed of two leaves, which fall when the petals expand. These are usually four in number; but there is a variety in which the flower is double. The germen, which is smooth and globular, supports a radiated stigma, and is surrounded by numerous short and slender filaments, with erect, oblong, compressed anthers. The capsule is smooth and glaucous, of a rounded shape, from two to four inches in diameter, somewhat flattened at the top and bottom, and crowned with the persistent stigma, the diverging segments of which are arranged in a circle upon the summit. It contains numerous minute white seeds, which, when perfectly ripe, escape through small openings beneath the stigma. In the *black poppy*, the flower, though sometimes white, is usually violet coloured or red, the capsule is somewhat smaller and more globular, and the seeds are of a brown or blackish colour.

All parts of the poppy contain a white, opaque, narcotic juice; but the leaves, when analyzed by M. Blondeau, yielded none of those active principles by which opium is characterized. (*Journ. de Pharm.*, vii. 214.) It is in the capsule that the juice most abounds, and the virtues of the plant chiefly reside. Hence this part is sometimes employed medicinally. (See *Papaver.*) The seeds are destitute of narcotic properties, and are even used as food in many parts of the world. The Romans employed them in the preparation of various dainties. They abound with a bland oil, which may be extracted by expression, and has most of the useful properties of olive oil. It is an article of much importance on the continent of Europe, particularly in France, in the northern departments of which the black poppy is very extensively cultivated for the seed alone. The oil is employed for culinary and pharmaceutic purposes, in painting, and the manufacture of soap, and in other ways as a substitute for olive oil, which is said to be frequently adulterated with it. The poppy does not appear to elaborate the milky fluid in which its narcotic properties reside, before a certain period of its growth; for we are told that, in Persia, the young plants which are pulled up to prevent too thick a crop are used as pot-herbs; and the μηκων of the Greeks, which is believed to be identical with the Papaver somniferum, is said by Hippocrates to be nutritive.

Though generally believed to be a native of Asia, this species of poppy grows wild in the South of Europe, and even in England, whither its seeds are supposed to have been brought at a very early period. It was cultivated by the ancient Greeks, and is mentioned by Homer as a garden plant. It is at present cultivated very extensively in India, Persia, Egypt, and Asiatic Turkey, for opium; and in several parts of Europe, especially in France, not only for this product, but also for the seed and capsules. In this country it is found only in our gardens as an ornamental flower.

The process for procuring opium from the poppy, as practised by the modern inhabitants of India and Persia, according to the reports of Kerr and of Kœmpfer, is very nearly the same with that described by Dioscorides as employed in his own times, about eighteen hundred years since; and the accounts of Bélon, Olivier, and Texier, as to the modes of collection in Asia Minor, are not materially different. As the capsules abound most in the narcotic juice, it is from these that the opium is procured. According to Texier, a few days after the fall of the flower, men and women proceed to the fields, and make horizontal incisions in the capsule, taking care not to penetrate its cavity. A white juice exudes, and appears in the form of tears upon the edges of the incisions. The

field is left in this state for twenty-four hours, after which the juice is scraped off by means of large blunt knives. A portion of the epidermis of the capsule is also removed, and constitutes about one-twelfth of the whole product. Each poppy-head affords opium but once. Thus collected, the opium is in the state of an adhesive and granular jelly. It is placed in small earthen vessels, where it is beaten, and at the same time moistened with saliva. When of a proper consistence, it is wrapped in leaves and sent into the market. (*Journ. de Pharm.*, xxi. 196.) Considerable quantities of good opium have been obtained in England by scarifying the capsules of the poppy.* Similar success has been met with in France; and the drug obtained by incisions, in both countries, has been found nearly if not quite equal to that imported from the East. In the *Dictionnaire des Drogues* it is stated that a specimen of opium, collected in this way in the vicinity of Provins, gave sixteen per cent. of the active principle, while a good commercial specimen, examined by M. Petit, afforded only eight per cent.

Another method of extracting the virtues of the capsules is to select such as have ceased to yield their juice by exudation, to beat them with a small proportion of water, and inspissate the liquid thus obtained by artificial heat. The ancient Greeks were acquainted with both processes, as appears from the writings of Dioscorides. The term οπιον, derived from οπος, juice, they applied to the substance procured by incisions, which answers precisely to the modern opium. The inspissated expressed juice they called μηκωνιον, from μηκων, the name of the plant. Tournefort states that it is the latter preparation which is exported from Turkey as opium, the former being much more valuable, and therefore retained in the country for the use of the great and wealthy. This error has been copied by many writers on the materia medica; and, till within a comparatively few years, opium was generally believed to be an extract obtained by evaporating either the expressed juice, or a decoction of the capsules.

Commercial History. Commerce is supplied with opium chiefly from Hindostan, Persia, Egypt, and the Asiatic dominions of Turkey. Immense quantities are produced in the Indian provinces of Bahar and Benares, and in the more interior province of Malwa. The opium of Hindostan is distributed ex-

* So early as the year 1796, a premium was awarded by the Society for the Encouragement of Arts, to Mr. Ball, for a specimen of British opium; and in 1823, Messrs. Cowley and Stains collected 196 pounds, which sold for nearly seven dollars a pound, from little more than twelve acres of land. This product, however, was by no means equal to that obtained in Scotland by Mr. John Young. From one acre of ground planted with poppies and potatoes, he procured fifty-six pounds of opium, valued at 450 dollars, while the whole expense was more than repaid by the potatoes, and the oil expressed from the seeds. For papers on the subject of the cultivation of the poppy in England, see *Edin. Philosoph. Journ.*, vol. i. p. 258, and the *Quarterly Journal of Science*, vol. iv. p. 69.

M. Aubergier has cultivated opium in France, with encouraging results. Instead of allowing the juice after the incision to inspissate on the capsule, he collected it immediately, and dried it by artificial heat. One workman collected in a day 300 grammes (9·64 troy ounces) of juice, which yielded one-quarter of its weight of opium. The product differed in strength very greatly, according to the variety of poppy used; the yield of morphia having varied from 3 to 17·8 per cent. He gives the preference to the *purple poppy*. (*Ann. de Thérap.*, A. D. 1852, p. 29.) See also the same work (A. D. 1853, p. 1) for an elaborate report on M. Aubergier's Memoir, by a committee consisting of MM. Rayer, Orfila, and others.

In Armenia, where opium is largely produced, four varieties of seeds are used, the white, yellow, black, and sky-blue. The flower produced by the white seeds is white, that by the yellow is red, that by the black is black, and that by the sky-blue, is deep purple. The white and sky-blue seeds yield large somewhat oblong capsules, like citrons in shape; the yellow and black, small and round capsules. For an extent of ground forty paces square, forty drachms of seeds are required. Each head yields about a grain of opium. The operators, not accustomed to the work, are apt to become intoxicated or stupefied during the period of harvest. (Gaultier de Claubry, *Journ. de Pharm.*, 3e *sér.*, xiii. 105.)

tensively through continental and insular India, where it is habitually employed in the place of spirituous liquors. Great quantities are also sent to China, into which it finds an easy entrance, notwithstanding prohibitory laws. Much was formerly imported by the East India Company into England, through which a small portion reached our own country; but it was so far inferior to that from Turkey, that it was at length excluded from the market, and none is now brought directly from the East. The great demand for it in the Indian Archipelago and in China, and its consequent high price, have probably contributed even more than its reputed inferiority to this result. Indeed, Ainslie explicitly states that India opium is inferior to none; and it is probable that the specimens from which the description was drawn up that was formerly current among authors upon the materia medica, were the refuse of the Eastern market. We know that the drug was formerly very much and variously adulterated by the natives. Among the impurities mentioned by authors are the extract of the poppy procured by decoction, the powdered leaves and stems of the plant made into a paste with mucilage, oil of sesamum, catechu, and even cow-dung. But a more careful superintendence by the officers of the Company has resulted in a great improvement of the India opium. Of that produced in Persia, very little is brought to this country; and it is scarcely known in our market as a distinct variety. Much was formerly produced in Upper Egypt, especially in the district of ancient Thebes, which was supposed to yield it in greatest perfection. It was in fact for a long time generally known by the name of *Opium Thebaicum*, and laudanum is still frequently directed in prescriptions as *Tinctura Thebaica*. Its cultivation has recently been again introduced into Egypt; and considerable quantities are now exported.

Turkey opium is produced in Anatolia, and shipped chiefly from the port of Smyrna. It is brought to the United States, either directly from the Levant, or indirectly through different European ports. From the treasury returns for the years from 1827 to 1845 inclusive, according to a table prepared by Dr. J. B. Biddle, and published in the *American Journal of Pharmacy* for April, 1847, it appears that the average value of the annual importations for the period referred to was from Turkey 128,137 dollars, from England 13,744, from France 4,470, and from all other places 6,607 dollars. Of this amount so much was exported as to leave for the average annual consumption of the country the value of 66,809 dollars. Turkey opium usually comes to us in masses of irregular size and shape, generally more or less flattened, covered with leaves, or the remains of leaves, and with the reddish capsules of some species of *Rumex*, which are said to be absent in the inferior kinds, and may therefore be considered as affording some indication of the purity of the drug. We may account for this circumstance upon the very probable supposition, that these capsules are removed during the operation which the masses sometimes undergo in the hands of the merchants, after leaving those of the cultivators. We are told by the French writers that extensive frauds are practised at Marseilles in this branch of commerce. The opium taken thither from the Levant is first softened, and then adulterated with various matters which are incorporated in its substance. To use a strong expression of M. Guibourt, they make the opium over again at Marseilles. Our traders to the Mediterranean would do well to bear this assertion in mind. According to Dr. A. T. Thomson, one-fourth part of Turkey opium generally consists of impurities. Sand, ashes, the seeds of different plants, extracts of the poppy, *Lactuca virosa*, *Glycyrrhiza glabra*, and *Chelidonium glaucum*, gum Arabic, tragacanth, salep, aloes, even small stones, and minute pieces of lead and iron, are mentioned among the substances employed in the sophistication of the drug. Mr. Landerer, of Athens, was informed by a person who had been

engaged in the extraction of opium, that grapes freed from their seeds and crushed, were almost universally mixed with the poppy juice, and that another adulteration consisted of the epidermis of the capsules and stem of the plant, pounded in a mortar with the white of eggs. (See *Am. Journ. of Pharm.*, xv. 238.) In England a sophisticated opium was a few years since prepared, so nearly resembling good Turkey opium in appearance, that by the eye alone it was difficult to detect the fraud, and yet wholly destitute of the active principle of this drug. Portions of it were sent into the markets both of France and this country. It was probably the genuine drug, deprived of its morphia by some process which did not materially disturb the visible arrangement of its particles.* (*Am. Journ. of Pharm.*, x. 261.)

* The great importance of opium renders it desirable that all its commercial varieties should be accurately described, and their relative value so far as possible ascertained. The following statement has been drawn up from the most recent published accounts of the drug, and from the personal observations of the author. The papers of Guibourt in France, Christison in Great Britain, and Merck and Martius in Germany, have been consulted. (See *Journ. de Pharm.*, xvii. 714, and xxi. 542; and *Annalen der Pharm.*, xviii. 79, and xxiv. 56.)

The varieties of this drug may be arranged, according to the countries in which they are produced, under the heads of *Turkey*, *Egyptian*, *India*, and *Persia opium*.

I. TURKEY OPIUM. This title belongs to the opium produced in the Turkish province of Anatolia, and exported from Smyrna and Constantinople. According to some authorities, there is no essential difference between the parcels of the drug brought from these two ports. Others maintain that they are distinct varieties, differing in their interior structure, and probably also in the precise place of their production, and the mode of their collection. The truth probably is, that most of the opium shipped at Constantinople is produced in the northern parts of Anatolia, while that from Smyrna is collected in the provinces more convenient to the latter city; and, though it is possible that an identical drug may be occasionally brought from the two ports, yet there seems to be good ground in general for arranging it under different varieties, as derived from these different sources.

1. *Smyrna Opium.* This is the variety which is, beyond all comparison, most abundant in our markets; and it is from this that the ordinary descriptions of opium are drawn up. It comes to us in masses of various size, usually from half a pound or somewhat less to a pound in weight, sometimes, though rarely, as much as two or even three pounds, originally, perhaps, of a globular form, but variously indented, and rendered quite irregular in shape, by the pressure to which they have been subjected, while yet soft, in the cases which contain them. Sometimes they are even pressed out into flat cakes. As brought into market, the lumps are usually hard on the outside, but still soft within. They are covered externally with the remains of leaves, and with the reddish capsules of a species of Rumex, which have no doubt been applied in order to prevent the surfaces from adhering. Notwithstanding, however, this coating, the masses sometimes stick together, and two or more become consolidated into one. In this way the fact may be accounted for, that the seeds of the Rumex are occasionally found in the interior of the masses. In the finer parcels of Smyrna opium, the colour internally is light-brown; in the inferior it is darker. A peculiar character of this variety is, that when a lump of it is cut into and then carefully torn, numerous minute shining tears are observable, particularly under a microscope; bearing some resemblance to small seeds, but readily distinguishable by pressure between the fingers. They are undoubtedly formed from the drops of juice which escape from the incisions in the capsules, and which, according to Bélon, are allowed to concrete before they are removed. From the account of the same author it appears that, after the juice has been collected, it is not subjected to the process of kneading or beating, as in the case of other varieties of opium; so that the tears preserve their original shape in the mass. It is probably owing to the peculiar mode of collecting Smyrna opium, that minute pieces of the skin of the poppy capsules are found intermingled in the mass; these being separated in the process of removing the adhering tears. In the finer specimens of Smyrna opium, these fragments of the capsules are the only impurities. This variety of the drug is of very different qualities, the finest kinds yielding, according to Merck, as much as 13 per cent. of pure morphia, while from some very bad parcels he could not procure more than 3 or 4 per cent. In these inferior specimens the colour is darker, the smell is often musty, and there is very generally more or less mouldiness both upon the surface, and in the interior of the masses, indicating perhaps too much moisture in the opium originally, or its subsequent exposure to an injurious degree of dampness. Good Smyrna opium ought to yield 10 or 11 per cent.

Opium is regarded as inferior when it has a blackish colour; a weak or empyreumatic smell; a sweet or slightly nauseous and bitter taste; a soft, viscid, or greasy consistence; a dull fracture; or an irregular, heterogeneous texture, arising from the intermixture of foreign substances. It should not impart a

of morphia. Dr. Christison, however, states that he has not been able to procure more than 9 per cent. from the finest Smyrna opium.*

2. *Constantinople Opium.* Most of the Constantinople opium is in lumps from half a pound to two and a half pounds in weight, and scarcely distinguishable in exterior appearance from those of the former variety, being equally irregular in shape, and in like manner covered with the capsules of the Rumex. It differs, however, strikingly from the Smyrna opium in its interior constitution, being, according to Merck, wholly destitute of the tears which characterize that variety. This would indicate some difference in the mode of collecting and preparing the juice. In the case of the Constantinople opium, it is probably either removed from the capsules before concretion, or subjected to pressure afterwards. Merck says that he has not discovered, in this variety, those minute portions of the poppy capsules which are usually present in the Smyrna opium. The average quality of the Constantinople opium, as above described, is about equal to that of the drug from Smyrna; but it appears to be occasionally purer; as Merck obtained from one specimen as much as 15 per cent. of pure morphia. Notwithstanding what has been above stated, we are not yet in possession of facts to prove that this is not, as some have supposed it to be, the better sort of Smyrna opium selected and sent to the capital.

Guibourt describes another variety of Constantinople opium of much inferior character. "It comes," he observes, "in small flattened cakes, sufficiently regular and of a lenticular shape, from two to two and a half inches in diameter, and always covered with a poppy leaf, the midrib of which divides the surface into two equal parts. It has an odour similar to that of the preceding variety, but feebler, and it blackens and dries in the air. It is more mucilaginous than Smyrna opium, and contains only half as much morphia." These characters are obviously those of Egyptian opium; and, though the parcels which came under the notice of Guibourt may have been imported directly from Constantinople, it is highly probable that they were originally from Alexandria. Mr. Stettner, of Trieste, though well acquainted with the opium commerce of that port, admits no such Constantinople opium as that described by Guibourt. (*Annal. der Pharm.*, xxiv. 65.)

II. EGYPTIAN OPIUM. This is in flat roundish cakes, of various dimensions, sometimes as much as six inches in diameter, and a pound in weight, usually, however, much smaller, and sometimes not weighing more than half an ounce. These cakes are either wrapped in a poppy leaf, so placed that the midrib divides the surface into two equal parts, or exhibits vestiges of such a covering. Occasionally the brown colour of the opium is seen through the leaf, and the surface appears as if uncovered, while the leaf is still present. This variety of opium is always destitute of the Rumex capsules, and differs from the Smyrna opium also in being brittle instead of tenacious, and equally hard in the centre as at the surface of the mass. Its fracture is conchoidal and of a waxy lustre, and small fragments of it are translucent. Its colour is usually redder than that of Smyrna opium, though it is sometimes dark. Some of the pieces, on exposure to the air, become damp and sticky on the outer surface, indicating the fraudulent addition of some deliquescent substance. The odour is similar to that of Smyrna opium, but weaker. It is an inferior variety; as the best of it, examined by Merck, yielded only 6 or 7 per cent. of morphia; and a specimen of it was found by Mr. J. Evans, of Philadelphia, to contain not more than 3·55 per cent. Egyptian opium, therefore, should never be dispensed by the apothecary, or employed in the preparation of his tinctures; as the prescription of the physician is based upon the strength of good Smyrna opium, which is about twice that of the Egyptian.

III. INDIA OPIUM. Little if any of this opium reaches our market. There appear to be two chief varieties of it, one produced in Bahar and Benares, in the Bengal Presi-

* According to Landerer, little of the opium is produced in the immediate neighbourhood of Smyrna; the greater portion being brought to that port, on the backs of camels, from a distance of from ten to eighteen days' journey. (*Journ. de Pharm.*, 3e *sér.*, xxiii. 33.) The same writer states that the opium is chiefly prepared at Kara Chissar, near Magnesia. The incisions are generally made before sunrise. The juice is partly caught in mussel-shells, and dried in the sun. This is considered the best. Every evening the juice which has dried upon the capsules is scraped off, with a portion of the epidermis. The poppy is then cut down, and stripped of its leaves, which are boiled in water; and the liquid is evaporated to the consistence of an extract. With this the inspissated juice is incorporated, and the mixture is then formed into cakes, wrapped in poppy-leaves, and placed on shelves to dry. (See *Am. Journ. of Pharm.*, xxiii. 251.) It is very evident, from the interior structure of the *best Smyrna opium*, that it has not been prepared in the way described by Landerer; though his account is probably true in reference to inferior varieties of the drug.—*Note to the tenth edition.*

deep-brown colour to the saliva, nor leave a dark uniform trace when drawn over paper, nor form with water a thick viscid solution.

Properties. Good opium has a peculiar strong narcotic odour, and a bitter, somewhat acrid taste. When long chewed it excites much irritation in the lips

dency, and called *Bengal opium*, the other in the interior provinces, and designated by the name of *Malwa opium*.

1. *Bengal Opium.* For a minute account of the cultivation and preparation of this variety of opium, the reader is referred to elaborate papers by Dr. Eatwell, of Calcutta, contained in the eleventh and twelfth volumes of the *London Pharmaceutical Journal and Transactions*, an abstract of which will be found in the *Am. Journ. of Pharm.*, xxiv. 118, and in the last edition of Pereira's *Materia Medica* (vol. ii. p. 1009, Am. ed.). Bengal opium is identical with the variety sometimes called *Patna opium*. It is in round balls, weighing three pounds and a half, invested by a coating half an inch thick, composed of agglutinated leaves and poppy-petals. The interior of the mass is of a brownish-black colour, of the consistence of a stiff paste, and possessed in a high degree of the characteristic odour and taste of opium. The proportion of active matter in this opium varies somewhat with the season, and in the different specimens. From a table given by Dr. Eatwell, it appears that the percentage of morphia varies from 2·17 to 3·67, and that of narcotina from 3·85 to 5·70. Prof. Procter found a specimen of Patna opium to yield about 5 per cent. of morphia. (*Am. Journ. of Pharm.*, xxi. 194.) It is, therefore, much inferior to the best Smyrna opium in its yield of morphia, while it is richer in narcotina. Yet Christison states that all the India opium which he has seen is exempt from the mixture of leaves, seeds, and fragments of poppy capsules so abundant in Smyrna opium. Its inferior character is in some degree probably owing to the juice, after collection, being kept for some time before it is made up, and consequently undergoing fermentation.

The India opium examined by Dr. A. T. Thomson was apparently of inferior character. As described by that author, it was in round masses, covered with the petals of the poppy in successive layers, to the thickness of nearly one-fourth of an inch. It had a strong empyreumatic smell, with little of the peculiar heavy odour of Turkey opium. Its taste was more bitter and equally nauseous, but less acrid. Its colour was blacker, and its texture, though as tenacious, was less plastic. It was more friable, and when triturated with water, was wholly suspended or dissolved, leaving none of that plastic residue which is afforded by the other variety. It yielded to Dr. Thomson more narcotina than Turkey opium, but only about one-third the quantity of morphia. All these are the characters of an extract of the poppy heads, rather than of their inspissated juice. The absence of the plastic principle analogous to caoutchouc is strong evidence in favour of this view of its nature; for it is obvious that water would not extract this principle from the capsules, while it is hardly probable that the juice is destitute of it. Besides, the strength indicated by Dr. Thomson is very nearly the same with that of the extract of the capsules prepared in France. The Bengal opium is at present a superior drug to that here described, though still inferior to the Smyrna opium.

There is a variety of Patna or Bengal opium, called *garden Patna opium*, which was described in the fifth edition of this work, on the authority of Dr. Christison, as Malwa opium. Dr. Christison has subsequently ascertained its true origin. It is prepared in Bahar with peculiar care, from juice which has not been suffered to undergo fermentation. It is in cakes three or four inches square, and about half an inch thick, which are packed in cases with a layer of mica between them. These cakes are without covering, hard, dry, and brittle, of a uniform shining fracture, and not unlike an extract in appearance. The colour is sometimes almost black, and sometimes of a light-brown, not unlike that of Egyptian opium. Dr. Christison states that it is much superior to the globular Bengal opium, and that some specimens are little inferior to Turkey opium in the proportion of morphia.

2. *Malwa Opium.* This is in flat, roundish cakes, five or six inches in diameter, and from four to eight ounces in weight. They are commonly quite hard, dry, and brittle, of a light-brown colour, a shining fracture, a compact homogeneous texture, and free from mechanical impurities. The quality is superior to that of common Bengal opium. (*Christison's Dispensatory.*) A specimen of Malwa opium described by Dr. Carson (*Am. Journ. of Pharm.*, xxi. 195) broke with a short rough fracture, which was of a blackish-brown colour, here and there showing irregular oily spots. Prof. Procter obtained from it 9¼ per cent. of morphia.

IV. PERSIA OPIUM. A variety of opium under this name has sometimes existed in the markets of London, and has even found its way to this country, though it is very rare. It is described as being in cylindrical pieces, about three and a half inches long and half

and tongue, and even blisters the mouth of those unaccustomed to its use. Its colour is reddish-brown or deep-fawn; its texture compact; its sp. gr. 1·336. When drawn over paper it usually leaves an interrupted trace of a light-brown colour. It is often soft in the interior of the mass, and in this state is tenacious; but when exposed to the air it gradually hardens, and ultimately becomes brittle, breaking with a shining fracture, and affording, when pulverized, a yellowish-brown powder, which becomes adhesive upon a slight elevation of temperature. It readily inflames upon the application of a lighted taper. It yields its virtues to water, alcohol, and diluted acids, but not to ether. To all these menstrua it imparts a deep-brown colour. Alcohol dissolves about four-fifths of it. Pelletier states that the proportion taken up by water varies in all specimens. He never found the quantity of extract prepared with cold water to exceed 12 parts out of 16. (*Journ. de Pharm.*, Nov. 1832.)

Much attention has been devoted to the chemical constitution of opium; and very interesting results have been obtained. It was by their researches into the nature of this substance that chemists were led to the discovery of those vegetable alkaloids, which, as the active principles of the plants in which they are found, have attracted so much attention, and been applied so advantageously in the treatment of disease. To Sertürner, an apothecary at Eimbeck, in Hanover, certainly belongs the credit of having opened this new and most important field of experiment. In the year 1803, M. Derosne made known the existence of a crystallizable substance which he had discovered in opium, and which he erroneously believed to be the active principle. In the following year, Seguin discovered another crystallizable body, which subsequent experience has proved to be the true narcotic principle of opium; but he did not fully investigate its nature, and no immediate practical advantage was derived from his excellent analysis. About the same time Sertürner was engaged in a similar investigation, the results of which, very analogous to those obtained by Seguin, were published in a German journal, without, however, attracting general attention. In this state the subject remained till the year 1817, when Sertürner announced the existence of a saline compound in opium, consisting of a peculiar alkaline principle united with a peculiar acid, and clearly demonstrated the precise nature of a substance, which, though before discovered both by Seguin and by himself, had been hitherto but vaguely known. To the alkaloid, in which he correctly conceived the narcotic powers of the opium to reside, he gave the name of *morphium*, which has been subsequently changed to *morphia*, in order to render it analogous to the titles of the other alkalies. The acid he called *meconic*, a term derived from the Greek name of the poppy. The correctness of the statements of Sertürner was confirmed by Robiquet, who also satisfactorily demonstrated that the substance obtained by Derosne, and called by him the *salt of opium*, was a principle altogether distinct from morphia, though supposed to possess

an inch thick, wrapped in glossy paper, and tied with a cotton thread. It is of a uniform consistence, but exhibits, nevertheless, under the microscope, small agglutinated tears, much less than those of the Smyrna opium. It has the liver-brown colour of Egyptian opium, a virose, musty odour, and a very bitter taste; and, like Egyptian opium, softens in a moist atmosphere. It is said to have been brought to England from Trebizond on the Black Sea; but its origin is not known. It is of inferior quality. From the report of a trial in the city of New York, published in the *Journal of Commerce*, it appears that a parcel of Persia opium imported into that city from London in August, 1835, was in small round balls, and contained only 3 per cent. of morphia.

It is highly important that the real value of these commercial varieties of opium should be known to the physician and apothecary; as otherwise, there can be no certainty in relation to the strength of the preparations which may be made from them. In the preparation of laudanum and the other tinctures into which opium enters, it is understood that the drug employed should have the average quality of good Smyrna opium. The inferior kinds should be used only for the extraction of morphia.

very considerable influence over the system. In the belief of its narcotic powers, Robiquet denominated it *narcotin*, a title which it still retains. Several other peculiar principles have since been discovered; though it is difficult to resist the impression, that some of them may be the result of the processes to which opium is submitted for their extraction. According to the views of its constitution at present admitted, opium contains, 1. morphia; 2. narcotin or narcotina; 3. codeia; 4. paramorphia; 5. narcein; 6. meconin; 7. porphyroxin; 8. meconic and sulphuric acids; 9. a peculiar acid, not yet fully investigated; 10. extractive matter; 11. gum; 12. bassorin; 13. a peculiar resinous body insoluble in ether and containing nitrogen; 14. fixed oil; 15. a substance resembling caoutchouc; 16. an odorous volatile principle; besides lignin, and a small proportion of acetic acid, sulphate of lime, sulphate of potassa, alumina, and iron. Besides these principles, Pelletier announced the discovery of another which he called pseudomorphia, but which appears to be only an occasional constituent of opium. (See *Journ. de Pharm.*, xxi. 575.)* In relation to their optical properties, all the

* Besides the components of opium mentioned in the text, notice has been given of the discovery of two other alkaloids, named respectively *papaverine* (*papaverina*) and *opianine* (*opiania*), of which we shall here give a brief notice; though further and repeated experiments will be necessary to establish their claims.

1. *Papaverina* (*papaverine*). The discovery of this alkaloid was announced by Dr. G. Merck. It is crystallizable in needles, insoluble in water, very sparingly soluble in cold alcohol or ether, more soluble in these liquids boiling hot, and deposited by them on cooling. With acids it forms salts most of which are very sparingly dissolved by water. The muriate crystallizes with extraordinary facility. The alkaloid is readily dissolved by moderately concentrated muriatic acid, from which, on the addition of more acid, the muriate separates, assuming the form of an oily layer at the bottom of the vessel, which is readily converted on standing into a mass of acicular crystals. These crystals are very sparingly soluble in cold water. The muriate yields with chloride of platinum a yellow precipitate which is insoluble in boiling water or alcohol. (See *Am. Journ. of Pharm.*, ix. 311.) Papaverina is prepared by precipitating the aqueous infusion of opium with soda, exhausting the precipitate with alcohol, evaporating the tincture to dryness, treating the residue with a dilute acid, filtering, precipitating by ammonia, dissolving the precipitate in muriatic acid, mixing with the solution the acetate of soda, and treating with boiling ether the resulting precipitate. The ethereal solution deposits the papaverina on cooling. A characteristic property of this alkaloid is that its crystals, when moistened with concentrated sulphuric acid, acquire a dark-blue colour. It consists of nitrogen, carbon, hydrogen, and oxygen; its formula being $NC_{40}H_{21}O_8$. (*Chem. Gaz.*, March 15, 1850, from *Liebig's Annalen.*)

2. *Opiania* (*opianine*). This was found by Dr. Hinterberger in some supposed narcotina, which had been obtained by Engler, an apothecary of Vienna, from a parcel of Egyptian opium which he was working for morphia. An infusion of the opium was precipitated by ammonia, and the precipitate, having been washed first with water and then with cold alcohol, was dissolved in hot alcohol, and decolorized by animal charcoal. A crystalline mass was thus obtained consisting apparently of morphia and narcotina. By repeated solutions in hot alcohol and crystallization, the former was separated, remaining in the alcohol, while the supposed narcotina was obtained in crystals. These, upon being examined by Dr. Hinterberger, proved to be a new alkaloid, to which he gave the name of *opianine*. It is in long, colourless, transparent needles, belonging to the prismatic system. When precipitated by ammonia from the solution of the muriate, it is in the form of a soft white powder. It is without smell, and in alcoholic solution has a strong and durable bitter taste. At the temperature of 212° F. it remains unchanged. It is insoluble in water, and requires for solution a large quantity of boiling alcohol, from which it is entirely thrown down, upon cooling, in the state of crystals. In alcoholic solution it has a strong alkaline reaction; and from this solution both opiania itself and its salts are thrown down by alkalies. Concentrated sulphuric acid dissolves without changing it; nitric acid renders it yellow, and, if added to its sulphuric acid solution, blood-red, but after a short time changing to light-yellow. Its formula, according to Hinterberger, is $N_2C_{66}H_{36}O_{21}$. From experiments performed with it on the lower animals, it has been inferred to be powerfully narcotic, and to resemble morphia in its action. About one-tenth of a grain of each of these alkaloids was given to two cats, one to one cat, and the other to the other, with very similar effects, which were decidedly narcotic, and continued for a considerable time, but had ceased at the expiration of 24 hours, without fatal effects. (*Chem. Gaz.*, Dec. 1, 1852, p. 444, from the *Proceedings of the Acad. of Sci. at Vienna*, vii. part 3.)—*Note to the tenth edition.*

organic bases of opium have the property of deviating to the left the rays of polarized light. (MM. Bouchardat and Felix Boudet, *Journ. de Pharm.*, 3e sér., xxiii. 294.)

Of the principles above mentioned *morphia* is by far the most important. It is generally admitted to exist in opium united with meconic acid in the state of meconate, and to a certain extent also as a sulphate. Of morphia and its preparations we shall treat at large under another head. (See *Morphia.*)

Narcotina or *narcotin* receives one or the other of these names according as it is considered alkaline or neuter; they who rank it among the alkalies giving it the former name, they who deny it such a position, the latter. It exists in opium, chiefly, at least, in the free state, and is left behind in considerable quantity when the drug is macerated with water. It is white, tasteless, and inodorous; and crystallizes in silky flexible needles, usually larger than the crystals of morphia, fusible at a moderate elevation of temperature, insoluble in cold water, soluble in 400 parts of boiling water, in 100 parts of cold and 24 of boiling alcohol which deposits it upon cooling, and very soluble in ether. The fixed and volatile oils, and the diluted acids also dissolve it. As it exerts no alkaline reaction upon vegetable colours, and does not prevent the acids from reddening litmus paper, there would appear to be some reason for denying it the rank of an alkali. But it unites with some of the acids forming definite compounds, which may be procured in a separate state; and Robiquet obtained the sulphate and muriate of narcotina well crystallized. (*Journ. de Pharm.*, xvii. 639, and xix. 59.) Hence many chemists, among whom is Berzelius, consider it alkaline; and, perhaps, this view of it is the most convenient. It must be admitted, however, to have a very feeble neutralizing power. With acetic acid it does not appear to form a permanent combination; for, though dissolved by cold acetic acid, it is separated by heating the solution. Narcotina consists of nitrogen, carbon, hydrogen, and oxygen; and its received formula is $NC_{48}H_{24}O_{15}$. It may be distinguished from morphia by its insipidity, solubility in ether, and insolubility in alkaline solutions, by not affecting vegetable colours, by assuming a yellowish instead of a blood-red colour under the action of strong nitric acid, by not decomposing iodic acid, and by not producing a blue colour with the salts of iron. It is however, reddened by a mixture of nitric and sulphuric acids. Hence, if to a mixture of it with strong sulphuric acid a small piece of nitre be added, a deep blood-red colour is produced; while morphia, under the same circumstances, yields a brownish or olive-green colour. It gives a greasy stain to paper when heated upon it over a candle. Heated with an excess of sulphuric acid and deutoxide of manganese, it is converted into an acid called *opianic acid*, and into a substance of feeble alkaline properties, which has received the name of *cotarnine* (*cotarnia*). (*Journ. de Pharm.*, 3e sér., vi. 99.) When subjected to distillation with potassa, it yields a colourless volatile liquid having alkaline properties, with the strong smell of herring-pickle together with that of ammonia. This is thought to be a peculiar alkaloid, and has received the name of *propylamine*. (Wertheim, *Pharm. Cent. Blatt*, June 1, 1850, p. 421, and Dec. 17, 1831, p. 918.)* Water extracts narcotina partially from opium, in consequence of the acid which the latter contains, either free or combined with

* There would seem, from the observations of Wertheim and Hinterberger, to be four homologous modifications of narcotina, having a fixed relation to each other in composition, the number of eqs. of nitrogen and oxygen being the same in all, while those of carbon and hydrogen increase by 2 eqs. in regular progression. Thus 1. *normal narcotina* (Hinterberger) has the formula $NC_{42}H_{21}O_{14}$; 2. *methylic narcotina* (Wertheim) $NC_{44}H_{23}O_{14}$; 3. *æthylic narcotina* (Wertheim) $NC_{46}H_{25}O_{14}$; and 4. *propylic narcotina* (Wertheim) $NC_{48}H_{27}O_{14}$. Another interesting point is that each of these yields a peculiar volatile alkali by distillation with potassa; and the several products bear to each other the same chemical relation as exists between the fixed alkaloids from which they are derived. They are *ammonia* from

the narcotina. It is usually obtained mixed with morphia in the processes for procuring that principle; and may be separated by the action of sulphuric ether, which dissolves it without affecting the morphia, and yields it upon evaporation. It may also be obtained by digesting opium in sulphuric ether, and slowly evaporating the ethereal solution, which deposits crystals of narcotina. Another mode of procuring it is to treat opium, which has been exhausted by previous maceration in water, with dilute acetic acid, to filter the solution, precipitate by an alkali, wash the precipitate with water, and purify it by solution in boiling alcohol, from which it crystallizes as the liquid cools. Should it still be impure, the solution in alcohol and crystallization may be repeated.

The proportion of this principle found in opium varies extremely in the different varieties, and in different specimens of the same variety. Thus in Smyrna opium it has been found, according to different observers, in quantities varying from 1·30 per cent. (*Schindler*) to 9·36 per cent., in one of the specimens examined by Mulder.

Though narcotina itself is tasteless, its salts are very bitter, even more so than those of morphia. (*Berzelius.*) Their solution reddens litmus, and affords precipitates with the alkalies and infusion of galls. They have not been very accurately investigated. It has already been stated that Robiquet obtained the sulphate and muriate crystallized.

Different opinions have been advanced relative to the action of narcotina on the system. Derosne believed it to be the active principle of opium; though, upon experimenting with it, he obtained effects but little stronger than those produced by an equal dose of opium itself. Magendie found it to act powerfully upon dogs. One grain dissolved in oil was sufficient to throw the animal into a state of stupor, terminating in death in twenty-four hours. This stupor was wholly different from the composed sleep produced by morphia and its preparations. He inferred that, while the latter principle exercises the remedial, anodyne, and soporific virtues of opium, the injurious excitant operation of the medicine is ascribable to the narcotina. Both Derosne and Magendie found its unpleasant effects to be modified or prevented by its conjunction with acetic acid. According to Magendie, twenty-four grains, dissolved in vinegar, may be given to a dog without destroying life. M. Baily prescribed it in the dose of sixty grains, both in the solid state and dissolved in muriatic acid, without observing from it any sensible effect. In the same state, Orfila found that it might be taken by man in very large doses with impunity; and thirty grains of it, dissolved in acetic acid, produced no effect upon several patients to whom it was administered. Upon dogs, he informs us that it is without action when dissolved in nitric or muriatic acid; but held in solution by acetic or sulphuric acid, or by olive oil, thirty or forty grains of it were sufficient to produce fatal effects. A singular circumstance noticed by the same experimenter was, that the solution in acetic or sulphuric acid occasioned violent excitement; while the contrary condition uniformly resulted from the use of the solution in olive oil. On the whole, we may conclude that narcotina, either in the solid form or dissolved in acids, is not possessed of any considerable narcotic powers; and that the effects of a narcotic character which have been attributed to it, have probably arisen from the employment of a preparation not entirely freed from other principles contained in the opium. Dr. O'Shaughnessy, Professor of Chemistry in the Medical College

the first, *methylamine* from the second, *æthylamine* from the third, and *propylamine* from the fourth. The last of these volatile alkaloids has been referred to in the text as having the smell of herring-pickle. It is said to be produced also by distilling ergot with potassa. Methylamine was procured by Wertheim The other products are, we believe, thus far hypothetical. (*Pharm. Cent. Blatt*, Dec. 17, 1851, p. 918; and *Journ. de Pharm.*, 3e sér., xxiii. 154.)—*Note to the tenth edition.*

of Calcutta, recommends narcotina very highly in intermittent fever, and believes that he has discovered in it even stronger antiperiodic properties than those of quinia. In the cases reported by him, it was employed in combination with muriatic acid. Given in this form, though powerfully febrifuge, it was found not to produce narcotic effects, not to constipate the bowels, and never to occasion that distressing headache and restlessness which sometimes follow the use of quinia. It proved, moreover, powerfully sudorific. It was given in doses of three grains, three times a day. Dr. O'Shaughnessy was induced to recommend its employment to his medical friends in India, from a knowledge that it had proved effectual in mild agues, in the hands of Dr. Roots and Mr. Jetson in England.*

Codeia was discovered in 1832 by Robiquet in the muriate of morphia prepared according to the process of Gregory. It exists in opium combined like morphia with meconic acid, and is extracted along with that alkali in the preparation of the muriate. (See *Morphia.*) When the solution of the mixed muriates of morphia and codeia is treated with ammonia, the former alkali is precipitated, and the codeia, remaining in solution, may be obtained by evaporation and crystallization. It may be purified by treating the crystals with hot ether, which dissolves them, and yields the codeia in colourless crystals by spontaneous evaporation. This alkaline product melts at 300° without decomposition. It is soluble in water, which takes up 1·26 per cent. at 60°, 3·7 at 110°, and 5·9 at 212°. When added in excess to boiling water, the undissolved portion melts and sinks to the bottom, having the appearance of an oil. It is soluble also in alcohol and ether, but is insoluble in alkaline solutions. Hence, it may be separated from morphia by a solution of potassa or soda, which dissolves the morphia, and leaves the codeia. It has an alkaline reaction on test paper, and combines with acids to form salts, some of which are crystallizable, particularly the nitrate. Its capacity of saturation is almost identical with that of morphia. According to Robiquet, 1 part of muriatic acid is saturated by 7·837 of codeia, and by 7·88 of morphia. It is distinguishable, however, from the latter principle, by the different form of its crystals, which are octohedral, by its solubility in boiling ether, greater solubility in water, and insolubility in alkaline solutions, and by not assuming a red colour with nitric acid, nor a blue one with the salts of the sesquioxide of iron. (*Journ. de Pharm.*, xix. 91.) Tincture of galls precipitates from its solutions a tannate of codeia. Crystallized from a watery solution, it contains about six per cent. of water, which is driven off at 212°. The crystals obtained from a solution in ether contain no water. Like most of the other organic alkalies, it consists of nitrogen, carbon, hydrogen and oxygen; its received formula being $NC_{35}H_{20}O_5$, and its combining number consequently 284. According to Dr. Anderson, however, the formula of the anhydrous alkaloid is $NC_{36}H_{21}O_6$, with the addition of two eqs. of water in the hydrate. (*Month. Journ. of Med. Sci.*, May, 1850, p. 492.) Dr. Gregory tried the effects of *nitrate of codeia* upon himself and several of his pupils, and found that, in a dose of three grains or less, it produced no obvious effect, but, in the quantity of from four to six grains, accelerated the pulse, occasioned a sense of heat in the head and face, and gave rise to an agreeable excitement of the spirits like that resulting from intoxicating drinks, which was attended with a sense of itching upon the skin, and, after lasting for several hours, was followed by an unpleasant depression, with nausea and sometimes vomiting. No tendency to sleep was observed, except in the state of depression. In two or three cases the medicine produced a slight purgative effect; but in

* The different effects, obtained by different experimenters from narcotina, are readily explicable, should the statements, contained in previous notes (see *pages* 532 and 533), as to the existence of a powerful alkaloid (opiania), which may have been mixed with the narcotina, and of several different modifications of narcotina itself, prove to be correct.—*Note to the tenth edition.*

others it appeared to exercise no peculiar influence on the bowels. M. Barbier, of Amiens, administered codeia *uncombined* in numerous cases, and observed that, in the dose of one or two grains, it acted on the nervous system, and appeared to be directed especially to the great sympathetic; as it relieved painful affections having their origin apparently in disorders of this nerve, while it exerted no influence over pains of the back and extremities supplied by nerves from the spinal marrow. He did not find it to affect the circulation, to disturb digestion, or to produce constipation. In sufficient quantity, it induced sleep, without occasioning those marks of cerebral congestion occasioned by opium. Dr. Miranda, of Havana, employed it with great advantage in several bad cases of dyspepsia. On the whole, there can be no doubt that this principle has a decided action on the animal economy, and is among those upon which opium depends for its peculiar powers.

Paramorphia (*thebaina*) is the name given by Pelletier to a principle, discovered by him in the precipitate thrown down from an infusion of opium treated with milk of lime. The precipitate being washed with water till the liquid came away colourless, and then treated with alcohol, instead of affording morphia to this solvent, as was anticipated, yielded a new alkaline principle, which was obtained separate by evaporating the alcohol, acting on the residue with ether, allowing the ethereal solution to evaporate spontaneously, and then purifying the resulting crystalline mass by dissolving it in an acid, precipitating by ammonia, and recrystallizing by means of alcohol or ether. Pelletier named it paramorphia, from its close analogy in composition with morphia, from which, however, it is quite distinct in properties. It is white, crystallizable in needles, of an acrid and styptic rather than bitter taste, fusible at about 300°, scarcely soluble in water, very soluble in alcohol and ether even when cold, and still more so when heated, and capable of combining with the acids, with which it forms salts not crystallizable from their aqueous solution. Alkalies precipitate it from its acid solutions, and, unless in very concentrated solution, do not dissolve it when added in excess. It is not, like morphia, reddened by nitric acid, nor does it become blue with solutions of the salts of sesquioxide of iron. From codeia it differs in never being in large crystals, in not forming crystallizable salts, in being always precipitated from its acid solutions by ammonia, and in not melting in oily drops. From narcotina, which it most resembles, it may be distinguished by its shorter crystals, which want the pearly appearance of those of narcotina, by its different taste, by its much greater solubility in cold alcohol, of which 10 parts will dissolve 1 of this principle, while narcotina requires 100 parts, and by the action of nitric acid, which converts it into a resin-like matter before dissolving it, while the same acid instantly dissolves narcotina. It consists of nitrogen, carbon, hydrogen, and oxygen, its formula being $NC_{25}H_{14}O_3$ (*Kane*), and its combining number consequently 202. Dr. Anderson gives the formula $NC_{38}H_{21}O_6$. (See *Journ. de Pharm.*, 3*e sér.*, xxiv. 233.) The name of *thebain* was proposed for it by M. Couërbe, who was disposed to give the credit of its discovery to M. Thiboumery, the director of Pelletier's laboratory. According to Magendie, it is closely analogous, in its effects on the system, to strychnia and brucia, producing tetanic spasms in the dose of a grain. (See *Am. Journ. of Pharm.*, viii. 69.)

Narcein, discovered by Pelletier in 1832, is white, in silky acicular crystals, inodorous, of a slightly bitter taste, fusible at 197° F., soluble in 375 parts of cold and 220 of boiling water, soluble also in alcohol, and insoluble in ether. It forms a bluish compound with iodine, the colour of which is destroyed by heat and the alkalies. It is rendered blue by the action of mineral acids so far diluted as not to decompose it; but does not, like morphia, become blue by the action of the salts of iron, nor red by that of nitric acid. It is dissolved by the acids, but does not neutralize them, and, though at first thought to be alkaline by Pelle-

tier, is not so considered at present. It resembles the organic alkalies, however, in its constitution, consisting of nitrogen, carbon, hydrogen, and oxygen. Its formula is $NC_{28}H_{20}O_{12}$, or, according to Dr. Anderson, $NC_{46}H_{29}O_{18}$. Pelletier obtained it in the course of his analysis of opium. Having formed an aqueous extract of opium, he treated it with distilled water, precipitated the morphia by ammonia, concentrated the solution, filtered it, threw down the meconic acid by baryta water, separated the excess of baryta by carbonate of ammonia, drove off the excess of the ammoniacal salt by heat, evaporated the liquor to the consistence of syrup, set it aside till a pulpy matter formed containing crystals, separated and expressed this pulpy matter, then treated it with alcohol, and concentrated the alcoholic solution. This, upon cooling, deposited crystals of *narcein*, which were easily purified by repeated solution and crystallization. When mixed with meconin, which often crystallizes with it, the latter may be separated by the agency of ether. It has not been ascertained to have any influence upon the system. Two grains of it have been introduced into the jugular vein of a dog without any observable effect.

Meconin, the existence of which was announced in 1832 by M. Couërbe, is identical with a substance discovered several years previously by M. Dublanc, jun., but of which no account was published. It is perfectly white, in the form of acicular crystals, soluble in about 265 parts of cold and 18 of boiling water, very soluble in ether, alcohol, and the essential oils, fusible at 195°, volatilizable without change, and possessed of a degree of acrimony which favours the supposition that it may not be without action upon the system. It is neither acid nor alkaline, and contains no nitrogen. Meconin is obtained by precipitating the aqueous infusion of opium with ammonia, washing the precipitate with water until the latter nearly ceases to acquire colour, mixing the watery fluids, evaporating them to the consistence of molasses, setting them aside for two or three weeks, during which a mass of granular crystals is formed, then decanting the liquid, expressing the mass, and drying it with a gentle heat. The meconin may be separated from the mass by treating it with boiling alcohol of 36° Baumé, evaporating so as to obtain crystals, dissolving these in boiling water with animal charcoal, filtering the liquid while hot, and subjecting the crystals which form upon the cooling of the solution to the action of ether, which dissolves the meconin, and yields it in a state of purity by spontaneous evaporation. (*Journ. de Pharm.*, Dec. 1832.)

Porphyroxin (*opine*, Berzelius), according to Merck, may be obtained by treating powdered opium (previously exhausted by boiling ether, and then made into a pulp by means of water) with carbonate of potassa, agitating it with ether, evaporating the ethereal solution, dissolving the residue in dilute muriatic acid, and precipitating with ammonia. Paramorphia and porphyroxin are thus obtained together. These are to be dissolved in ether, which, by spontaneous evaporation, deposits the former in crystals, and the latter in the form of resin. The porphyroxin is separated by the cautious use of alcohol, and is obtained by the evaporation of the alcoholic solution. It is neuter, crystallizable in shining needles, insoluble in water, soluble in alcohol and ether, and characterized by the property of assuming a purple-red or rose-colour when heated in dilute muriatic acid. (*Journ. de Pharm.*, 3e *sér.*, xiv. 187.)

Of *pseudomorphia*, as it is found in opium only as an occasional ingredient, and is not generally present, it is scarcely necessary to treat in detail. An interesting fact, however, in relation to it, and one of some toxicological importance, is that it possesses two properties considered characteristic of morphia, those namely of being reddened by nitric acid, and of striking a blue colour with the salts of iron, and yet is without any poisonous influence upon the animal economy. (See *Am. Journ. of Pharm.*, viii. 77, or *Journ. de Pharm.*, xxi. 575.)

But it differs in not forming salts with the acids, and in not decomposing iodic acid. It consists of nitrogen, carbon, hydrogen, and oxygen.

Meconic acid is in white crystalline scales, of a sour taste followed by bitterness, fusible and volatilizable by heat, soluble in four parts of boiling water, soluble also in cold water and alcohol, with the property of reddening vegetable blues, and forming salts. Its compounds with the earths and heavy metallic oxides are generally insoluble in water. Its characteristic properties are, that it produces a blood-red colour with the salts of sesquioxide of iron, a green precipitate with a weak solution of ammoniated sulphate of copper, and white precipitates soluble in nitric acid, with acetate of lead, nitrate of silver, and chloride of barium. It is obtained by macerating opium in water, filtering the infusion, and adding a solution of chloride of calcium. Meconate and sulphate of lime are precipitated. The precipitate, having been washed with hot water and with alcohol, is treated with dilute muriatic acid at 180°. The meconate of lime is taken up, and, upon the cooling of the liquid, bimeconate of lime is deposited. This is dissolved in warm concentrated muriatic acid, which deposits pure meconic acid when it cools. It may be freed from colouring matter by neutralizing it with potassa, decomposing the crystallized meconate thus obtained by muriatic acid, and again crystallizing. Meconic acid has little or no action on the system, and is not used separately in medicine; but its natural relation to morphia requires that it should be understood.

Incompatibles. All the substances which produce precipitates with opium do not necessarily affect its medical virtues; but the *alkalies*, and all vegetable infusions containing tannic and gallic acids, are strictly incompatible; the former separating and precipitating the active principle, the latter forming with it an insoluble compound.

The proportion of morphia which any particular specimen of opium will furnish, may be considered as the best test of its value, except that of actual trial upon the system. Good opium should yield ten or twelve per cent. of the impure morphia precipitated from the infusion by ammonia with alcohol, according to the process of the United States Pharmacopœia. (See *Morphia.*) The Edinburgh College gives the following test. "A solution from 100 grains of fine opium macerated twenty-four hours in two fluidounces of water, filtered, and strongly squeezed in a cloth, if treated with a cold solution of half an ounce of carbonate of soda in two waters, yields a precipitate, which weighs, when dry, at least ten grains, and dissolves entirely in solution of oxalic acid."

M. Guilliermond gives the following mode of estimating the strength of opium, as tested by the amount of morphia which it will yield. Take 15 parts of opium, cut it in pieces, rub it up with 60 parts of alcohol at 160°, drain the mixture on linen and express, treat the residue with 40 parts of alcohol at the same temperature, unite the tinctures in a vessel with a large mouth into which 4 parts of solution of ammonia (22° Cartier) have been introduced, and allow the mixture to stand 12 hours. The crystals which form are to be put upon linen, washed repeatedly with water to separate the meconate of ammonia, and then introduced into a small vessel of water. The crystals of narcotina being very light, remain suspended in the water, and may be decanted along with it, while those of morphia, remaining at the bottom, may be collected and weighed. Good opium treated in this way will yield for the 15 parts employed from 1·25 to 1·75 parts of the crystals of morphia. (*Journ. de Chim. et de Pharm.*, xvi. 18.)*

* As the morphia obtained in the above process is not quite free from narcotina, M. De Vry proposes the following modification. The mixture of morphia and narcotina, precipitated from the alcoholic solution by ammonia, after being washed, is to be heated with a slight excess of sulphate of copper dissolved in pure water. The narcotina has no action on the sulphate of copper, which is decomposed by the morphia, producing sulphate of

Tests of Opium. It is sometimes highly important to be able to ascertain the presence or absence of opium in any suspected mixture. As meconic acid and morphia have been found only in the products of the poppy, if either or both of them be shown to exist in any substance, very strong evidence is afforded of the presence of opium in that substance. Our tests should, therefore, be applied in reference to the detection of these two principles. If an aqueous infusion of the substance examined yield a red colour with the tincture of chloride of iron, there is presumptive evidence of the presence of meconic acid. Greater certainty may be obtained by the following process. Add in excess to the filtered liquor a solution of acetate of lead. If opium be present, there will be a precipitate of meconate of lead, and the acetates of morphia and lead will remain in solution. The precipitate is then to be suspended in water, and decomposed, either by adding a little diluted sulphuric acid, which forms the sulphate of lead and leaves the meconic acid in solution, or by passing through it a stream of sulphuretted hydrogen, removing by filtration the precipitated sulphuret of lead, and heating the clear liquor so as to drive off the sulphuretted hydrogen. With the clear liquor thus obtained, if it contain meconic acid, the tincture of chloride of iron will produce a striking red colour, the ammoniated sulphate of copper a green precipitate, and acetate of lead, nitrate of silver, and chloride of barium, white precipitates soluble in nitric acid. Sulphocyanuret of potassium, which, according to Dr. Wright, is an invariable constituent of saliva (*Simon's Chemistry*, ii. 6), produces a red colour with the salts of sesquioxide of iron, resembling that produced by meconic acid; but, according to Mr. Everitt, this colour is entirely and at once destroyed by a solution of corrosive sublimate, which has no effect on the red colour of the meconate of iron. (See *Am. Journ. of Pharm.*, xii. 88.) On the contrary, chloride of gold reddens a solution of hydrosulphocyanic acid or a sulphocyanuret, but not of meconic acid. Pereira says the acetates also redden the salts of sesquioxide of iron; but they do not afford the results above mentioned with acetate of lead and chloride of barium. To test the presence of morphia, the liquid from which the meconate of lead has been precipitated, and which may be supposed to contain the acetates of morphia and lead, must be freed from the lead by a stream of sulphuretted hydrogen, and then from the sulphuretted hydrogen by heat; after which, the following reagents may be applied:—viz. 1. nitric acid, which colours the morphia red; 2. iodic acid, which is decomposed by the morphia with the extrication of iodine, which colours the liquid reddish-brown, and, if starch is present, unites with it to form a blue compound; 3. solution of ammonia, which, if carefully added so as not to be in excess, throws down a precipitate of morphia soluble in a great excess of that alkali or of potassa; and 4. tannic acid, which precipitates an insoluble tannate of morphia. If the precipitate thrown down by ammonia afford a deep-red colour, becoming yellow, with nitric acid, and a blue colour with the sesquichloride of iron, the proof may be considered as complete.*

morphia and tribasic sulphate of copper. The latter and the narcotina remain undissolved, and a solution is obtained containing sulphate of morphia with a little sulphate of copper. This being filtered is treated first with sulphuretted hydrogen, which precipitates the copper, and afterwards with ammonia which throws down the morphia. (*Pharm. Journ. and Trans.*, x. 77.)

* Merck has proposed a test of opium, founded on the property which characterizes porphyroxin of assuming a red colour when heated in dilute muriatic acid. The suspected liquid is first to be carefully evaporated, a few drops of solution of potassa are to be added, and the mixture agitated with ether. The ethereal solution being filtered off, a slip of unsized paper is to be dipped into it and dried; and the moistening and drying should be repeated several times. The paper thus prepared is to be moistened with dilute muriatic acid, and then exposed to the vapour of boiling water. If it become reddened, opium may be inferred to exist in the liquid tested. M. Heusler states that this test is not applicable

Medical Properties and Uses. Opium is a stimulant narcotic. Taken by a healthy person, in a moderate dose, it increases the force, fulness, and frequency of the pulse, augments the temperature of the skin, invigorates the muscular system, quickens the senses, animates the spirits, and gives new energy to the intellectual faculties. Its operation, while thus extending to all parts of the system, is directed with peculiar force to the brain, the functions of which it excites sometimes even to intoxication or delirium. In a short time this excitation subsides; a calmness of the corporeal actions, and a delightful placidity of mind succeed; and the individual, insensible to painful impressions, forgetting all sources of care and anxiety, submits himself to a current of undefined and unconnected, but pleasing fancies; and is conscious of no other feeling than that of a quiet and vague enjoyment. At the end of half an hour or an hour from the administration of the narcotic, all consciousness is lost in sleep. The soporific effect, after having continued for eight or ten hours, goes off, and is generally succeeded by more or less nausea, headache, tremors, and other symptoms of diminished or irregular nervous action, which soon yield to the recuperative energies of the system; and, unless the dose be frequently repeated, and the powers of nature worn out by over-excitement, no injurious consequences ultimately result. Such is the obvious operation of opium when moderately taken; but other effects, very important in a remedial point of view, are also experienced. All the secretions, with the exception of that from the skin, are either suspended or diminished; the peristaltic motion of the bowels is lessened; pain and inordinate muscular contraction, if present, are allayed; and general nervous irritation is composed, if not entirely relieved.

In doses insufficient to produce the full soporific effect, the stimulant influence upon the mental functions continues longer, and the subsequent calming effect is sustained for hours; sleep being not unfrequently prevented, or rendered so light and dreamy that, upon awaking, the patient will scarcely admit that he has slept at all. When large doses are taken, the period of excitement and exhilaration is shorter; the soporific and anodyne effects are more intense and of longer duration; and the succeeding symptoms of debility are more obvious and alarming.

From quantities sufficient to destroy life, after a brief excitement, the pulse is reduced in frequency though not in force, muscular strength is diminished, and feelings of languor and drowsiness supervene, which soon eventuate in a deep apoplectic sleep. A stertorous respiration; a dark suffusion of the countenance; a full, slow, and labouring pulse; an almost total insensibility to external impressions; and—when a moment of consciousness is obtained by violent agitation, or irritating applications—a confused state of intellect, and an irresistible disposition to sink back into comatose sleep, are symptoms which, for the first few hours, attend the operation of the poison. Though not signs of an elevated condition of the bodily powers, neither do they imply a state of pure, unmixed debility. The pulse is, indeed, slow; but it is often so full and strong as even to call for the use of the lancet. In the space, however, of a few hours, varying according to the quantity of the narcotic taken, and the powers of the patient's constitution, a condition of genuine debility ensues; and this condition will be hastened in point of time, though it will be more under the control of remedies, if the opium be evacuated from the stomach. Called to an individual labouring under the influence of a fatal dose of opium, at a period from six to eight hours after it has been swallowed, the practitioner will generally find him with a cool, clammy skin; cold extremities; a pallid countenance; a feeble, thread-

to the aqueous solution or extract of opium, because porphyroxin is insoluble in water; but Mr. Robertson, of Rotterdam, has found it to succeed with the watery extract, and infers that the porphyroxin is so combined in opium as to render it in some measure soluble. (*Journ. de Pharm.*, 3e *sér.*, xxii. 190.)—*Note to the tenth edition.*

like, scarcely perceptible pulse; a slow, interrupted, almost gasping respiration; and a torpor little short of absolute, death-like insensibility. Death soon follows, unless relief is afforded.

No appearances are revealed by the dissection of those who have died of the immediate effects of opium, which can be considered as affording satisfactory evidence of its mode of operation. The redness occasionally observed in the mucous membrane of the stomach is not constantly present, and is ascribable as much to the irritating effect of remedies prescribed, or to the spirituous vehicle in which the poison has been swallowed, as to the action of the poison itself. Such at least is the inference drawn by Nysten from his experiments and observations; and Orfila states that the stomachs of dogs which he had killed by opium, internally administered, did not present the slightest vestige of inflammation. The force of the medicine is directed to the cerebral and nervous functions; and death is produced by a suspension of respiration, arising from the want of due influence from the brain. The section of the par vagum on both sides has not been found to prevent or retard the death of animals to which large doses of opium have been given, nor even materially to modify its narcotic effects. (*Nysten, quoted by Orfila.*) It would seem, therefore, that the active principle is conveyed into the circulation, and operates upon the brain, and probably upon the nervous system at large, by immediate contact. It is an error to attribute the anodyne, sedative, and soporific effects of the medicine to the previous excitement. They are, as much as this very excitement, the direct results of its action upon the brain. It is in the state of exhaustion and collapse which ensue after the peculiar influence of the opium has ceased, that we are to look for an illustration of that principle of the system, by which any great exaltation of its energies above the natural standard is followed by a corresponding depression. We may be permitted to advance the conjecture, that the excitement which almost immediately supervenes upon the internal use of opium, may be in some degree produced by means of nervous communication; while the succeeding narcotic effects are attributable to its absorption and entrance into the circulation; and the prostration of all the powers of the system which ultimately takes place, is a necessary consequence of the previous agitation of the various organs.

On some individuals opium produces very peculiar effects, totally differing from the ordinary results of its operation. In very small quantities it occasionally gives rise to excessive sickness and vomiting, and even spasm of the stomach; in other cases it produces restlessness, headache, and delirium; and we have known it, even in large doses, to occasion obstinate wakefulness. The headache, want of appetite, tremors, &c., which usually follow, in a slight degree, its narcotic operation, are uniformly experienced by some individuals to such an extent, as to render the use of the medicine very inconvenient. It is possible that some of these disagreeable effects may arise not from the meconate of morphia contained in the opium, but from some other of its ingredients, and those which do result from the meconate may not be produced by other salts of morphia. It has, indeed, been found that the operation of opium may often be favourably modified by changing the state of combination in which its active principle naturally exists. Dissolved in vinegar or lemon juice, it had been known to act in some instances more pleasantly and effectually than in substance, or in the state of tincture, long before physicians had learned to explain the fact by referring it to the production of an acetate or citrate of morphia. When upon the subject of morphia, we shall take occasion to treat of the medical properties of this principle in its various combinations.

An occasional effect of opium, which has not yet been alluded to, is a disagreeable itching or sense of pricking in the skin, which is sometimes attended with a species of miliary eruption. We have found the effect to result equally from all the preparations of this narcotic.

The general operation of opium may be obtained by injecting it into the rectum, or applying it to the surface of the body, especially upon a part denuded of the cuticle. It has appeared to us, when thus applied, to produce less general excitement, in proportion to its other effects, than when administered by the mouth; but we do not make the statement with entire confidence. It is said that, when introduced into the cellular membrane, it acts with great energy; and, when thrown into the cavity of the peritoneum, speedily produces convulsions and death. Injected into the cavity of the heart, it impairs or altogether destroys the powers of that organ.

The local effects of opium are similar in character to those which follow its general operation. An increased action of the part is first observable; then a diminution of its sensibility and contractility; and the latter effect is more speedy, more intense, and of longer continuance, the larger the quantity in which the narcotic is applied.

In all parts of the world, opium is habitually employed by many with a view to its exhilarating and anodyne influence. This is particularly the case among the Mahomedans and Hindoos, who find in this narcotic the most pleasing substitute for those alcoholic drinks which are interdicted by the precepts of their religion. In India, Persia, and Turkey, it is consumed in immense quantities; and many nations of the East smoke opium as those of the West smoke tobacco. This is not the place to speak of the fearful effects of such a practice upon both the intellectual and bodily faculties.

The use of opium as a medicine can be clearly traced back to Diagoras, who was nearly contemporary with Hippocrates; and it was probably employed before his time. It is at present more frequently prescribed than perhaps any other article of the materia medica. Its extensive applicability to the cure of disease will be rendered evident by a view of the indications which it is calculated to fulfil. 1. It is excitant in its primary action. In low or typhoid complaints, requiring a supporting treatment, it exalts the actions of the arterial and nervous systems, and, in moderate doses frequently repeated, may be employed with advantage in conjunction or alternation with other stimulants. 2. It relieves pain more speedily and effectually than any other known medicine, with the exception of ether and chloroform. If possessed of no other property than this, it would be entitled to high consideration. Not to mention cancer, and other incurable affections, in which the alleviation afforded by opium is of incalculable value, we have numerous instances of painful diseases which are not only temporarily relieved, but entirely cured by the remedy; and there is scarcely a complaint in the catalogue of human ailments, in the treatment of which it is not occasionally demanded for the relief of suffering, which, if allowed to continue, might aggravate the disorder, and protract if not prevent a cure. 3. Another very important indication, which, beyond any other narcotic, it is capable of fulfilling, is the production of sleep. For this purpose it is given in a great variety of diseases; whenever, in fact, morbid vigilance exists, not dependent on acute inflammation of the brain. Among the complaints in which it proves most serviceable in this way is delirium tremens, or the mania of drunkards, in which it is frequently sufficient of itself to effect a cure. Opium produces sleep in two ways; first, by its direct operation on the brain, secondly, by allaying that morbid nervous irritation upon which wakefulness generally depends. In the latter case it may frequently be advantageously combined with camphor or Hoffmann's anodyne. 4. Opium is powerfully antispasmodic. No medicine is so efficient in relaxing spasm, and in controlling those irregular muscular movements which depend on unhealthy nervous action. Hence its great importance as a remedy in tetanus; colic; spasm of the stomach attending gout, dyspepsia, and cholera; spasm of the ureters in nephritis, and of the biliary ducts during

the passage of calculi; and in various convulsive affections. 5. Probably dependent upon a similar influence over the nervous system, is the property which it possesses of allaying general and local irritations, whether exhibited in the nerves or bloodvessels, provided the action do not amount to positive inflammation; and even in this case it is often prescribed with advantage. Hence its use in composing restlessness, quieting cough, and relieving nausea, tenesmus, and strangury. 6. In suppressing morbid discharges, it answers another indication which fits it for the treatment of a long list of diseases. This effect it is, perhaps, enabled to produce by diminishing the nervous energy upon which secretion and muscular motion depend. Upon this principle it is useful in diarrhœa, when the complaint consists merely in increased secretion into the bowels, without high action or organic derangement; in consumption, chronic catarrh, humoral asthma, and other cases of morbidly increased expectoration; in diabetes, and in certain forms of hemorrhage, particularly that from the uterus, in combination with other remedies. 7. It remains to mention one other indication; that, namely, of producing perspiration, in fulfilling which, opium, conjoined with small doses of emetic medicines, is pre-eminent. No diaphoretic is so powerful as a combination of opium and ipecacuanha; and none is so extensively employed. We shall speak more fully of this application of the remedy under the head of *Pulvis Ipecacuanhæ et Opii*. It is here sufficient to say, that its beneficial effects are especially experienced in rheumatism, the bowel affections, and certain pectoral diseases.

From this great diversity of properties, and the frequent occurrence of those morbid conditions in which opium affords relief, it is often prescribed in the same disease to meet numerous indications. Thus, in idiopathic fevers, we frequently meet with morbid vigilance and great nervous irritation, combined with a low condition of the system. In typhous pneumonia, there is the same depression of the vital powers, combined often with severe neuralgic pains, and much nervous irritation. In diarrhœa, besides the indications presented by the spasmodic pain and increased discharge, there is a strong call for the diaphoretic operation of the opium. It is unnecessary to multiply instances. There is hardly a complaint which does not occasionally present a complication of symptoms demanding the use of this remedy.

But a medicine possessed of such extensive powers may do much injury, if improperly directed; and conditions of the system frequently occur, in which, though some one of the symptoms calls for its use, others, on the contrary, are incompatible with it. Thus, opium is contra-indicated by a high state of inflammatory excitement, which should be reduced before we can with propriety venture upon its employment; and when there is any doubt as to the sufficiency of the reduction, the opium should be given in combination with tartarized antimony or ipecacuanha, which modify its stimulant operation, and give it a more decided tendency to the skin. It is also contra-indicated by inflammation of the brain, or strong determination of blood to the head, by deficient secretion from inflamed mucous membranes, as in the early stages of bronchitis, and generally by constipation of the bowels. When, however, the constipation depends upon intestinal spasm, as in colic, it is sometimes relieved by the antispasmodic action of the opium; and the binding effects of the medicine may generally be counteracted by the use of laxatives.

Opium is usually administered in substance or in tincture. In the former state it is given in the shape of pill, which, as a general rule, should be formed out of powdered opium, as it is thus more readily dissolved in the liquors of the stomach, and therefore operates more speedily and effectually than when made, as it sometimes is, immediately from the plastic mass. There is no medicine of which the dose is more variable, according to the habits of the patient, the nature of his complaint, or the purpose to be effected. While in catarrh and diarrhœa we often prescribe not more than one-fourth or one-third of a grain, in tetanus

and some other nervous affections, it has been administered, without abating the violence of the symptoms, in the enormous quantity of two drachms in twenty-four hours; and in a case of cancer of the uterus, under the care of the late Drs. Monges and La Roche, of this city, the quantity is stated to have been gradually increased till the amount taken during one day, either in the shape of tincture or in substance, was equivalent to more than three ounces. The medium dose, in ordinary cases of disease, to produce the anodyne and soporific effects of the medicine, is one grain.

Experience has shown that the action of opium is sometimes favourably modified by employing only those of its constituents which are soluble in water. Hence the watery extract is sometimes advantageously substituted for the drug itself, and an infusion for the tincture.* (See *Extractum Opii.*)

Opium may often be administered with great advantage by the rectum. In this way it operates most advantageously in cases of obstinate vomiting, of painful nephritic and uterine affections, of strangury from blisters, and of dysenteric tenesmus. It may be employed as a suppository, or in the form of enema made with laudanum and a small quantity of viscid liquid, as flaxseed tea, mucilage of gum Arabic, or starch prepared with hot water. The quantity, as a general rule, may be three times that administered by the mouth; but the relative susceptibility of the stomach and rectum in different persons is not always the same; and the effects produced by the narcotic, given by injection, are sometimes much greater than was anticipated. The practitioner, moreover, should take into consideration the previous habits of the patient. In an individual who has long been accustomed to take opium internally, and whose stomach will receive large doses with impunity, it is possible that the rectum may not have lost, in a proportionate degree, its absorbing power or susceptibility; and that serious consequences might result by adhering, in such a case, to the general rule as to the relative quantity to be given in the way of enema or suppository.

In some one of its liquid preparations, opium is often used externally as an addition to collyria in ophthalmia, to injections in gonorrhœa, and to lotions and cataplasms in various complaints of the skin, and external pains, as those of gout and rheumatism. It is also employed in substance as a local anodyne, in the form of a plaster or cataplasm made from the powder. But its external use requires some caution, especially when the skin is deprived of the cuticle. Death is said to have resulted from a cataplasm, containing a large quantity of laudanum, applied to the epigastrium. (*Ann. de Thérap.*, 1843, p. 5.)

When opium has been taken in an overdose, the only effectual mode of relief is immediately to evacuate the stomach, either by means of the stomach-pump, or, when this is not attainable, by the more active emetics, such as tartarized antimony, sulphate of zinc, or sulphate of copper, conjoined with ipecacuanha. Emetics are preferable to the stomach-pump, when opium has been swallowed in substance; as the capacity of the tube is insufficient to admit of the passage of the masses in which the poison is sometimes taken. The operation of the emetic should be promoted by a very free use of warm drinks, by irritating the fauces with a feather, by keeping the patient in motion, and, if the insusceptibility to the action of the remedy is very great, by dashing cold water upon the

* A good extemporaneous infusion of opium cannot well be prepared. Hence, to obtain the effects of this preparation it is best to dissolve the extract in water. Mr. Eugene Dupuy, of New York, first prepares an infusion, and then adds alcohol enough to preserve it; so that the preparation may be kept ready made by the apothecary, to be used as a substitute for laudanum. He takes ten drachms of opium, reduces it to a thin pulp with water, allows the mixture to stand 48 hours, then percolates with water so as to obtain twelve fluidounces of infusion, to which four fluidounces of alcohol of 95 per cent. are added. The preparation is intended to be of about the same strength as laudanum. Consequently the dose should be from twelve to fifteen minims, or about as many drops. (*Am. Journ. of Pharm.*, xxiii. 211.)

head and shoulders, thus counteracting, for a moment, the narcotic influence of the opium upon the brain, and enabling this organ to receive and transmit the necessary impressions. Advantage will sometimes accrue from a moderate loss of blood, which tends to diminish the cerebral congestion, and thus not only awaken susceptibility to the impression of the emetic, but obviate also the danger of hemorrhagic effusion; but the bleeding should not be carried far, in consequence of danger from the subsequent debility. For the same purpose of favouring the emetic action, it has been recommended to pass a current of electricity through the brain. After the evacuation of the poison, the chief indication is to obviate the debility which generally supervenes, and which, when the quantity of the narcotic has been large, or has remained long in the stomach, is sometimes alarming and even fatal. For this purpose the carbonate of ammonia, or the aromatic spirit of ammonia, with wine whey, may be employed internally, and sinapisms and stimulant frictions applied to the surface. The practitioner should not despair even if called at the last moment. The stomach tube may be applied at any period; and it is possible that, even without evacuation of the stomach, a little aid may enable the system to resist the prostrating influence of the poison, if not taken in an overwhelming dose. The electro-magnetic battery was employed with great advantage in a case of prostration of this kind by Dr. Page, of Valparaiso; and the practice has been imitated in Europe and this country. Strong coffee, under these circumstances, has been found useful, and is obviously suggested in all cases by its powerful influence in producing wakefulness. Should other measures fail, resort may be had to artificial respiration, by which the functions of the lungs and heart may possibly be sustained till the brain has struggled through its conflict with the narcotic, and is enabled to resume its healthful action. Brodie has demonstrated that death from many of the narcotics results from a suspension of the cerebral influence necessary to sustain the respiratory function, and that the heart ceases to act in consequence of the cessation of respiration. If this can be restored artificially before the contractions of the heart have entirely ceased, the circulation may continue, and life be supported for a time without aid from the brain, which now receives a supply of arterial blood, and is thus better enabled to rise above the repressing action of the opium. As this narcotic does not produce a structural derangement, but operates chiefly upon the nervous power, a favourable result is more likely to be experienced than in cases of poisoning from some other articles of the same class. Several cases are on record, in which patients, apparently in the very last stage, were saved by a resort to artificial respiration. (See *N. Am. Med. and Surg. Journ.*, iii. 277, and *Am. Journ. of the Med. Sci.*, xx. 450.)

Off. Prep. Acetum Opii; Confectio Opii; Electuarium Catechu; Emplastrum Opii; Extractum Opii; Linimentum Opii; Morphia; Morphiæ Murias; Pilulæ Calomelanos et Opii; Pil. Opii; Pil. Plumbi Opiatæ; Pil. Saponis Compositæ; Pil. Styracis Comp.; Pulvis Cretæ Compositus cum Opio; Pulvis Ipecacuanhæ et Opii; Pulvis Kino Compositus; Tinctura Opii; Tinct. Opii Acetata; Tinct. Opii Ammoniata; Tinct. Opii Camphorata; Trochisci Glycyrrhizæ et Opii; Unguentum Gallæ Compositum; Unguentum Opii; Vinum Opii. W.

ORIGANUM. *U. S., Ed.*

Origanum.

The herb of Origanum vulgare. *U. S., Ed.*

Origan, *Fr.;* Gemeiner Dosten, Wohlgemuth, *Germ.;* Origano, *Ital.;* Oregano, *Span.*

ORIGANUM. *Sex. Syst.* Didynamia Gymnospermia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Strobile four-cornered, spiked, collecting the calyces. *Corolla* with the upper lip erect and flat, the lower three-parted, with the segments equal. *Willd.*

Two species of Origanum have been used in medicine, *O. Majorana* or sweet marjoram, and *O. vulgare* or common marjoram. The former, however, having been discarded from the Dublin Pharmacopœia, which was the last to retain it, is no longer officinal. It grows wild in Portugal and Andalusia, and is cultivated as a garden herb in other parts of Europe, and in the United States. Some authors, however, consider *O. Majoranoïdes*, which is a native of Barbary, and closely allied to *O. Majorana*, as the type of the sweet marjoram of our gardens. *Sweet marjoram* has a pleasant odour, and a warm, aromatic, bitterish taste, which it imparts to water and alcohol. By distillation with water it yields a volatile oil, which is directed by the Edinburgh College among their preparations, probably by mistake, as the plant has been rejected. It is tonic and gently excitant, but is used more as a condiment in cookery than as a medicine. In domestic practice, its infusion is much employed by the vulgar to hasten the tardy eruption in measles and other exanthematous diseases.

Origianum vulgare. Willd. *Sp. Plant.* iii. 135; Woodv. *Med. Bot.* p. 344, t. 123. Origanum or *common marjoram* is a perennial herb, with erect, purplish, downy, four-sided, trichotomous stems, which rise about eighteen inches high, and bear opposite, ovate, entire, somewhat hairy leaves, of a deep yellowish-green colour. The flowers are numerous, of a pinkish-purple or rose colour, disposed in roundish, panicled spikes, and accompanied with ovate reddish bractes, longer than the calyx. This is tubular and five-toothed, with nearly equal segments. The corolla is funnel-shaped, with the upper lip erect, bifid, and obtuse, the lower trifid, blunt, and spreading. The anthers are double, the stigma bifid, and reflexed.

The plant is a native of Europe and America. In this country it grows along the road sides, and in dry stony fields and woods, from Pennsylvania to Virginia, and is in flower from June to October; but it is not very abundant, and is seldom collected for use. It has a peculiar, agreeable, aromatic odour, and a warm, pungent taste. These properties it owes to a volatile oil, which is the part chiefly employed. It may be separated by distillation; but is mostly imported from Europe. (See *Oleum Origani.*)

Medical Properties and Uses. Origanum is gently tonic and excitant, and has been used in the form of infusion as a diaphoretic and emmenagogue, and externally as a fomentation; but it is at present scarcely employed.

Off. Prep. Oleum Origani. W.

OS. *U. S.*

Bone.

Off. Syn. OSSA. Bones of the ox, or Bos Taurus. *Dub.*
Os, *Fr.;* Knochen, *Germ.;* Ossa, *Ital.;* Huesos, *Span.*

Bones are employed in several pharmaceutical processes, and those derived from the domestic quadrupeds, especially the ox, are the kind intended for officinal use. They have been expunged from the officinal list of the Edinburgh College, though used by the College for preparing phosphate of soda.

Properties, &c. They are solid, white, and of a lamellated texture, and constitute the skeleton of the superior orders of animals, of which they are the hardest and densest parts. They consist of a cellular gelatinous tissue, the cavities of which are filled up with certain earthy salts, to be mentioned presently. When subjected to destructive distillation, in *close* vessels, they are decomposed

without alteration of shape, lose about three-sevenths of their weight, become brittle, and are converted into a black carbonaceous substance, containing the earthy salts of the bone, and constituting the species of animal charcoal called *bone-black*. (See *Carbo Animalis.*) The portions which distil over consist of the usual ammoniacal products derived from animal matter. (See *Ammoniæ Murias.*) When calcined in *open* vessels they lose more of their weight in consequence of the dissipation of the charcoal, and are converted into a white friable substance, consisting of the incombustible part, and commonly called *bone-earth*, or *bone-ash;* and a similar residue is obtained by calcining horn. (See *Cornu Ustum.*) Treated with boiling water, a small portion of the gelatinous matter is dissolved; but, when acted on by water in a *Papin's digester*, the whole of it is taken up, and the earthy salts, deprived of their cement, crumble into powder, and become diffused through the solution. When subjected to the action of dilute muriatic acid, the earthy salts are dissolved, and the bone softens without losing its shape, and becomes semitransparent and flexible. The portion remaining unattacked by the acid is the gelatinous tissue, which may be converted into gelatin by long boiling. This portion of bone is nutritious, and has been prepared so as to form a wholesome aliment by M. d'Arcet. His process for obtaining it consists in digesting bones in weak muriatic acid for seven or eight days, occasionally renewing the acid, plunging them for a few moments in boiling water, and then subjecting them to a strong current of cold water. The pure animal matter, thus procured, is made into cakes, called *portable soup* (*tablettes de bouillon*), by dissolving it in water, concentrating the solution until it gelatinizes, and drying the matter obtained.

Composition. The bones of different animals, and of the same animal at different ages, vary somewhat in their composition. Dry ox-bones, according to Berzelius, consist of bone-gelatin (cartilage of bone) 33·3, bone-phosphate of lime with a little fluoride of calcium 57·35, carbonate of lime 3·85, phosphate of magnesia 2·05, soda with a very little chloride of sodium 3·45=100. Fourcroy and Vauquelin's results give a larger proportion of animal matter and carbonate of lime, and a smaller of bone-phosphate. Fossil bones have the same general composition. Human bones differ somewhat in the proportions of their constituents, and in containing traces of iron and manganese. According to Dr. W. Heintz, however, bones exhausted with water, so as to remove the colouring matter of blood, contain not a trace of iron. Marchand found one per cent. of fluoride of calcium in human bone. *Bone-phosphate of lime* consists, according to Mitscherlich, of one eq. of acid and three of lime. This analysis makes it a tribasic phosphate, and the same composition has been assigned to it by Dr. Heintz. (*Chem. Gaz.*, June 15, 1849.)

Uses. Bones are applied to numerous uses. Burnt to whiteness, they furnish bone-phosphate of lime, from which phosphorus and all its compounds are either directly or indirectly obtained. (See *Phosphorus.*) Subjected to destructive distillation in close vessels, they yield *impure carbonate of ammonia* and empyreumatic oil; and a carbonaceous residue is left, called *bone-black*. Calcined, pulverized, and washed, they form the material of which *cupels* are made. As bone-dust, they form an excellent manure. Deprived of their earthy salts by weak acids, they furnish a nutritious article of diet. By proper treatment with water they furnish gelatin, applicable not only to the purposes of size and common glue, but also to those of the finer sorts of gelatin, called isinglass, in making animal jellies, and for the fining of wines. (See *Ichthyocolla* and *Cornu.*) The hoof bones of the ox, when boiled with water, furnish a peculiar oil, called neats-foot oil. (See *Oleum Bubulum.*)

Off. Prep. Calcis Phosphas Præcipitatum; Sodæ Phosphas. B.

OVUM. *U. S., Ed., Dub.*

Egg.

The egg of Phasianus Gallus. *U. S., Ed., Dub.*

Off. Syn. OVI ALBUMEN. Gallus Bankiva, *var. domesticus.* The white of the egg. OVI VITELLUS. The yolk of the egg. *Lond.*

Œuf, *Fr.;* Ei, *Germ.;* Ovo, *Ital.;* Huevo, *Span.*

The common dunghill fowl is supposed to have come originally from India, where it is found in a wild state. It is now domesticated in almost all parts of the globe.

The egg, which is the only officinal product, consists of 1. an exterior covering called the shell; 2. a white, semi-opaque membrane, lining the internal surface of the shell; 3. the white; 4. the yolk. Other distinct parts are recognised by the comparative anatomist, but they have no peculiar interest for the practical physician or pharmaceutist.

1. The shell—*testa ovi* or *putamen ovi*—consists, according to Vauquelin, chiefly of carbonate of lime, with animal matter, and a minute proportion of phosphate of lime, carbonate of magnesia, oxide of iron, and sulphur. When exposed to a high degree of heat in the open air, the carbonic acid is driven off, the animal matter consumed, and lime is left nearly pure.

2. The membrane lining the shell appears to be of an albuminous nature.

3. The white—*albumen ovi*—is a glairy viscid liquid contained in very delicate membranes, without odour or taste, readily soluble in water, coagulable by the stronger acids, by alcohol, and by a heat of 160° F. Exposed in thin layers to a current of air, it becomes solid, retaining its transparency and solubility in water. By coagulation it is rendered sapid, white, opaque, and insoluble. At a temperature of 212°, one part of it renders one thousand parts of water in which it has been dissolved opaque. It contains, according to Dr. Bostock, in one hundred parts, 85 of water, 12 of pure albumen, 2·7 of mucus or uncoagulable matter, and 0·3 of saline substances, including soda with traces of sulphur. The white of egg is precipitated by chloride of tin, chloride of gold, subacetate of lead, sulphate of copper, corrosive sublimate, and tannin. When kept in the fluid state it soon putrefies; but, if carefully dried without coagulation, it may be long preserved without change, and may be applied in a state of solution to the same purposes as in its original condition.

4. The yolk—*vitellus ovi*—is inodorous, of a bland oily taste, and forms an opaque emulsion when agitated with water. By heat it is coagulated into a granular solid, which yields a fixed oil by expression. According to M. Gobley, 100 parts of it contain 51·486 of water, 15·760 of a peculiar albuminous principle denominated *vitellin*, 21·304 of margarin and olein, 0·438 of cholesterin, 7·226 of oleic and margaric acids, 1·200 of phosphoglyceric acid, 0·034 of muriate of ammonia, 0·277 of chlorides of sodium and potassium and sulphate of potassa, 1·022 of phosphates of lime and magnesia, 0·400 of animal extract (*extrait de viande*), and 0·553 of colouring matter, traces of iron, traces of lactic acid, &c. (*Journ. de Pharm.*, 3e *sér.*, xii. 12.)

Medical Properties and Uses. Eggs are applied to various purposes in medicine and pharmacy. The shells, powdered and levigated, may be used beneficially as an antacid in diarrhœa. In common with oyster-shells, they possess the advantage of uniting intimately animal matter with carbonate of lime, the particles of which are thus more thoroughly isolated, and prove more acceptable to the stomach than chalk, in the finest state of division to which the latter can be brought by mechanical means. The dose and mode of preparation are the same with those of oyster-shell. (See *Testa.*)

The *white* of the egg is used chiefly for the clarification of liquids, which it effects by involving, during its coagulation, the undissolved particles, and rising with them to the surface or subsiding. It is highly recommended as an antidote for corrosive sublimate and sulphate of copper, with which it forms insoluble and comparatively inert compounds. It is sometimes also used for the suspension of insoluble substances in water, but is inferior for this purpose to the yolk, and even to mucilage of gum Arabic. Agitated briskly with a lump of alum it coagulates, at the same time dissolving a portion of the alum, and thus forming an astringent poultice, which may be advantageously applied between folds of gauze over the eye, in some states of ophthalmia.

The *yolk* in its raw state is thought to be laxative, and is a popular remedy in jaundice. If beneficial in this complaint, it is probably in consequence of affording a mild nutritious diet, acceptable to the stomach and easily digested. In dyspepsia it is, from this cause, highly useful. The late Dr. Jos. Parrish, of Philadelphia, found great advantage in that complaint from the habitual use of the yolk of egg, beat up with water and a little ginger. In pharmacy, the yolk is highly useful as an intermedium between water and insoluble substances, such as the balsams, turpentine, oils, &c. It is a mistake to employ the white, instead of the yolk of eggs, in preparing emulsions.

Off. Prep. Enema Terebinthinæ; Mistura Spiritûs Vini Gallici. W.

PANAX. *U. S. Secondary.*

Ginseng.

The root of Panax quinquefolium. *U. S.*

Ginseng, *Fr., Germ., Span.;* Ginsen, *Ital.*

PANAX. *Sex. Syst.* Pentandria Digynia. (Polygamia Dicœcia, *Linn.*)—*Nat. Ord.* Araliaceæ.

Gen. Ch. Flowers polygamous. *Umbel* simple. *Calyx* five-toothed. *Corolla* of five petals. *Berry* inferior, subcordate, two, sometimes three-seeded. *Calyx* in the male flower entire. *Nuttall.*

Panax quinquefolium. Willd. *Sp. Plant.* iv. 1124; Woodv. *Med. Bot.* p. 149, t. 58; Bigelow, *Am. Med. Bot.* ii. 82. The ginseng has a perennial root, which sends up annually a smooth round stem, about a foot high, and divided at the summit into three leafstalks, each of which supports a compound leaf, consisting of five, or more rarely of three or seven petiolate, oblong-obovate, acuminate, serrate leaflets. The flowers are small, greenish, and arranged in a simple umbel, supported by a peduncle, which rises from the top of the stem in the centre of the petioles. The fruit consists of kidney-shaped, scarlet berries, crowned with the styles and calyx, and containing two and sometimes three seeds.

The plant is indigenous, growing in the hilly regions of the Northern, Middle, and Western States, and preferring the shelter of thick, shady woods. The root is the part employed. This is collected in considerable quantities in Ohio and Western Virginia, and brought to Philadelphia and other cities on the sea-board for the purpose of exportation to China, where it is highly valued. Some suppose the ginseng plant of Chinese Tartary to be the same as ours; others believe it to be the *Panax Schinseng* of Nees Von Esenbeck; while by others, again, though acknowledged to be a Panax, it is thought to be a different species from either of those mentioned. While supplied with this drug exclusively from their own native sources, which furnished the root only in small quantities, the Chinese entertained the most extravagant notions of its virtues, considering it as a remedy for all diseases, and as possessing almost miraculous powers in preserving health, invigorating the system, and prolonging life. It is said to have been

worth its weight in gold at Pekin; and the first shipments made from North America to Canton yielded enormous profits. But the subsequent abundance of supply has greatly diminished its value.

The root is fleshy, somewhat spindle-shaped, from one to three inches long, about as thick as the little finger, and terminated by several slender fibres. Frequently there are two portions, sometimes three or more, connected at their upper extremity, and bearing a supposed, though very remote resemblance to the human figure, from which circumstance it is said that the Chinese name *ginseng* originated. When dried, the root is yellowish-white and wrinkled externally, and within consists usually of a hard central portion, surrounded by a soft whitish bark. It has a feeble odour, and a sweet, slightly aromatic taste, somewhat analogous to that of liquorice root. It has not been accurately analyzed, but is said to be rich in gum and starch. It is sometimes submitted, before being dried, to a process of clarification, which renders it semitransparent and horny, and enhances its value as an article of export. The extraordinary medical virtues formerly ascribed to ginseng had no other existence than in the imaginations of the Chinese. It is little more than a demulcent, and in this country is not employed as a medicine. Some persons, however, are in the habit of chewing it, having acquired a relish for its taste; and it is chiefly to supply the wants of these that it is kept in the shops. W.

PANIS. *Lond.*

Bread.

Wheaten Bread. *Lond.*

See FARINA.

Off. Prep. Cataplasma Carbonis.

PAPAVER. *U. S., Lond., Ed., Dub.*

Poppy-heads.

The ripe capsules of Papaver somniferum. *U. S.* The ripe fruit. *Lond.* Capsules not quite ripe. *Ed.* The dried capsules. *Dub.*

Capsules des pavots, *Fr.;* Kapseln des weissen Mohns, *Germ.;* Capidel papavero, *Ital.;* Cabezas de amapola, *Span.*

See OPIUM.

In England the poppy is cultivated chiefly for its capsules, which are gathered as they ripen, and taken to market enclosed in bags. The Edinburgh College directs them to be collected before they are quite ripe, as they then contain more of the active milky juice; but, cut at this period, they are apt to lose their juice through the wounded surface, unless carefully kept inverted upon their crown when drying; and, even when thus treated, they are, according to the observations of Buchner, less active than the capsules collected after perfect maturity, while they contain more of useless saccharine and mucilaginous matter. (*Buchner's Repert.*, 3 R., viii. 289 and 326.) M. Meurein states, as the result of his experiments, that the richest are those collected just before the maturity of the seeds, when the capsules have passed from their glaucous-green to a yellowish-green colour. (*Journ. de Pharm.*, 3e *sér.*, xxiii. 341.) They are occasionally imported into this country; but as no effect is produced by them which cannot be as readily obtained from opium, or some one of its preparations, they are little employed.

The dried poppy capsules vary in size from the dimensions of a small egg to those of the fist. They differ also in shape according to the variety of the poppy

from which they are procured. On the continent two sub-varieties of the white poppy are recognised, the *long*, and the *round or depressed*. Of these, according to Aubergier, the long are richest in morphia, and his conclusions are confirmed by Meurein, who has also found the largest capsules most efficient. Those commonly found in our shops are of a spheroidal shape, flattened below, and surmounted by a crown-like expansion—the persistent stigma—which is marked by numerous diverging rays that rise somewhat above its upper surface, and appear to be prolongations of partial septa, or partitions, proceeding along the interior circumference of the capsule from the top to the bottom. In the recent state, the seeds, which are very numerous, adhere to these septa; but in the dried capsule they are loose in its cavity. The capsules of the black poppy are smaller and more globular than those of the white, and contain dark instead of light-coloured seeds. There appears to be no essential difference in their properties. Both kinds, when fresh, are glaucous, but when dry, as directed in the Pharmacopœias, are of a dirty white or purplish-brown colour, have a consistence somewhat like that of paper, are without smell, and have little taste, unless long chewed, when they are decidedly bitter. Submitted to analysis, they are found to contain principles similar to those of opium, which they yield to water by decoction. They have been employed in France for obtaining morphia.

Medical Properties and Uses. Dried poppy-heads, though analogous to opium in medical properties, are exceedingly feeble. They are sometimes employed in the form of decoction, as an external emollient and anodyne application; and, in the shape of emulsion, syrup, or extract, are often used internally by European practitioners to calm irritation, promote rest, and produce generally the narcotic effects of opium.

Off. Prep. Decoctum Papaveris; Extractum Papaveris; Syrupus Papaveris.

W.

PAREIRA. *U. S. Secondary, Lond., Ed., Dub.*

Pareira Brava.

The root of Cissampelos Pareira. *U. S., Lond., Ed., Dub.*

CISSAMPELOS. *Sex. Syst.* Dicœcia Monadelphia.—*Nat. Ord.* Menispermaceæ.

Gen. Ch. MALE. *Calyx* four-leaved. *Corolla* none. *Nectary* rotate. *Stamens* four, with connate filaments. FEMALE. *Calyx* one-leaved, ligulate roundish. *Corolla* none. *Styles* three. *Berry* one-seeded.

Cissampelos Pareira. Willd. *Sp. Plant.* iv. 861; Woodv. *Med. Bot.* 3d ed. p. 167, t. 65. This is a climbing plant, with numerous slender, shrubby stems, and roundish, entire leaves, indented at the top, covered with soft hair upon their under surface, and supported upon downy footstalks, which are inserted into the back of the leaf. The flowers are very small, and disposed in racemes, of which those in the female plant are longer than the leaves. The plant is a native of the West Indies and South America, and is supposed to be the source of the root brought from Brazil, under the name of *pareira brava*. According to Auguste St. Hilaire, however, the true pareira is obtained from another species of the same genus, growing in Brazil, and denominated *C. glaberrima;* while by Aublet it is referred to a species of *Abuta*, belonging to the same natural family.

The root comes in pieces from the thickness of the finger to that of the arm, from a few inches to two or more feet in length, cylindrical, sometimes contorted or forked, and covered with a thin, firmly adhering, grayish-brown bark. The outer surface is marked with longitudinal and annular wrinkles, and sometimes, in the larger pieces, with knotty excrescences. The interior is ligneous, yellowish, very porous, marked by irregular concentric circles, inodorous, and of a sweetish, nauseous, bitter taste. The root imparts its virtues readily to water. M. Feneulle found in it a soft resin, a yellow bitter principle, a brown substance,

an azotized substance, fecula, acidulous malate of lime, nitrate of potassa, and various other salts. He considers the yellow bitter substance as the active principle. It is soluble in water and alcohol, and precipitated from its solution by tincture of galls. Wiggers announced, in 1838, the existence in pareira brava of an organic alkali, for which he proposed the name of *cissampelina*. He procured it by boiling the root with water acidulated with sulphuric acid, precipitating by carbonate of potassa, dissolving the precipitate again in water acidulated with sulphuric acid, treating the solution with animal charcoal, precipitating anew with carbonate of potassa, drying and pulverizing the precipitate, treating it repeatedly with ether, and evaporating the ethereal solution. The alkali thus obtained may be rendered entirely pure by dissolving it in diluted acetic acid, precipitating with carbonate of potassa, and washing and drying the precipitate. (*Annal. der Pharm.*, xxvii. 29.) Wiggers did not describe this alkali. It is probably the chief ingredient of the bitter substance obtained by Feneulle. Peretti of Rome and Pelletier afterwards separated an alkali from the root, which was characterized by assuming a beautiful purple colour by contact with strong nitric acid. (*Journ. de Pharm.*, xxvi. 162.) In Christison's Dispensatory it is stated to be uncrystallizable, insoluble in water, soluble in ether, alcohol, and the acids, and of an intensely bitter and sweetish taste.

Medical Properties and Uses. Pareira brava is said to be tonic, aperient, and diuretic. It was introduced into European practice so long ago as 1688, and at one time enjoyed considerable reputation as a lithontriptic. It has been recommended in calculous affections, chronic inflammation and ulceration of the kidneys and bladder, leucorrhœa, dropsy, rheumatism, and jaundice. The purpose for which it is at present chiefly employed is the relief of chronic diseases of the urinary passages. Sir Benjamin Brodie found it very useful in chronic inflammation of the bladder, in allaying irritability of that organ, and correcting the disposition to profuse mucous secretion; and it has subsequently come into general use in the same affections. Advantage may often be derived from combining it, in this complaint, with one of the narcotics, as opium or hyoscyamus. In Brazil, it is used in the cure of the bites of poisonous serpents; a vinous infusion of the root being taken internally, while the bruised leaves of the plant are applied to the wound. The dose of pareira brava in substance is from thirty grains to a drachm. The infusion, however, is more convenient. (See *Infusum Pareiræ.*) A tincture, made by macerating one part of the root in five parts of alcohol, has been given in the dose of a fluidrachm. The aqueous extract may be given in the dose of from ten to thirty grains.

Off. Prep. Decoctum Pareiræ; Extractum Pareiræ; Infusum Pareiræ. W.

PETROLEUM. *Lond., Ed.*

Petroleum.

A blackish liquid bitumen, flowing spontaneously from the earth. *Lond.*

Barbadoes tar, Rock oil; Pétrole, Huile de Gabian, *Fr.;* Steinöl, *Germ.;* Petrolio, *Ital.;* Petroleo, *Span.*

Petroleum belongs to the class of native inflammable substances, called *bitumens*. These are liquids or readily fusible solids, which emit, when heated, a peculiar smell, burn easily, and leave a very small carbonaceous residue. They are of two kinds, one liquid, called naphtha, the other solid, denominated asphaltum. *Naphtha* is a transparent, yellowish-white, very light and inflammable, limpid liquid, which is found abundantly in Persia. It has been used with asserted advantage in Asiatic cholera, particularly by Dr. Andreosky, of the Russian army. The dose is from ten to twenty drops, given in half a glass of white wine, or in mint-water. It consists exclusively of carbon and hydrogen.

As oxygen does not enter into its composition, it may be advantageously employed for preserving potassium. From the tar formed in the manufacture of coal gas, an *artificial naphtha* is obtained, which by rectification is rendered equally light and limpid with the natural substance. Thus purified, it was found by Mr. James Syme, of Edinburgh, to possess the property of dissolving caoutchouc; and the solution has been usefully applied to the purpose of forming various surgical instruments of that material. This solution has also been employed, at the suggestion of Mr. Mackintosh, of Glasgow, for rendering cloth and other fabrics water-proof. They are varnished with the solution on one side, and the varnished surfaces are applied to each other, and made to adhere by powerful pressure. *Asphaltum* is solid, black, dry, friable, and insoluble in alcohol. These two varieties of bitumen often exist in a state of mixture in nature. When the asphaltum predominates it takes the name of *maltha* or *mineral tar;* when the naphtha is in the larger proportion it is called *petroleum.*

Localities. Petroleum is found principally at Amiano in Italy, at Gabian in France, upon the borders of the Caspian Sea, near Rangoon in the Birman Empire, and in Barbadoes, Trinidad, and other West India Islands. An interesting account of the pitch lake of Trinidad, by Mr. Darling, is contained in the ninth volume of the *Pharm. Journal and Transactions.* The wells of petroleum in Birmah are said to produce four hundred thousand hogsheads annually.

In the United States, petroleum is found in various localities, the principal of which are on the Kenhawa in Virginia; near Scottsville in Kentucky; in Western Pennsylvania; on Duck Creek in Ohio; and on the shores of Seneca Lake in New York. That found in the latter locality is usually called in this country Seneca oil; and similar varieties of petroleum from other domestic sources are known by the same name.

Barbadoes petroleum is a black, nearly opaque, inflammable liquid, of the consistence of molasses, unctuous to the touch, and possessing a bituminous taste, and strong and tenacious odour. Its sp. gr. varies from 0·730 to 0·878. When subjected to distillation, it yields naphtha, and leaves a solid residue of asphaltum. It is little affected by alcohol, acids, or alkalies, but dissolves in ether and in the fixed and volatile oils. It consists chiefly of carbon and hydrogen, associated with a little nitrogen and oxygen. *Rangoon petroleum* has a reddish-black colour, a strong, rather fragrant odour, and the consistence of lard in summer. When heated to 90°, it becomes a reddish-brown very mobile liquid. Dr. Christison obtained from it by distillation, first, a large quantity of naphtha, and afterwards a crystalline principle, which he ascertained to be identical with paraffin. In the naphtha Dr. Gregory subsequently discovered eupione. It is probable, as Dr. Christison remarks, that this petroleum is more active than the Barbadoes.

Oil of turpentine may be detected in petroleum, according to M. Saladin, by triturating the suspected sample with iodide of potassium and water, when, if the oil be present, the petroleum will instantly acquire a yellow colour, which is of a deeper tint, in proportion to the quantity of the adulterating oil.

Medical Properties and Uses. Petroleum is accounted a stimulating antispasmodic and sudorific. It is occasionally given in disorders of the chest, when not attended with inflammation. In Germany it has been extolled as a remedy for tape-worm. Schwartz's formula in such cases was a mixture of one part of petroleum with one and a half parts of tincture of assafetida, of which forty drops were given three times a day. Externally, petroleum is employed in chilblains, chronic rheumatism, affections of the joints, paralysis, and diseases of the skin. It is an ingredient in the popular remedy called *British oil.* (See *note*, page 521.) The dose of petroleum is from thirty drops to a small teaspoonful, given in any convenient vehicle.

The *New York petroleum*, called *Seneca oil*, is used to a considerable extent

as an external application in domestic practice. It is lighter coloured, thinner in consistence, and less sapid and odorous than the Barbadoes petroleum, and probably contains more naphtha. B.

PETROSELINUM. *U. S. Secondary.*

Parsley Root.

The root of Petroselinum sativum. *U. S.*

Persil, *Fr.;* Petersilie, *Germ.;* Prezzemolo, *Ital.;* Perexil, *Span.*

PETROSELINUM. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Apiaceæ or Umbelliferæ.

Gen. Ch. Umbels compound. *Involucres,* partial of many, general of few bractes. *Calyx* obsolete. *Fruit* ovate, contracted at the sides. Ridges five, narrow, equal, the lateral on the edge. Vittæ one to each furrow. *Albumen* plano-convex. *Lindley.*

Petroselinum sativum. Hoffmann, *Umb.* i. t. 1, f. 2; Lindley, *Flor. Med.* p. 35.—*Apium Petroselinum.* Willd. *Sp. Plant.* i. 1475; Woodv. *Med. Bot.* p. 118, t. 45. Parsley has a biennial root, with an annual, round, furrowed, jointed, erect, branching stem, which rises about two feet in height. The radical leaves are compound, pinnated in ternaries, with the leaflets smooth, divided into three lobes, and notched at the margin. In the cauline leaves, the segments of the leaflets are linear and entire. The flowers are small, pale-yellow, and disposed in terminal compound umbels, with a one or two-leaved general involucre, and partial ones composed of six or eight leaflets. The petals are five, roundish, and inflexed at their apex. The seeds (half fruits) are small, ovate, flat on one side, convex on the other, of a dark-green colour, and marked with five longitudinal ridges. They have a strong, terebinthinate odour, and a warm aromatic taste.

The plant is a native of Sardinia, and other parts of Southern Europe, and is cultivated everywhere in gardens. All parts of it contain an essential oil, to which it owes its medicinal virtues, as well as its use in seasoning. M. H. Braconnot obtained from the herb a peculiar gelatinous substance, resembling pectic acid in appearance, which he named *apiin.* It differs from pectin in being more soluble in alcohol than cold water, in not being precipitated by alcohol from its watery solution, and in being separated by acids from its alkaline solutions unaltered, whereas pectin is under these circumstances converted into pectic acid. (*Journ. de Pharm.,* 3*e sér.,* xix. 448.) It is procured by boiling the herb in water, straining the liquor, and allowing it to cool. The apiin then forms a gelatinous mass, which requires only to be washed with cold water. (*Philos. Mag.,* xxiv. 155.) The seeds are said to contain a peculiar principle, which has been named *apiol,* upon which their medicinal activity depends. (See *Journ. de Pharm.,* 3*e sér.,* xxii. 84.) The root is the part directed by the Pharmacopœia, though the fruit is at least equally efficient.

The root is spindle-shaped, about as thick as the finger, externally white, and marked with close annular wrinkles, internally fleshy and white, with a yellowish central portion. It has a pleasant smell, and a sweetish slightly aromatic taste; but loses these properties by long boiling, and by the action of time. It should be employed in the recent state.

Medical Properties and Uses. Parsley root is said to be aperient and diuretic, and is occasionally used in nephritic and dropsical affections, in connexion with more active medicines. It was highly recommended by Professor Chapman. The usual form of administration is that of strong infusion. The juice of the fresh herb has been employed as a substitute for quinia in intermittents; and the seeds, as well as their supposed active principle, have been employed with great asserted effect in the same complaint. W.

PHOSPHORUS. *Lond.*

Phosphorus.

Phosphore, *Fr.;* Phosphor, *Germ.;* Fosforo, *Ital., Span.*

This non-metallic element was discovered in 1669 by Brandt, an alchemist of Hamburg; and the process by which it was made remained a secret until 1737. At first it was obtained from putrid urine, and was exceedingly scarce and costly. In 1769, Gahn discovered it in bones, and shortly afterwards published a process by which it might be extracted from them; and his method has been followed to the present time.

Preparation. Powdered calcined bones, which consist principally of bone-phosphate of lime, are digested for twenty-four hours with two-thirds of their weight of strong sulphuric acid, previously diluted with twelve times its weight of water. The sulphuric acid separates the greater part of the lime from the phosphoric acid, and precipitates as sulphate of lime; while a superphosphate of lime remains in solution. The liquid is then strained through a linen cloth to separate the sulphate of lime, and afterwards submitted to evaporation, which causes a fresh precipitation of sulphate, requiring to be separated by a new straining. The strained solution of superphosphate is evaporated to a syrupy consistence, and then thoroughly mixed with half its weight of powdered charcoal, so as to form a soft mass, which is dried by being heated to dull redness in an iron pot. The mass when cool is quickly transferred to a coated earthenware retort, furnished with an adopter of copper, bent downwards at right angles, so as to enter a bottle with a large neck containing water, which should rise about two lines above the orifice of the adopter. The bottle is closed round the adopter with a cork, which is traversed by a small glass tube, to give exit to the gaseous products. The retort is heated in a furnace, furnished with a dome, in the most gradual manner, so as to occupy about four hours in bringing it to a red heat. Afterwards the heat is pushed vigorously, so long as any phosphorus drops into the water; and this takes place generally for from twenty-four to thirty hours. During this part of the process, the excess of acid in the superphosphate is decomposed; its oxygen combining with the charcoal, and the liberated phosphorus distilling over. A quantity of the materials sufficient to fill a quart retort will yield about a pound of phosphorus. The calcined bones of the sheep are preferred; as they contain most phosphate of lime, and are more readily acted on by the acid.

Mr. Donovan recommends the following process, in which the calcining of the bones is avoided. Digest ten avoird. pounds of bones, broken into small pieces, in six of commercial nitric acid, diluted with five gallons (Imp. meas.) of water, for a few days. Strain the liquor, and add eight pounds of acetate of lead, dissolved in water. There result acetic acid and nitrate of lime in solution, and phosphate of lead which precipitates. Wash and dry the precipitate, and reduce its bulk to one-half, by heating it red-hot in a crucible. Mix the ignited powder with one-sixth of its weight of fine charcoal powder, and distil from a coated earthenware retort in the usual way. The bones, in this process, having the phosphate of lime dissolved out of them by the nitric acid, are reduced to soft, flexible, cartilaginous masses, which may be manufactured into size or glue. The process may be conducted on a smaller scale with unburnt hartshorn shavings, which contain twice as much phosphate of lime as bone, by using the following proportions: shavings a pound avoirdupois, nitric acid seventeen ounces in a gallon of water, and of acetate of lead twenty-four ounces. From the residue of the shavings in this process may be obtained a nutritious jelly. (See an abstract of Mr. Donovan's paper in the *Am. Journ. of Pharm.*, xxiv. 167.)

Properties. Phosphorus is a semitransparent solid, without taste, but possessing an alliaceous smell. When perfectly pure it is colourless; but as usually prepared it is yellowish or reddish-yellow. It is flexible, and when cut exhibits a waxy lustre. It is insoluble in water, but dissolves sparingly in alcohol and the oils, and more freely in ether and bisulphuret of carbon. Its sp. gr. is 1·84, and its equivalent number 32 (31·02 Schroetter). It takes fire at 100°, melts at 108°, and boils at 550°, air being excluded. During its combustion, it combines with the oxygen of the air, and forms dry phosphoric acid. On account of its great inflammability, it must be kept under water. When exposed to the air it undergoes a slow combustion, emitting white vapours, which are luminous in the dark. It was found by Wöhler, in one instance, to contain one-half of one per cent. of arsenic; and, therefore, when used in forming medicinal preparations, should be tested for that metal. It also occasionally contains antimony and sulphur. The latter impurity renders it brittle.

Prof. Schroetter, of Vienna, has discovered an allotropic form of phosphorus, which he calls *red amorphous phosphorus.* It is formed when ordinary phosphorus is kept for a long time at a temperature between 419° and 482° F., in atmospheres which have no action on it, or in closed glass tubes. Red phosphorus is much more indifferent than the ordinary substance, and is more dense. It is not acted on by the air, and is insoluble in bisulphuret of carbon, alcohol, and ether, in which ordinary phosphorus is soluble. When solidified from the fused state, it is brittle, and breaks with a conchoidal fracture. Its hardness is considerable. When obtained by distillation in a non-acting gas, it is mixed with ordinary phosphorus, from which it may be freed by bisulphuret of carbon, which dissolves the ordinary phosphorus, and leaves the modification as a deep-red amorphous powder. Amorphous phosphorus is not poisonous. It is applicable to the manufacture of lucifer matches, and, as it does not take fire by friction at ordinary temperatures, may be transported with the greatest safety.

Phosphorus forms with oxygen the hypophosphorous, phosphorous, and phosphoric acids, and three varieties of the latter acid, distinguished by their containing, severally, three, two, and one equivalents of water. The only officinal combinations containing phosphorus are the "diluted phosphoric acid" of the London College, and the phosphates of iron, lime, and soda.

Medical Properties. Phosphorus, exhibited in small doses, acts as a powerful general stimulant; in large doses, as a violent irritant poison. Its action seems directed particularly to the kidneys and genital organs, producing diuresis, and excitation of the venereal appetite. The latter effect has been conclusively proved by the experiments of Alphonse Leroy, Chenevix, and Bertrand-Pelletier. From its peculiar physiological action, it is considered applicable to diseases attended with extreme prostration of the vital powers. It has been recommended in dropsy, impotency, typhoid and typhus fevers, phthisis, marasmus, chlorosis, paralysis, amaurosis, mania, &c. Those who work in phosphorus, as the manufacturers of lucifer matches, are liable to necrosis of the jaw-bones, the consequence of periostitis. The affection is probably produced by the long-continued breathing of air contaminated with phosphorus vapour, which has a local action on the teeth, gums, and jaws, and a general deteriorating effect on the blood.

The usual form for exhibiting phosphorus is in oily solution. The *Oleum Phosphoratum* or *phosphorated oil* of the Prussian Pharmacopœia is made as follows. Take of phosphorus *twelve grains;* almond oil, recently prepared, *an ounce.* Melt the phosphorus in the oil by the heat of warm water, and agitate until it appears to be dissolved. The ounce of oil takes up about four grains of phosphorus; and the dose of the solution is from five to ten drops, mixed with some mucilaginous liquid. An aromatic flavour may be given to the phosphorated oil by the addition of a few drops of oil of bergamot. Dr. R. M. Glover has pro-

posed to give phosphorus, dissolved in chloroform or cod-liver oil. Chloroform furnishes a non-inflammable solution, containing one-fourth of its weight of phosphorus. Of this solution Dr. Glover gave four or five minims, twice a day, with a drachm of ether in a wineglassful of port wine, in typhoid fever. The solution in the cod-liver oil is effected by adding the phosphorus in chips, to the oil contained in a bottle, in the proportion of half a grain to the ounce. The bottle is then immersed in hot water, and the solution effected by shaking. This mode of giving phosphorus was used by Dr. Glover in strumous cases. (See *Braithwaite's Retrospect*, Am. ed., xxvii. 246.)

Great caution is necessary in the exhibition of phosphorus, and its effects should be closely watched. It ought never to be given in substance; as, when thus administered, it is apt to produce violent irritation of the stomach. When taken in substance in a poisonous dose, two or three grains of tartar emetic should be given to dislodge it. If swallowed in the state of solution, copious draughts of cold water, containing magnesia in suspension, should be administered, in order to prevent the combustion of the phosphorus, and to neutralize any acid which may have been formed. Duflos has proposed, as an antidote, a mixture of one part of magnesia and eight of chlorine water. From experiments made on rabbits by A. Bechert, it may be inferred that this mixture would prove useful. In a case of chronic poisoning from the copious inhalation of phosphorus vapour, the principal results were a gradual decay of the sexual function, paralysis, and death at the end of three years. (*Arch. Gén.*, Feb. 1853.)

Off. Prep. Acidum Phosphoricum Dilutum. B.

PHYTOLACCÆ BACCÆ. *U. S. Secondary.*

Poke Berries.

The berries of Phytolacca decandra. *U. S.*

PHYTOLACCÆ RADIX. *U. S. Secondary.*

Poke Root.

The root of Phytolacca decandra. *U. S.*

PHYTOLACCA. *Sex. Syst.* Decandria Decagynia.—*Nat. Ord.* Phytolacceæ. *Gen. Ch. Calyx* none. *Petals* five, calycine. *Berry* superior, ten-celled, ten-seeded. *Willd.*

Phytolacca decandra. Willd. *Sp. Plant.* ii. 822; Bigelow, *Am. Med. Bot.* i. 39; Barton, *Med. Bot.* ii. 213. This is an indigenous plant with a very large perennial root, often five or six inches in diameter, divided into two or three principal branches, soft, fleshy, fibrous, whitish within, and covered with a brownish cuticle. The stems, which are annual, frequently grow to the height of six or eight feet, and divide into numerous spreading branches. They are round, very smooth, green when young, but purple after the berries have ripened. The leaves are scattered, ovate-oblong, entire, pointed, smooth, ribbed beneath, and supported on short footstalks. The flowers are numerous, small, and grow in long racemes, which are sometimes erect, sometimes drooping. The corolla consists of five ovate, concave petals, folding inwards, and of a whitish colour. The germ is green. There are ten stamens, and the same number of pistils. The raceme of flowers becomes a cluster of dark purple, almost black, shining berries, flattened above and below, and divided into ten cells, each of which contains one seed.

The poke is abundant in all parts of the United States, flourishing along fences,

by the borders of woods, and especially in newly-cleared and uncultivated fields. It also grows spontaneously in the North of Africa and the South of Europe, where, however, it is supposed to have been introduced from America. Its flowers begin to appear in July, and the fruit ripens in autumn. The magnitude of the poke-weed, its large rich leaves, and its beautiful clusters of purple berries, often mingled upon the same branch with the green unripe fruit, and the flowers still in bloom, render it one of the most striking of our native plants. The young shoots are much used as food early in the spring, boiled in the manner of spinage. The ashes of the dried stems and leaves contain a very large proportion of potassa, yielding, according to Braconnot, not less than forty-two per cent. of the pure caustic alkali. In the plant the potassa is neutralized by an acid closely resembling the malic, though differing from it in some respects. The leaves, berries, and root are used in medicine, but the two latter only are mentioned in the Pharmacopœia. The root is most active. It should be dug up late in November, cut into thin transverse slices, and dried with a moderate heat. As its virtues are diminished by keeping, a new supply should be procured every year. The berries should be collected when perfectly ripe, and the leaves about the middle of summer, when the footstalks begin to redden.

The *berries* contain a succulent pulp, and yield upon pressure a large quantity of fine purplish-red juice. They have a sweetish, nauseous, slightly acrid taste, with little odour. The colouring principle of their juice is evanescent, and cannot be applied to useful purposes in dyeing, from the difficulty of fixing it. Alkalies render it yellow; but the original colour is restored by acids. The juice contains saccharine matter, and, after fermenting, yields alcohol by distillation.

The *dried root* is of a light yellowish-brown colour externally, very much wrinkled, and, when in transverse slices, exhibits on the cut surface numerous concentric rings, formed by the projecting ends of fibres, between which the intervening matter has shrunk in drying. The structure internally in the older roots is firm and almost ligneous; the colour yellowish-white, alternating with darker circular layers. There is no smell; the taste is slightly sweetish, and at first mild, but followed by a sense of acrimony. The active matter is imparted to boiling water and alcohol. From the analysis of Mr. Edward Donelly, the root appears to contain tannic acid, starch, gum, sugar, resin, fixed oil, and lignin, besides various inorganic principles. (*Am. Journ. of Pharm.*, xv. 169.)

Medical Properties and Uses. Poke is emetic, purgative, and somewhat narcotic. As an emetic it is very slow in its operation, frequently not beginning to vomit in less than one or two hours after it has been taken, and then continuing to act for a long time upon both the stomach and bowels. The vomiting produced by it is said not to be attended with much pain or spasm; but narcotic effects have been observed by some physicians, such as drowsiness, vertigo, and dimness of vision. In over-doses it produces excessive vomiting and purging, attended with great prostration of strength, and sometimes with convulsions. A case is recorded in the *Stethoscope*, for March, 1852 (ii. 134), by Dr. Geo. F. Terrill, of Hanover Co., Va., in which death was produced in a woman by eating a double handful of the berries. Free purgation followed upon the first day, after which coma set in, with great prostration, though death did not occur until after the sixth day. Poke has been proposed as a substitute for ipecacuanha; but the slowness and long continuance of its action, and its tendency to purge, wholly unfit it for the purposes which that emetic is calculated to fulfil. In small doses it acts as an alterative, and has been highly recommended in the treatment of chronic rheumatism. The dose of the powdered root, as an emetic, is from ten to thirty grains; as an alterative, from one to five grains. A saturated tincture of the berries, prepared with diluted alcohol, may be given in rheumatic cases, in the dose of a fluidrachm, three times a day. A strong infusion

of the leaves or root has been recommended in piles. An ointment, prepared by mixing a drachm of the powdered root or leaves with an ounce of lard, has been used with advantage in psora, tinea capitis, and some other forms of cutaneous disease. It occasions at first a sense of heat and smarting in the part to which it is applied. An extract made by evaporating the expressed juice of the recent leaves has been used for the same purposes, and acquired at one time considerable repute as a remedy in cancer. W.

PIMENTA. *U. S., Lond., Ed., Dub.*

Pimento.

The unripe berries of Myrtus Pimenta, *U. S.* Eugenia Pimenta. The unripe fruit, *Lond.* The unripe berries, *Ed., Dub.*

Allspice, Jamaica pepper; Piment, Poivre de la Jamaique, *Fr.;* Nelkenpfeffer, *Germ.;* Pimenti, *Ital.;* Pimienta de la Jamaica, *Span.*

Myrtus. *Sex. Syst.* Icosandria Monogynia.—*Nat. Ord.* Myrtaceæ.

Gen. Ch. Calyx five-cleft, superior. *Petals* five. *Berry* two to five-celled, many-seeded. *Willd.*

Myrtus Pimenta. Willd. *Sp. Plant.* ii. 973; Woodv. *Med. Bot.* p. 541, t. 194. —*Eugenia Pimenta.* De Cand. *Prodrom.* iii. 285; Lindley, *Flor. Med.* p. 76. This is a beautiful tree, about thirty feet high, with a straight trunk, much branched above, and covered with a very smooth gray bark. Its dense and ever-verdant foliage gives it at all times a refreshing appearance. The leaves, which are petiolate, vary in shape and size; but are usually about four inches long, elliptical, entire, blunt, or obtusely pointed, veined, and of a deep shining green colour. The flowers are small, without show, and disposed in panicles upon trichotomous stalks, which usually terminate the branches. The fruit is a spherical berry, crowned with the persistent calyx, and when ripe is smooth, shining, and of a black or dark-purple colour. The tree exhales an aromatic fragrance, especially during the summer months, when it is in flower.

It is a native of the West Indies, Mexico, and South America, and is abundant in Jamaica, whence its fruit received the name of *Jamaica pepper.* The berries are the officinal part. They are gathered after having attained their full size, but while yet green, and are carefully dried in the sun. When sufficiently dry, they are put into bags and casks for exportation.

Properties. The berries, as they reach us, are of different sizes, usually about as large as a small pea, round, wrinkled, umbilicate at the summit, of a brownish colour, and when broken present two cells, each containing a black hemispherical seed. They have a fragrant odour, thought to resemble that of a mixture of cinnamon, cloves, and nutmeg. Hence the name of *allspice*, by which they are best known in this country. Their taste is warm, aromatic, pungent, and slightly astringent. They impart their flavour to water, and all their virtues to alcohol. The infusion is of a brown colour, and reddens litmus paper. They yield a volatile oil by distillation. (See *Oleum Pimentæ.*) By a minute analysis, Bonastre obtained from them a volatile oil, a green fixed oil, a fatty substance in yellowish flakes, tannin, gum, resin, uncrystallizable sugar, colouring matter, malic and gallic acids, saline matters, moisture, and lignin. The green oil has the burning aromatic taste of pimento, and is supposed to be the acrid principle. Upon this, therefore, together with the volatile oil, the medical properties of the berries depend; and, as these two principles exist most largely in the shell or cortical portion, this part is most efficient. According to Bonastre, the shell contains 10 per cent. of the volatile, and 8 of the fixed oil, the seeds only 5 per cent. of the former, and 2·5 of the latter. Berzelius considers the green fixed oil of Bonastre as a mixture of volatile oil, resin, fixed oil, and perhaps a little chlorophylle.

Medical Properties and Uses. Pimento is a warm, aromatic stimulant, used in medicine chiefly as an adjuvant to tonics and purgatives, the taste of which it serves to cover, while it increases their warmth, and renders them more acceptable to the stomach. It is particularly useful in cases attended with much flatulence. It is, however, much more largely employed as a condiment than as a medicine. The dose is from ten to forty grains. A tincture of pimento has been recommended as a local application in chilblains.

Off. Prep. Aqua Pimentæ; Oleum Pimentæ; Spiritus Pimentæ; Syrupus Rhamni. W.

PIPER. *U. S.*

Black Pepper.

The berries of piper nigrum. *U. S.*

Off. Syn. PIPER NIGRUM. Piper nigrum. The unripe fruit. *Lond.* Dried unripe berries. *Ed., Dub.*

Poivre, *Fr.;* Schwarzer Pfeffer, *Germ.;* Gemeine peper, *Dutch;* Pepe nero, *Ital.;* Pimienta negra, *Span.;* Fifil uswud, *Arab.;* Lada, *Malay;* Maricha, *Javan.;* Sahan, *Palembang.*

PIPER. See CUBEBA.

Piper nigrum. Willd. *Sp. Plant.* i. 159; Woodv. *Med. Bot.* p. 721, t. 246; Carson, *Illust. of Med. Bot.* ii. 38, pl. 83. The pepper vine is a perennial plant, with a round, smooth, woody, articulated stem, swelling near the joints, branched, and from eight to twelve feet or more in length. The leaves are entire, broad-ovate, acuminate, seven-nerved, coriaceous, very smooth, of a dark-green colour, and attached by strong sheath-like footstalks to the joints of the branches. The flowers are small, whitish, sessile, covering thickly a cylindrical spadix, and succeeded by globular berries, which are of a red colour when ripe.

The plant grows wild in Cochin-china and various parts of India. It is cultivated on the coast of Malabar, in the peninsula of Malacca, in Siam, Sumatra, Java, Borneo, the Philippines, and many other places in the East. We are told by Crawford, that the best pepper is produced in Malabar; but Europe and America derive their chief supplies from Sumatra and Java. The plant is propagated by cuttings, and is supported by props, or by trees of various kinds planted for the purpose, upon which it is trained. In three or four years from the period of planting, it begins to bear fruit. The berries are gathered before they are all perfectly ripe, and, upon being dried, become black and wrinkled.

White pepper is the ripe berry, deprived of its skin by maceration in water and subsequent friction, and afterwards dried in the sun. It has less of the peculiar virtues of the spice than the black pepper, and is seldom employed in this country.

Properties. The dried berries are about as large as a small pea, externally blackish and wrinkled, internally whitish, of an aromatic smell, and a hot, pungent, almost fiery taste. They yield their virtues partially to water, entirely to alcohol and ether. Pelletier found them to contain a peculiar crystalline matter called piperin, an acrid concrete oil or soft resin of a green colour, a balsamic volatile oil, a coloured gummy substance, an extractive matter like that found in leguminous plants capable of being precipitated by infusion of galls, a portion of bassorin, uric and malic acids, lignin, and various salts. *Piperin* was discovered by Professor Œrsted, of Copenhagen, who considered it an organic alkali, and the active principle of pepper. Pelletier, however, utterly denied its alkaline nature and medical activity, and ascribed all the effects, supposed to have been obtained from it, to a portion of the acrid concrete oil with which it is mixed when not very carefully prepared. When perfectly pure, piperin is in

colourless transparent crystals, according to Pelletier without taste, fusible at 212°, insoluble in cold water, slightly soluble in boiling water which deposits it upon cooling, soluble in alcohol, ether, and acetic acid, decomposed by the concentrated mineral acids, with the sulphuric becoming of a blood-red colour, with the nitric, first of a greenish-yellow, then orange, and ultimately red. Christison, however, states, in his Dispensatory, that the whitest crystals he had been able to obtain were still acrid, and emitted an irritating vapour when thrown on heated iron. As ordinarily procured the crystals are yellow. Piperin consists of nitrogen, carbon, hydrogen, and oxygen; and its formula, according to Wertheim, is $N_2C_{70}H_{37}O_{10}$.* It is obtained by treating pepper with alcohol, evaporating the tincture to the consistence of an extract, submitting the extract to the action of an alkaline solution by which the oleaginous matter is converted into soap, washing the undissolved portion with cold water, separating the liquid by filtration, treating the matter left on the filter with alcohol, and allowing the solution thus obtained to evaporate spontaneously, or by a gentle heat. Crystals of piperin are deposited, and may be purified by alternate solution in alcohol or ether, and crystallization. The taste and medicinal activity of pepper probably depend mainly on the concrete oil or resin, and on the volatile oil. The concrete oil is of a deep-green colour, very acrid, and soluble in alcohol and ether. The volatile oil is limpid, colourless, becoming yellow by age, of a strong odour, and of a taste less acrid than that of the pepper. It consists of 10 eqs. of carbon and 8 of hydrogen, and forms a liquid, but not a concrete compound with muriatic acid.

Medical Properties and Uses. Black pepper is a warm carminative stimulant, capable of producing general arterial excitement, but acting with greater proportional energy on the part to which it is applied. From the time of Hippocrates it has been employed as a condiment and medicine. Its chief medicinal application is to excite the languid stomach, and correct flatulence. It was long since occasionally administered for the cure of intermittents; but its employment for this purpose had passed from the profession to the vulgar, till a few years since revived by an Italian physician, to be again consigned to forgetfulness. Piperin has also been employed in the same complaint, and has even been thought superior to sulphate of quinia; but experience has not confirmed this favourable opinion. That, in its impure state, when mixed with a portion of the acrid principle, it will occasionally cure intermittents, there can be no doubt; but it is not comparable to the preparations of bark, and is probably less active than the alcoholic extract of pepper. In intermittent fever, when the stomach is not duly susceptible to the action of quinia, as sometimes in drunkards, pepper may be found a useful adjuvant to the more powerful febrifuge. The dose of pepper is from five to twenty grains. It may be given whole or in powder; but is more energetic in the latter state. Piperin has been given in doses varying from one to six or eight grains.

Off. Prep. Confectio Piperis; Confectio Rutæ; Emplastrum Cantharidis Compositum; Extractum Piperis Fluidum. W.

* An interesting chemical investigation into the nature of piperin has been made by Wertheim, the result of which is that it probably consists of a volatile alkaline principle ($NC_{12}H_7$), combined with an electro-negative compound ($NC_{58}H_{30}O_{10}$), which, however, is thus far hypothetical. The former is obtained by distilling piperin mixed with soda and hydrate of lime, at a temperature between 300° and 320°. It is considered by Wertheim as identical with *picoline*, previously obtained by Dr. Anderson from the reaction of nitric acid on piperin, and described by him in a paper presented at the meeting of the British Association, at Edinburgh in 1850. (*Chem. Gaz.*, Aug. 1849, p. 309, from *Liebig's Annalen.*) M. Cahours has since repeated the experiments of Wertheim, and obtained the same alkaline principle, which he names *piperidine*, and for which he gives the formula $NC_{10}H_{11}$, corresponding precisely with that given by Dr. Anderson for *picoline*. According to M. Cahours, it is a colourless liquid, having a mixed odour of ammonia and pepper, a very caustic taste, and a strong alkaline reaction. It is soluble in water in all proportions, and forms crystallizable salts with several acids. (*Ibid.*, May 1, 1852, p. 167.)

PIPER LONGUM. *Lond., Ed.*

Long Pepper.

Piper longum. The unripe fruit. *Lond.* The dried spikes. *Ed.*

Poivre longue, *Fr.;* Langer Pfeffer, *Germ.;* Pepe lungo, *Ital.;* Pimienta larga, *Span.*

PIPER. See CUBEBA.

Piper longum. Willd. *Sp. Plant.* i. 161; Woodv. *Med. Bot.* p. 724, t. 247. This species of Piper differs from its congeners in having its lower leaves cordate, petiolate, seven-nerved, its upper oblong-cordate, sessile, and five-nerved; its flowers in dense, short, terminal, and nearly cylindrical spikes; and its fruit, consisting of very small one-seeded berries or grains, embedded in a pulpy matter. It is a native of South-eastern Asia, and is produced abundantly in Bengal and other parts of Hindostan. The fruit is green when immature, and becomes red as it ripens. It is gathered in the former state, as it is then hotter than when perfectly ripe. The whole spike is taken from the plant and dried in the sun.

Long pepper is cylindrical, an inch or more in length, indented on its surface, of a dark-gray colour, a weak aromatic odour, and a pungent fiery taste. M. Dulong found its chemical composition to be closely analogous to that of black pepper. Like that it contains *piperin*, a concrete oil or soft resin upon which its burning acrimony depends, and a volatile oil to which it probably owes its odour. Its medical virtues are essentially the same as those of black pepper; but it is considered inferior to that spice, and is seldom used.

Off. Prep. Confectio Opii; Pulvis Cinnamomi Compositus; Pulvis Cretæ Compositus; Tinctura Cinnamomi Composita. W.

PIX. *Lond.*

Pitch.

Dry bitumen prepared from tar. *Lond.*

Off. Syn. PIX ARIDA. Pitch: from various species of Pinus and Abies. *Ed.*

This is the solid black mass left after the evaporation of the liquid parts of tar. It was formerly called *pix nigra* or *black pitch.* It has a shining fracture, softens and becomes adhesive with a moderate heat, melts in boiling water, and consists of the resin of the pine unaltered, and of various empyreumatic resinous products which have received the name of *pyretin.* (*Berzelius, Trait. de Chim.*, vi. 641 and 680.) It appears to be very gently stimulant or tonic, and has been used internally in ichthyosis and other cutaneous diseases, and recently with great advantage in piles. The dose is from ten grains to a drachm given in pills. Pitch is also used externally in the form of ointment.

Off. Prep. Unguentum Picis. W.

PIX BURGUNDICA. *U. S., Lond., Ed., Dub.*

Burgundy Pitch.

The prepared concrete juice of Abies excelsa. *U. S.* Impure resin prepared from the turpentine. *Lond.* Concrete resinous exudation, probably in a great measure from Abies excelsa. *Ed.* Abies excelsa. Burgundy pitch. *Dub.*

Poix de Bourgogne, Poix jaune, Poix blanche, *Fr.;* Burgundisches Pech, *Germ.*

The genus Pinus of Linnæus has been divided into three genera, viz., *Pinus, Abies,* and *Larix;* the first including the pines, the second the firs and spruces,

and the third the larches. We follow the Pharmacopœias in adopting this division.

ABIES. *Sex. Syst.* Monœcia Monadelphia.—*Nat. Ord.* Pinaceæ or Coniferæ. *Gen. Ch.* MALE FLOWERS. *Catkins* solitary, not racemose; *Scales* staminiferous at the apex. *Stamens* two, with one-celled anthers. FEMALES. *Catkins* simple. *Ovaries* two. *Stigmas* glandular. *Cone* with imbricated scales, which are thin at the apex, and rounded. *Cotyledons* digitate-partite. *Leaves* solitary in each sheath. *De Cand.*

Abies excelsa. De Candolle.—*A. communis.* Loudon's *Encyc. of Plants.*—*Pinus Abies.* Willd. *Sp. Plant.* iv. 506; Woodv. *Med. Bot.* p. 4, t. 2. The *Norway spruce* is a very lofty tree, rising sometimes one hundred and fifty feet in height, with a trunk from three to five feet in diameter. The leaves, which stand thickly upon the branches, are short, obscurely four-cornered, often curved, of a dusky green colour, and shining on the upper surface. The male aments are purple and axillary, the female of the same colour, but usually terminal. The fruit is in pendent, purple, nearly cylindrical strobiles, the scales of which are oval, pointed, and ragged at the edges.

This tree is a native of Europe and Northern Asia. Though designated as the source of Burgundy pitch, it furnishes but a part of the substance sold under that name by the druggists. Tingley asserts that the real Burgundy pitch is obtained from the *Abies picea*, or European silver fir tree; and the same fact is stated by Fée. According to Geiger, who is probably correct, it is procured from both species. To obtain the *pitch*, portions of the bark are removed so as to lay bare the wood, and the flakes of concrete resinous matter which form upon the surface of the wound, having been detached by iron instruments, are melted with water in large boilers, and then strained through coarse cloths. It is called Burgundy pitch from the province of that name in the East of France. We are told that the greater portion is collected in the neighbourhood of Neufchatel.

From various species of pine, in different parts of Europe, a similar product is obtained and sold by the same name. It is prepared by removing the juice which concretes upon the bark of the tree, or upon the surface of incisions, called *galipot* by the French, and purifying it by melting and straining, either through cloth or a layer of straw. A *factitious Burgundy pitch* is made by melting together common pitch, resin, and turpentine, and agitating the mixture with water, which gives it the requisite yellowish colour. Its odour is different from that of the genuine.

As brought to this country, Burgundy pitch is generally mixed with impurities, which require that it should be melted and strained before being used. In its pure state it is hard, brittle, quite opaque, of a yellowish or brownish-yellow colour, and a weak terebinthinate taste and odour. It is very fusible, and at the heat of the body softens and becomes adhesive. It differs from turpentine in containing a smaller proportion of volatile oil.

THUS. *Frankincense.* Under the name of *Thus*, the London and Dublin Colleges direct the concrete juice of the *spruce fir*, as taken immediately from the bark of the tree without any preparation. The London College recognises also Pinus palustris as one of its sources. As sold in London it is in all probability derived chiefly if not exclusively from the latter tree, being in fact nothing more than our common turpentine, perfectly dry and brittle. (See *Terebinthina.*) It is in solid, brittle tears, of a yellowish or brownish-yellow colour on the outside, and paler within, and emits an agreeable odour when burned. It softens and becomes adhesive at the temperature of the body.

Medical Properties and Uses. Applied to the skin in the shape of a plaster, Burgundy pitch acts as a gentle rubefacient, producing a slight degree of inflammation and serous effusion without separating the cuticle. Sometimes it excites

a papillary or vesicular eruption; and we have known it to act upon the surface as a violent poison, giving rise to severe pain, swelling, and redness, followed by vesication and even ulceration. It is used chiefly in slight chronic pains of a rheumatic character, or in chronic affections of the chest or abdomen, which call for a gentle but long-continued revulsion to the skin. The resinous exudation of the spruce fir (*thus or frankincense*) is used only as an ingredient of plasters.

Off. Prep. of Burgundy Pitch. Emplastrum Cantharidis Compositum; Emplast. Ferri; Emplast. Galbani Comp.; Emplast. Opii; Emplast. Picis; Emplast. Picis Burgundicæ; Emplast. Picis cum Cantharide; Pix Burgundica Præparata.

Off. Prep. of Frankincense. Thus Præparatum. W.

PIX CANADENSIS. *U. S.*

Canada Pitch.

The prepared concrete juice of Abies Canadensis. *U. S.*

Abies. See PIX BURGUNDICA.

Abies Canadensis. Michaux, *N. Am. Sylv.* iii. 185.—*Pinus Canadensis.* Willd. *Sp. Plant.* iv. 505. This is the *hemlock spruce* of the United States and Canada. When of full growth it is often seventy or eighty feet high, with a trunk two or three feet in diameter, and of nearly uniform dimensions for two-thirds of its length. The branches are slender, and dependent at their extremities. The leaves are very numerous, six or eight lines long, flat, denticulate, and irregularly arranged in two rows. The strobiles are ovate, little longer than the leaves, pendulous, and situated at the ends of the branches.

The tree is abundant in Canada, Nova Scotia, and the more northern parts of New England; and is found in the elevated and mountainous regions of the Middle States. Its bark abounds in the astringent principle, and is much used for tanning in the northern parts of the United States. It contains much less juice than some other of the Pinaceæ; and very little flows from incisions made into its trunk. But in the trees which have attained their full growth, and are about or have begun to decay, the juice exudes spontaneously, and hardens upon the bark, in consequence of the partial evaporation or oxidation of its volatile oil. The bark thus incrusted is stripped from the tree, broken into pieces of convenient size, and boiled in water. The pitch melts, rises to the surface, is skimmed off, and is still further purified by a second boiling in water. It is brought to Philadelphia from the north of Pennsylvania, in dark-coloured brittle masses, which, on being broken, exhibit numerous minute fragments of bark, interspersed through their substance. From these it is purified in the shops by melting and straining through linen or canvas. (Ellis, *Journ. of Phil. Col. of Pharm.*, ii. 18.)

Thus prepared it is hard, brittle, quite opaque, of a dark yellowish-brown colour, which becomes still darker by exposure to the air, of a weak peculiar odour, and scarcely any taste. It softens and becomes adhesive with a moderate heat, and melts at 198° F. Its constituents are resin and a minute proportion of volatile oil. It is commonly known by the incorrect name of *hemlock gum.*

Medical Properties and Uses. Canada pitch is a gentle rubefacient, closely analogous to Burgundy pitch in its properties, and employed for precisely the same purposes. It is, however, more readily softened by heat, and is sometimes almost too soft for convenient application at the temperature of the body. A volatile oil obtained from Abies Canadensis, and called *oil of hemlock*, has been employed to produce abortion, with the effect of endangering the life of the female. (J. S. Paige, *N. Y. Journ. of Med.*, viii. 184.) W.

PIX LIQUIDA. *U. S., Lond., Ed., Dub.*

Tar.

The impure turpentine procured by burning from the wood of Pinus palustris and other species of Pinus. *U. S.* Pinus sylvestris and other species. Liquid bitumen prepared from the wood by fire. *Lond.* Tar from various species of Pinus and Abies. *Ed.* Tar from Pinus sylvestris. *Dub.*

Goudron, *Fr.;* Theer, *Germ.;* Pece liquida, *Ital.;* Alquitran, *Span.*

The tar used in this country is prepared from the wood of various species of pine, particularly *Pinus palustris* of the Southern States, the *P. australis* of Michaux. (See *Terebinthina.*) The dead wood is usually selected, because, when vegetation ceases, the resinous matter becomes concentrated in the interior layers. The wood is cut into billets of a convenient size, which are placed together so as to form a large stack or pile, and then covered with earth as in the process for making charcoal. The stack is built upon a small circular mound of earth previously prepared, the summit of which gradually declines from the circumference to the centre, where a small cavity is formed, communicating by a conduit with a shallow ditch surrounding the mound. Fire is applied through an opening in the top of the pile, and a slow combustion is maintained, so that the resinous matter may be melted by the heat. This runs into the cavity in the centre of the mound, and passes thence by the conduit into the ditch, whence it is transferred into barrels. Immense quantities of tar are thus prepared in North Carolina and the south-eastern parts of Virginia, sufficient, after supplying our own consumption, to afford a large surplus for exportation.

Considerable quantities of tar have also been prepared in the lower parts of New Jersey, in some portions of New England, and in Pennsylvania west of the Alleghany mountains, from the *Pinus rigida,* or pitch pine, and perhaps from some other species.

Properties. Tar has a peculiar empyreumatic odour, a bitterish, resinous, somewhat acid taste, a colour almost black, and a tenacious consistence intermediate between that of a liquid and solid. It consists of resinous matter, united with acetic acid, oil of turpentine, and various volatile empyreumatic products, and coloured with charcoal. By distillation it yields an acid liquor called *pyroligneous acid* (see *Acidum Aceticum*), and an empyreumatic oil called *oil of tar;* and what is left behind is *pitch.* The empyreumatic oil has been ascertained by Dr. Reichenbach, of Moravia, to contain, besides oil of turpentine, six distinct principles, which he has named *paraffine, eupione, creasote, picamar, capnomor,* and *pittacal.* Of these, only picamar and creasote merit particular attention; the former as the principle to which tar owes its bitterness, the latter as the one upon which it probably depends chiefly for its medical virtues. (See *Creasotum.*) Tar yields a small proportion of its constituents to water, which is thus rendered medicinal, and is employed under the name of *tar water.* It is dissolved by alcohol, ether, and the volatile and fixed oils.

Medical Properties and Uses. The medical properties of tar are similar to those of the turpentines. It is occasionally used with advantage in chronic catarrhal affections, and complaints of the urinary passages. Little benefit can be expected from it in genuine phthisis, in the treatment of which it was formerly recommended. Dr. Bateman employed it advantageously as an internal remedy in ichthyosis. Its vapour, inhaled into the lungs, has been found serviceable in numerous cases of bronchial disease. Its effects in this way are most conveniently obtained by placing a cup containing tar or oil of tar in a small water-bath, over a common nurse-lamp, and thus impregnating the air of the chamber.

Externally applied, in the state of ointment, tar is a very efficient remedy in tinea capitis or scaldhead, and in some cases of psoriasis; and has been used with advantage in foul or indolent ulcers, and some other affections of the skin.

It may be used in the form of tar water, or in substance made into pills with wheat flour, or mixed with sugar in the form of an electuary. The dose is from half a drachm to a drachm, and may be repeated so as to amount to three or four drachms daily.

Tar water (*Aqua Picis Liquidæ*) may be prepared by stirring a pint of tar with half a gallon of water for fifteen minutes, then allowing the tar to subside, and straining the liquid. Water takes from tar a small portion of acetic acid, empyreumatic oil, and resinous matter, acquiring a sharp empyreumatic taste, and the colour of Madeira wine. Thus impregnated it is stimulant and diuretic, and may be taken in the quantity of from one to two pints daily. It is also used as a wash in chronic cutaneous affections, and is said to have proved beneficial, by injection into the bladder, in some cases of chronic cystitis.*

Off. Prep. Unguentum Picis Liquidæ. W.

PLUMBUM.

Lead.

Plomb, *Fr.;* Blei, *Germ.;* Lood, *Dutch;* Plombo, *Ital.;* Plomo, *Span.;* Chumbo, *Port.*

Lead is not officinal in its metallic state; but enters into a number of important medicinal preparations. It occurs in nature in three principal states—as an oxide, as a sulphuret called *galena*, and in saline combination, forming the native sulphate, phosphate, carbonate, chromate, molybdate, tungstate, and arseniate of lead. The oxide is rare, but galena is exceedingly abundant and diffused, and is the ore from which nearly all the lead of commerce is extracted. The process of extraction consists in melting the ore in contact with charcoal. Mines of galena occur in different parts of the world, but the richest and most extensive are found in this country. The lead region of the United States extends in length from the Wisconsin in the north to the Red river of Arkansas in the south, and in breadth about one hundred and fifty miles.

Properties. Lead is a soft, bluish-gray, and very malleable metal, presenting a bright surface when newly melted or cut. It has a perceptible taste, and a peculiar smell when rubbed. It undergoes but little change in the air, but is acted on by the combined influence of air and water, which give rise to a hydrated protoxide, which is afterwards changed, in part, into carbonate, by absorbing carbonic acid from the atmosphere. This chemical effect on the metal is greater in proportion as the water is purer. (See *page* 110.) Its sp. gr. is 11·4, melting point about 612°, and equivalent number 103·6. Exposed to a stream of oxygen on ignited charcoal, it burns with a blue flame, throwing off dense yellow fumes. The best solvent of lead is nitric acid; but the presence of sulphuric acid destroys, and that of muriatic acid lessens its solvent power, on

* *Tar Beer or Wine of Tar.* A preparation under this name has been used to some extent in Philadelphia in pulmonary affections. The following is the formula recommended by Prof. Procter. Take of *ground malt*, *honey*, and *tar*, each a pound; *yeast* half a pint. Mix the malt and honey with six pints of water in an earthen vessel; keep the mixture for three hours, with occasional stirring, at the temperature of 150° F.; then allow it to cool to 80° F., and add the yeast. Sustain the fermentation for thirty-six hours by a heat between 70° and 80°, then decant the supernatant liquid, add the tar gradually to the dregs, stirring constantly, so as to make a uniform mixture, and return the decanted fluid to the vessel. Stir the whole occasionally for a week, adding water so as to preserve the original measure; then strain with strong expression, allow the expressed liquor to stand until it becomes nearly clear by subsidence, and finally filter through paper. (*Am. Journ. of Pharm.* xxii. 111.)

account of the insolubility of the sulphate and chloride of lead. Lead forms five oxides, a dioxide, protoxide, sesquioxide, deutoxide, and red oxide. The *dioxide* consists of two equivalents of lead and one of oxygen. The *protoxide*, called in commerce *massicot*, may be obtained by calcining, in a platinum crucible, the subnitrate of lead, formed by precipitating a solution of the nitrate by ammonia. On a large scale it is manufactured by exposing melted lead to the action of the air. Its surface becomes encrusted with a gray pellicle, which, being scraped off, is quickly succeeded by another; and the whole of the metal, being in this way successively presented to the air, becomes converted into a greenish-gray powder, consisting of protoxide and metallic lead. This, by exposure to a moderate heat, absorbs more oxygen, and is converted entirely into protoxide. This oxide has a yellow colour, and is the only oxide of lead capable of forming salts with the acids. It consists of one eq. of lead 103·6, and one of oxygen 8 = 111·6. A variety of the protoxide called *litharge* is very much used in pharmacy, and is officinal in all the Pharmacopœias. (See *Plumbi Oxidum Semivitreum.*) The *sesquioxide*, discovered by Winckelblech, is unimportant. The *deutoxide*, called also *puce* oxide from its *flea*-brown colour, may be obtained by treating red lead with nitric acid. The acid takes up the protoxide and leaves the deutoxide, which may be purified by washing with boiling water. It is a tasteless powder, of a dark-brown colour. When heated to redness it loses half its oxygen and becomes protoxide. It consists of one eq. of lead 103·6, and two of oxygen 16 = 119·6. The *red oxide*, called in commerce *minium* or *red lead*, is described under another head. (See *Plumbi Oxidum Rubrum.*) Lead combines with iodine, forming the officinal iodide of lead. The acetate, carbonate, and nitrate are also officinal.

The best tests of lead are sulphuretted hydrogen, and a solution of iodide of potassium. The former produces a black precipitate of sulphuret of lead, the latter, a yellow one of iodide of lead.

Medical Properties and Uses. The effects of lead in its various combinations are those of a sedative and astringent. It is used internally for the purpose of reducing vascular action, and restraining inordinate discharges; and externally as an abater of inflammation. When introduced into the system in a gradual manner, either by working in the metal, or by taking it in small and frequently repeated doses, it acts injuriously on the nervous system, producing a peculiar colic, called *lead colic*, sometimes apoplectic symptoms, and occasionally palsy, which is almost always partial, and affects for the most part the upper extremities. In some instances salivation is produced, and, according to Dr. Henry Burton, the constitutional effects of the metal are indicated by a narrow lead-blue line at the edge of the gum, round two or more of the teeth, as a constant and early sign. According to Mialhe lead gains access to the circulation by means of the chlorides of the alkalifiable metals in the alimentary canal, which form with the lead, a soluble double chloride of lead and potassium or of lead and sodium. The treatment necessary in lead colic is given under *carbonate of lead.* Lead palsy is usually attended with dyspepsia, constipation, tendency to colic, lassitude, and gloominess of mind; and is best treated by tonics, aperients, exercise, and avoidance of the cause of the disease. The poisonous effects of an over-dose of the lead preparations are to be combated by emetics, if free vomiting has not previously occurred, by the exhibition of sulphate of magnesia or sulphate of soda, and by opium. The sulphates mentioned as purgatives have been recommended, under the impression that they acted as antidotes by forming sulphate of lead. It is probable that they lessen the poisonous effects of the soluble salts of lead; but the sulphate, though insoluble in water, may be, to some extent, soluble in the gastric juice; and, so far as its external use in the form of ointment is concerned, it has been found by Flandin to prove poisonous to the inferior animals.

In chronic poisoning by lead, warm sulphuretted baths, formed by dissolving four ounces of sulphuret of potassium in thirty gallons of water, in a wooden tub, are useful. These baths cause discoloration of the skin, from the formation of sulphuret of lead, and should be repeated every few days, until this effect ceases to be produced. During each bath, the patient should be well rubbed with a flesh-brush, and soap and water, in order to remove the discoloration. By proceeding in this way, the lead on the skin, or in its pores, is rendered insoluble and inert, and at the same time removed. Dr. Melsens praises iodide of potassium in chronic lead poisoning, the medicine having the effect of rendering the lead soluble, and of eliminating it from the system principally by the urine.

Orfila has determined, by experiments on dogs, the appearance exhibited by the mucous membrane of the stomach, after the use of small doses of the salts of lead. After the action of such doses for two hours, dull white points are visible on the membrane, sometimes in rows and sometimes disseminated, and evidently consisting of the metal, united with the organic tissue. If the animal be allowed to live for four days, the same spots may be seen with the magnifier; and if sulphuretted hydrogen be applied to the surface, they are instantly blackened. (*Archives Gén.*, 3*e série*, iv. 244.)

According to M. Gendrin, sulphuric acid, prepared like lemonade, and used both internally and externally, is a prophylactic against the poisonous effects of lead, especially the lead colic. It may be supposed to act by forming the comparatively inert sulphate of lead with the poison. Mr. Benson, a manager of white lead works at Birmingham, has tried this acid, and finds it a preventive of lead colic in his establishment, where it was exceedingly prevalent before its employment. He uses it as an addition to ginger beer, to which bicarbonate of soda is also added to render it brisk, but not in sufficient quantity to prevent a considerable portion of the acid remaining in excess. (*London Lancet*, Dec., 1842.) On the other hand, the powers of sulphuric acid in preventing the poisonous effects of lead are positively denied by Dr. A. Grisolle, Dr. Melsens, and other authorities. Dr. Grisolle recommends that workmen employed in lead manufactories should use frequent baths, avoid intemperance, and always eat before they enter upon their work in the morning. He supposes that, in a great majority of cases, the metal is introduced into the system through the stomach by means of the saliva or food. After acute poisoning by lead, the metal has been found in the liver and brain. Indeed, it may be detected in all the organs, a long time after the ingestion of the poison.

The following table embraces all the officinal preparations of lead.

Plumbi Oxidum Rubrum. *Ed.*

Plumbi Oxidum Semivitreum, *U. S.*; Plumbi Oxidum, *Lond.*; Lithargyrum, *Ed.*, *Dub.* Anglicè, *Litharge.*

Emplastrum Plumbi, *U. S.*, *Lond.*; Emplastrum Lithargyri, *Ed.*, *Dub.* Anglicè, *Lead plaster. Litharge plaster.*

Unguentum Plumbi Compositum, *Lond.*

Liquor Plumbi Subacetatis, *U. S.*; Liquor Plumbi Diacetatis, *Lond.*; Plumbi Diacetatis Solutio, *Ed.*; Plumbi Subacetatis Liquor, *Dub.* Anglicè, *Goulard's extract.*

Liquor Plumbi Subacetatis Dilutus, *U. S.*; Liquor Plumbi Diacetatis Dilutus, *Lond.*; Plumbi Subacetatis Liquor Compositus, *Dub.* Anglicè, *Lead-water.*

Ceratum Plumbi Subacetatis, *U. S.*; Ceratum Plumbi Compositum, *Lond.* Anglicè, *Goulard's cerate.*

Ceratum Saponis, *U. S.*; Ceratum Saponis Compositum, *Lond.*

Plumbi Iodidum, *U. S.*, *Lond.*, *Ed.*, *Dub.*

Unguentum Plumbi Iodidi, *Lond.*, *Dub.*

Plumbi Acetas, *U. S., Lond., Ed., Dub.*
Ceratum Plumbi Acetatis, *Lond.;* Unguentum Plumbi Acetatis, *Ed., Dub.*
Pilulæ Plumbi Opiatæ, *Ed.*
Plumbi Carbonas, *U. S., Ed., Dub.*
Unguentum Plumbi Carbonatis, *U. S., Ed., Dub.*
Plumbi Nitras, *U. S., Ed., Dub.* B.

PLUMBI ACETAS. *U. S., Lond., Ed., Dub.*

Acetate of Lead.

Sugar of Lead; Saccharum Saturni, Cerussa acetata, *Lat.;* Acétate de plomb, Sucre de plomb, Sel de Saturne, *Fr.;* Essigsaures Bleioxyd, Bleizucker, *Germ.;* Zucchero di Saturno, *Ital.;* Azucar de plomo, *Span.*

Of the Pharmacopœias commented on in this work, the Edinburgh alone gives a formula for preparing this salt. In the other Pharmacopœias it is more properly placed in the catalogue of the Materia Medica.

Preparation. Sugar of lead is obtained by two methods. By one method, thin plates of lead are placed in shallow vessels filled with distilled vinegar, in such a manner as to have a part of each plate rising above the vinegar; and these are turned from time to time, so as to bring different portions of the metallic surface in contact with the air. The metal, after becoming protoxidized, dissolves in the vinegar to saturation, and the solution is evaporated to the point of crystallization. This process is a slow one, but furnishes a salt which is perfectly neutral. The other method consists in dissolving, by the assistance of heat, litharge, or the protoxide of lead obtained by calcination, in an excess of distilled vinegar or of purified pyroligneous acid, contained in leaden boilers. The oxide is quickly dissolved, and, when the acid has become saturated, the solution is transferred to other vessels to cool and crystallize. The crystals having formed, the mother waters are decanted, and, by a new evaporation, made to yield a new crop. These are generally yellow, but may be rendered white by repeated solutions and crystallizations.

Sugar of lead is extensively manufactured in Germany, Holland, France, and England, as well as in the United States. It is principally consumed in the arts of dyeing and calico-printing, in which it is employed to form with alum the acetate of alumina, to act as a mordant.

Properties. Acetate of lead is a white salt, crystallized in brilliant needles, which have the shape of long prisms, terminated by dihedral summits. Its taste is at first sweet and afterwards astringent. Exposed to the air it effloresces slowly. It dissolves in four times its weight of cold, and in a much smaller quantity of boiling water. It is soluble also in alcohol. Its solution in common water is turbid, in consequence of the formation of carbonate of lead with the carbonic acid which such water always contains. This turbidness may be removed by the addition of a small proportion of vinegar, or of dilute acetic acid. In pure distilled water, free from carbonic acid, it ought to dissolve entirely, and form a clear solution. Sulphuric acid, when added to a solution of acetate of lead, produces instantly a precipitate of sulphate of lead; and the disengaged acetic acid gives rise to vapours having the smell of vinegar. The salt, when heated, first fuses and parts with its water of crystallization, and afterwards is decomposed, yielding acetic acid and pyroacetic spirit (acetone), and leaving a residue of charcoal and reduced lead. An important property of sugar of lead is its power of dissolving a large quantity of protoxide of lead. (See *Liquor Plumbi Subacetatis.*) It consists of one eq. of acetic acid 51, one of protoxide of lead 111·6, and three of water 27=189·6.

Incompatibles. Acetate of lead is decomposed by all acids, and by those soluble salts, the acids of which produce with protoxide of lead insoluble or sparingly

soluble compounds. Acids of this character are the sulphuric, muriatic, citric, and tartaric. It is also decomposed by lime-water, and by ammonia, potassa, and soda; the last two, if added in excess, dissolving the precipitate at first formed. It is decomposed by hard water, in consequence of the sulphate of lime and common salt which such water usually contains. With sulphuretted hydrogen, it gives a black precipitate of sulphuret of lead; with iodide of potassium, a yellow one of iodide of lead; and with a carbonated alkali, a white one of carbonate of lead.

Medical Properties and Uses. Acetate of lead, in medicinal doses, is a powerful astringent and sedative; in over-doses, an irritant poison. It has sometimes been given in pretty large doses in regular practice without any bad effects, and cases are on record where a quarter of an ounce has been swallowed without proving fatal. On the other hand, it sometimes produces colica pictonum when given in medicinal doses, though taken with acetic acid to ward off its deleterious effects. It is proper to remark, however, that the immediate effects of an over-dose are often escaped by prompt and spontaneous vomiting; and that the remote constitutional effects are not apt to occur, so long as the evacuations from the bowels are not materially diminished. The principal diseases in which it has been exhibited are hemorrhages, particularly from the lungs, intestines, and uterus. Its effect in restraining the discharge of blood is admitted to be very powerful. It has also been used with advantage in certain forms of dysentery and diarrhœa, and has been recommended in particular stages of cholera infantum. Combined with opium, it is well suited to the treatment of the diarrhœa occurring in phthisis. It sometimes proves a valuable remedy in checking vomiting. Dr. Irvine, of Charleston, recommends it to compose the irritability of the stomach in yellow fever; and Dr. Davis, of Columbia, S. C., used it with benefit in the irritable stomach attendant on bilious fever. It has been much extolled by the German practitioners in dothinenteritis, or the typhoid fever attended with ulcerations of the intestines. In some of these cases it was advantageously combined with carbonate of ammonia. The same practitioners have strongly recommended it in aneurism of the aorta, and Dupuytren, on their report of its efficacy, tried it in several cases, and with marked effect in diminishing the size of the aneurismal tumour. (*Archives Gén.*, 3e *sér.*, v. 445.) One of the authors has imitated the practice in aneurism of the aorta, and in enlargement of the heart, and with encouraging results. It has been employed by Drs. Neuhold and Hasserbronc, with remarkable success, in strangulated hernia, used in enemata, containing ten grains of the salt dissolved in six fluidounces of tepid water, and repeated every two hours. In mercurial salivation, M. Brachet, of Lyons, found sugar of lead very efficacious, administered in grain pills, night and morning. Several cases of severe salivation of several months' duration, which had resisted the use of opium, purgatives, &c., were speedily relieved by the remedy. The solution is frequently used as a collyrium; and, applied by means of cloths, or mixed with crumb of bread, it forms a good application to superficial inflammation. It is sometimes advantageous to associate opium with the solution, in which case the meconate of morphia of the opium is decomposed, with the result of forming acetate of morphia in solution, and meconate of lead which precipitates. A convenient lotion, containing an excess of acetate of lead, may be formed by adding four grains of the acetate and four of opium to a fluidounce of water.

When employing this medicine, the practitioner should always bear in mind that, when long continued in small doses, it is apt to produce dangerous constitutional effects. These are chiefly of two kinds; 1. an affection of the alimentary canal, attended with severe pain and obstinate constipation, called *colica pictonum*, or *lead colic;* 2. a chronic affection of the muscles, especially of the extensors of the upper extremities, characterized by an excessive wasting of

these organs, and denominated *lead palsy*. Both these affections are apt to be excited in those artisans who work in lead. The approach of these dangerous constitutional symptoms is said to be indicated by a narrow lead-blue line at the edge of the gums. (See *page* 567.)

The dose of sugar of lead is from one to three grains, in the form of pill, repeated every two or three hours. It is generally given combined with opium. The solution for external use may be made by dissolving from two to three drachms in a pint of water; and if it be wanted clear, a fluidrachm of vinegar, or of dilute acetic acid may be added, which immediately dissolves the carbonate of lead, to which its turbidness is owing. When the skin is denuded of the cuticle, the solution should be weaker. The usual strength of the solution as a collyrium is from one to two grains to the fluidounce of distilled water.

Off. Prep. Acidum Aceticum; Acidum Aceticum Glaciale; Liquor Plumbi Subacetatis; Pilulæ Plumbi Opiatæ; Plumbi Iodidum; Unguentum Plumbi Acetatis; Zinci Acetas. B.

PLUMBI CARBONAS. *U. S., Ed., Dub.*

Carbonate of Lead.

White lead, Ceruse; Céruse, Carbonate de plomb, Blanc de plomb, Blanc de céruse, *Fr.;* Bleiweiss, *Germ.;* Cerussa, *Lat., Ital.;* Albayalde, *Span.*

Preparation. Carbonate of lead is prepared by two principal methods. By one method it is obtained by passing a stream of carbonic acid through a solution of subacetate (trisacetate) of lead. The carbonic acid combines with the excess of protoxide and precipitates as carbonate of lead, while a neutral acetate remains in solution. This, by being boiled with a fresh portion of protoxide, is again brought to the state of subacetate, when it is treated with carbonic acid as before. In this way the same portion of acetate repeatedly serves the purpose of being converted into subacetate, and of being decomposed by carbonic acid. The carbonate obtained is washed, dried with a gentle heat, and thrown into commerce. This process, which produces white lead of the first quality, was invented and made public by Thenard, about the year 1802, and is that which is usually pursued in France and Sweden.

A modification of the process of Thenard is now pursued by some manufacturers in England. It consists in mixing litharge with a hundredth part of acetate of lead, and subjecting the mixture, previously moistened with very little water, to a stream of carbonic acid. (*Pelouze.*)

The other method, which consists in exposing lead to the vapours of vinegar, originated in Holland, and is usually pursued in England and the United States; but in England, with some modifications which are not well known. We shall describe this process as pursued by our own manufacturers. The lead is cast into thin sheets, made by pouring the melted lead over an oblong sheet-iron shovel, with a flat bottom, and raised edges on its sides, which is held in a slanting direction over the melting-pot. As many of these sheets are then loosely rolled up as may be sufficient to form a cylinder five or six inches in diameter, and seven or eight high, which is placed in an earthen pot containing about half a pint of vinegar, and having within, a few inches from the bottom, three equidistant projecting portions in the earthenware, on which the cylinder of lead is supported, in order to keep it from contact with the vinegar. The pots thus prepared are placed side by side, in horizontal layers, in a building roughly constructed of boards, with interstices between them. The first layer is covered with boards, on which a stratum of tan or refuse straw from the stables is strewed; and fresh layers of pots, boards, and straw are successively placed until the whole

building is filled. The sides also are enclosed with straw. The layers of pots contained in one building, called a stack, are allowed to remain undisturbed for about six weeks, at the end of which time they are unpacked, and the cylinder of sheet-lead in each pot, though still retaining its shape, is found almost entirely converted into a flaky, white, friable substance, which is the white lead. This is separated from the lead yet remaining in the metallic state, ground in water, whereby it is washed and reduced to fine powder, and finally dried in long shallow reservoirs, heated by steam.

Pelouze has succeeded in explaining all these processes on the same general principles. In Thenard's process, it is admitted that the same portion of acetate of lead repeatedly unites with protoxide, and gives it up again to carbonic acid to form the carbonate. In the modified English process, referred to above, he supposes that the one per cent. of acetate of lead combines with sufficient litharge to convert it into subacetate, which immediately returns to the state of neutral acetate, by yielding up its excess of base to form the carbonate with the carbonic acid. The acetate is now ready to combine with a fresh portion of litharge, to be transferred to the carbonic acid as before; and thus this small proportion of acetate, by combining with successive portions of the litharge, finally causes the whole of it to unite with the carbonic acid. In the Dutch process, Pelouze has rendered it almost certain, that none of the oxygen or carbonic acid of the carbonate is derived from the vinegar. Here he supposes that the heat, generated by the fermentation of the straw or tan, volatilizes the vinegar, the acetic acid of which, with the assistance of the oxygen of the air, forms with the lead a small portion of subacetate. This, by reacting with the carbonic acid resulting from the decomposition of the straw or tan, or derived from the atmosphere, forms carbonate of lead, and is reduced to the state of neutral acetate. The neutral acetate returns again to the state of subacetate, and, by alternately combining with and yielding up the protoxide, causes the whole of the lead to be finally converted into carbonate.

The temperature of the stacks of pots in the Dutch process is about 113°. If it fall below 95°, a part of the lead escapes corrosion, and if it rise above 122°, the product is yellow. The form of acetic acid usually employed in this process is common vinegar; but the variable nature of that liquid as to strength and purity is an objection to its use; and, accordingly, other forms of the acid have been substituted for it with advantage, as, for example, the purified acetic acid from wood in a diluted state. For further information in relation to the different processes proposed or pursued for making white lead, the reader is referred to a paper by Prof. J. C. Booth, in the *Journal of the Franklin Institute* for Jan. 1842.

Properties. Carbonate of lead is a heavy, opaque substance, in powder or friable lumps, insoluble in water, of a fine white colour, inodorous and nearly insipid. Its beauty as a pigment depends in a great measure on the purity of the lead from which it is manufactured. It is wholly soluble, with effervescence in dilute nitric acid. Exposed to heat it becomes yellow, and with charcoal is reduced to the metallic state. It is sometimes adulterated with the sulphates of baryta, lime, and lead, particularly the former. M. Louyet has examined samples of French white lead, containing considerably more than half their weight of sulphate of baryta. These sulphates, if present, are left undissolved by nitric acid. Chalk or whiting is another adulteration. This may be detected by adding to the nitric solution of the white lead an excess of potassa, which will redissolve the protoxide of lead first thrown down, but leave a white powder of lime. Neutral carbonate of lead consists of one eq. of carbonic acid 22, and one of protoxide of lead 111·6=133·6. Commercial white lead is a compound of the carbonate and hydrate of lead. Mulder and Hochstetter make its formula to be $2(PbO,CO_2)+PbO,HO$.

Medical Properties and Uses. White lead is ranked in the materia medica as an astringent and sedative. It is employed externally only, being used, in the form of ointment, as an application to ulcers, and to inflamed and excoriated surfaces. (See *Unguentum Plumbi Carbonatis.*) It is recommended in scalds and burns by Prof. Gross, and Dr. Henry, of Iowa, bears testimony to its efficacy. The white lead is first brought to the consistence of cream by linseed oil, and then brushed over the inflamed surface. (*Boston Med. and Surg. Journ.*, xlvi. 73.) Its external use, however, is viewed by many practitioners as dangerous, on account of the risk of absorption; but the danger is certainly overrated, as we have the testimony of respectable physicians that they frequently employ it in this way, without the least unpleasant result.

Of the different preparations of lead, the carbonate is considered to be the most poisonous. Being extensively manufactured for the purposes of the arts, it is that preparation which, by slow absorption, most frequently produces the peculiar spasmodic colic, called *colica pictonum.* This disease is characterized by pain about the region of the navel, and by obstinate constipation, attended with a frequent desire to evacuate the bowels, and is supposed to depend upon a spasmodic constriction of the intestinal tube, particularly of the colon. The principal indications in the treatment are, first to relax the spasm, and then to evacuate the bowels by the gentlest means. Opium and mild aperients, used alternately, are accordingly the best remedies, and among the latter castor oil and sulphate of magnesia are to be preferred. Indeed, the latter appears peculiarly adapted to the case; for, while it acts as an aperient, it operates to some extent as a counterpoison, by forming the sulphate of lead with any soluble compound of the metal which it may meet with in the bowels. Calomel is often useful; and, if it happen to induce ptyalism, the complaint immediately yields. By some practitioners alum is deemed almost a specific in colica pictonum.

Off. Prep. Unguentum Plumbi Carbonatis. B.

PLUMBI NITRAS. *U. S., Ed., Dub.*

Nitrate of Lead.

This salt has been introduced into the Materia Medica of the U. S. Pharmacopœia, chiefly as one of the substances employed in the preparation of iodide of lead. The Edinburgh and Dublin Colleges give processes for its preparation.

"Take of Litharge *four ounces and a half;* Diluted Nitric Acid *a pint* [Imperial measure]. Dissolve the Litharge to saturation with the aid of a gentle heat. Filter, and set the liquor aside to crystallize. Concentrate the residual liquid to obtain more crystals." *Ed.*

"Take of Litharge, in fine powder, *five ounces* [avoirdupois]; Pure Nitric Acid *two fluidounces;* Distilled Water *three pints* [Imp. meas.]; Dilute Nitric Acid, a sufficient quantity. To the litharge, placed in a porcelain dish, add the acid with a pint and a half of the water, and, applying a sand heat, and occasionally stirring the mixture, evaporate the whole to dryness. Upon the residue boil the remainder of the water, clear the solution by filtration, and, having acidulated it by the addition of a few drops of the dilute nitric acid, evaporate until a pellicle begins to form. The heat being now withdrawn, crystals will form on the cooling of the solution, which should be dried on blotting paper in a warm atmosphere, and preserved in a close bottle." *Dub.*

In these processes the nitric acid unites directly with the protoxide of lead to form the nitrate. This is in beautiful white, nearly opaque, tetrahedral or octohedral crystals, which are permanent in the air, of a sweet astringent taste, soluble in seven and a half parts of water, and in alcohol, and composed of one eq. of acid 54, and one of protoxide 111·6=165·6, without water of crystallization.

The following characteristics are given in the U. S. Pharmacopœia. "Its solution is precipitated black by sulphohydrate of ammonia, white by ferrocyanuret of potassium, and yellow by iodide of potassium. When nitrate of lead is triturated with sulphuric acid, the mixture colours morphia red, and if heated evolves nitrous fumes."

Medical Properties, &c. The effects of this salt upon the system are the same as those of the other soluble salts of lead; but, though formerly employed, it is now quite out of use as an internal remedy. Externally it is occasionally applied to excoriated surfaces; and a solution made in the proportion of ten grains to an ounce of water, and coloured probably with alkanet, has been used on the continent of Europe, as a secret remedy, in sore nipples, chopped hands, cracked lips, &c. It has recently been found useful in the correction of fetid odours dependent on the presence of sulphuretted hydrogen or hydrosulphate of ammonia, which it decomposes. It is employed for this purpose in solution, which may be sprinkled in apartments, or applied to putrescent ulcers, or mixed with offensive discharges, the odour of which it is desirable to correct. It will not prevent the putrefaction of animal substances; and there is no reason to suppose that it is capable of rendering contagious or marsh miasms innoxious. *Ledoyen's disinfecting fluid* is a solution of nitrate of lead in the proportion of a drachm to an ounce. Should the salt be used internally, the dose would be from the fourth to the half of a grain.

Dr. Ogier Ward has found a solution extremely useful as an injection and lotion in cases of fetid discharges from the uterus and vagina, in gleety discharges from the urethra, in sloughing and indolent ulcers, and in chronic impetiginous affections of the skin. He prepares the solution extemporaneously by dissolving a scruple of carbonate of lead in sufficient diluted nitric acid for solution, and adding a pint of distilled water. The application is to be made twice or three times daily. (*Prov. Med. and Surg. Journ.*, Oct. 15, 1851.)

Off. Prep. Plumbi Iodidum. W.

PLUMBI OXIDUM RUBRUM. *Ed.*

Red Oxide of Lead.

Red lead, Minium; Deutoxide de plomb, Oxide rouge de plomb, Minium, *Fr.;* Mennig, *Germ.;* Minio, *Ital., Span.*

Preparation. Red lead is prepared on the large scale in a furnace, with the floor slightly concave and the roof arched, presenting a general resemblance to a baker's oven. The lead is placed on the floor, and gradually raised to a red heat, whereby it melts and becomes covered with a pellicle of protoxide, which is removed by means of a long iron scraper; and the pellicles, as they successively form, are scraped off, until the whole of the metal has been converted into them. The product is subjected to further calcination with occasional stirring, for some time, with a view to oxidize any particles of metallic lead. It is thus rendered yellow, and constitutes the *protoxide of lead* or *massicot.* This is taken out of the furnace and thrown upon a level pavement, and cooled by being sprinkled with water. It is next reduced to fine powder by trituration and levigation, and dried; and in this state is introduced into large, shallow, square tin boxes, which are placed in another furnace, closed from the air, and heated nearly to redness; the heat being allowed gradually to fall during a period of from twenty-four to thirty hours. At the end of this time the protoxide of lead will have combined with an additional quantity of oxygen, and become the red oxide. This is taken out, and having been passed through a fine wire sieve, is packed in barrels for the purposes of commerce.

The above is an outline of the French process for making red lead. In England and the United States, the calcination of the protoxide is not performed in tin boxes, but by returning it to the furnace in which it was first calcined. To save the first calcination, litharge is generally used for making the red lead of commerce, which consequently is liable to contain the impurities of that substance, consisting of iron, copper, a little silver, and silica. Copper is hurtful in red lead when used for making glass, to which it communicates colour. In order to have red lead of good quality, it should be made in large quantities at a time. It is also important that it be slowly cooled; for, as the absorption of oxygen by which it is formed takes place during a particular interval of temperature only, it is necessary that the heat within that interval should be maintained sufficiently long to allow all the protoxide to absorb its appropriate dose of oxygen.

Properties, &c. Red lead is in the form of a heavy, scaly powder, of a bright red colour, with a slight shade of orange. Its sp. gr. is about 9. When exposed to heat it gives off oxygen, and is reduced to the state of protoxide. It is sometimes adulterated with red oxide of iron, or red bole, substances which may be detected by treating the red lead with nitric acid, and testing the nitric solution with tincture of galls. This reagent will produce a black precipitate, in consequence of the iron being dissolved by the nitric acid. If brick-dust be present, it will be left undissolved upon boiling the suspected specimen in water, with sugar and a small quantity of nitric acid. When free from impurities, it is completely reduced on charcoal, by means of the blowpipe, into a globule of metallic lead. It is completely soluble in highly fuming nitrous acid. (*Ed. Pharm.*) When treated with nitric acid, it is resolved into protoxide which dissolves, and deutoxide which remains in the form of a dark-brown powder.

The red lead of commerce may be considered as a mixture of what may be called the true red oxide, and variable proportions of protoxide. That this is its nature is proved by the action of cold dilute acetic acid, not used in excess, which takes up a variable quantity of protoxide, leaving a portion unchanged in colour, which may be deemed the pure red oxide. This latter, when analyzed by nitric acid, has been proved, by the coincident results of Dalton, Dumas, and Phillips, to consist of three eqs. of lead, and four of oxygen, equal to $2PbO,PbO_2$ (Dumas), or PbO,Pb_2O_3 (Winckelblech). According to Mulder, red lead has usually the following composition: $Pb_4O_5=3PbO,PbO_2$, or $2PbO,Pb_2O_3$. (*Chem. Gaz.*, Jan. 15, 1851.)

Red lead enters into no officinal preparation. It is employed by the Edinburgh College in preparing *Acidum Aceticum* and *Chlorinei Aqua*. In the arts it is used chiefly as a paint, and as an ingredient of flint glass. B.

PLUMBI OXIDUM SEMIVITREUM. *U. S.*

Semivitrified Oxide of Lead.

Off. Syn. PLUMBI OXIDUM. Plumbi Oxidum *semivitreum. Lond.* LITHARGYRUM. *Ed., Dub.*

Litharge; Oxide de plomb fondu, Litharge, *Fr.;* Bleiglatte, *Germ.;* Litargirio, *Ital.;* Almartaga, *Span.*

When the protoxide of lead is rendered semi-crystalline by incomplete fusion, it becomes the semivitrified oxide, or litharge. Almost all the litharge of commerce is obtained, as a secondary product, in the process for extracting silver from argentiferous galenas. After extracting the argentiferous lead from the ore, the alloy is calcined in the open air; whereby the lead becomes oxidized, and by fusion passes into the state of litharge, while the silver remains unchanged. The following is an outline of the process. The lead containing the silver is placed

upon an oval slightly excavated dish, about three feet long and twenty inches wide, called a *test*, made by beating pulverized bone-ash, made into a paste with water, into a mould, the sides of which are formed of an elliptical band of iron, and the bottom of strips of sheet iron, placed at short distances apart. The test is of such a size as exactly to fit an opening in the floor of a reverberatory furnace, where it is placed and adjusted to the level of the floor. On one side of the test the fire-place is situated, and exactly opposite, the chimney; while at one extremity of it the pipe of a strong bellows is placed, and at the other a vertical hole is made, communicating with a gutter leading from the centre of the test. The furnace is now lighted, and shortly afterwards the bellows is put in motion. The lead fuses and combines with oxygen, and the resulting oxide, melting also, forms a stratum which swims on the surface, and which is driven by the blast of the bellows, along the gutter and through the vertical hole, into a recipient below, where, upon solidifying, it crystallizes in small scales, which form the litharge. In proportion as the lead is oxidized and blown off the test, fresh portions are added, so as to keep it always sufficiently full. The process is continued for eight or ten days, after which no more lead is added. The operation is now confined to the metal remaining on the test; and, the oxidation proceeding, a period at last arrives when the whole of the lead has run off as litharge, and the silver, known to be pure by its brilliant appearance in the fused state, alone remains. This is then removed, and the process repeated on a fresh portion of argentiferous lead.

Properties. Litharge is in the form of small, brilliant, vitrified scales, some presenting a red, and others a yellow colour. In mass it has a foliaceous structure. It is devoid of taste or smell. It slowly attracts carbonic acid from the air, and contains more of this acid the longer it has been prepared. It is on this account that it commonly effervesces slightly with the dilute acids. It has the property of decolorizing wines, when agitated with them. When heated with the fats and oils, in connexion with water, it saponifies them. (See *Emplastrum Plumbi.*) In dilute nitric acid it should be almost entirely soluble. As it occurs in commerce, it usually contains iron, copper, and a little silver and silica. The English litharge is most esteemed; that from Germany being generally contaminated with iron and copper. In choosing litharge, samples should be selected which are free from copper, and from fragments of vegetable matter. Copper is detected, if, upon adding ferrocyanuret of potassium to a nitric solution of the litharge, a brown instead of a white precipitate is produced. Two varieties of litharge are distinguished in commerce, named from their colour, and dependent on differences in the process for making it. Sometimes it has a pale yellow colour and silvery appearance, and is then denominated *silver litharge* or *yellow litharge;* at other times it is of a red colour, and is known under the name of *gold litharge* or *red litharge.* The latter has been said to owe its colour to the presence of a portion of red lead; but M. Leblanc has shown that the two varieties of litharge differ in colour, structure, and density only, and not in chemical composition. In composition, litharge is essentially identical with the protoxide of lead. (See *Plumbum.*) The carbonic acid which it contains is variable; but its average amount is about four per cent.

Pharmaceutical Uses, &c. Litharge is never used internally, but is employed in several pharmaceutical operations, and forms an ingredient in various external applications, used for abating inflammation, and for other purposes. By reaction with olive oil it forms the *Emplastrum Plumbi*, which is the basis of many of the *Plasters.* (See *Emplastra.*) In the arts it is employed in the glazing of pottery, in painting to render oils drying, and as an ingredient in flint glass.

Off. Prep. Ceratum Saponis Compositum; Emplastrum Plumbi; Liquor Plumbi Subacetatis; Plumbi Acetas; Plumbi nitras. B.

PODOPHYLLUM. *U. S.*

May-apple.

The rhizoma of Podophyllum peltatum. *U. S.*

Podophyllum. *Sex. Syst.* Polyandria Monogynia.—*Nat. Ord.* Ranunculi, *Juss.*; Podophylleæ, *Lindley.*

Gen. Ch. Calyx three-leaved. *Corolla* nine-petalled. *Berry* one-celled, crowned with the stigma. *Willd.*

Podophyllum peltatum. Willd. *Sp. Plant.* ii. 1141; Barton, *Med. Bot.* ii. 9; Carson, *Illust. of Med. Bot.* i. 18, pl. 11. The may-apple, known also by the name of *mandrake*, is an indigenous herbaceous plant, and the only species of the genus. The root (rhizoma) is perennial, creeping, usually several feet in length, about one-quarter of an inch thick, of a brown colour externally, smooth, jointed, and furnished with radicles at the joints. The stem is about a foot high, erect, round, smooth, divided at top into two petioles, and supporting at the fork a solitary one-flowered peduncle. Each petiole bears a large, peltate, palmate leaf, with six or seven wedge-shaped lobes, irregularly incised at the extremity, yellowish-green on their upper surface, paler and slightly pubescent beneath. The flower is nodding. The calyx is composed of three oval, obtuse, concave, deciduous leaves. The corolla has from six to nine white, fragrant petals, which are obovate, obtuse, concave, with delicate transparent veins. The stamens are from thirteen to twenty, shorter than the petals, with oblong, yellow anthers, of twice the length of the filaments. The stigma is sessile, and rendered irregular on its surface by numerous folds or convolutions. The fruit is a large oval berry, crowned with the persistent stigma, and containing a sweetish fleshy pulp, in which about twelve ovate seeds are embedded. It is, when ripe, of a lemon-yellow colour, diversified by round brownish spots.

The plant is extensively diffused throughout the United States, growing luxuriantly in moist shady woods, and in low marshy grounds. It is propagated by its creeping root, and is often found in large patches. The flowers appear about the end of May and beginning of June; and the fruit ripens in the latter part of September. The leaves are said to be poisonous. The fruit has a subacid, sweetish, peculiar taste, agreeable to some palates, and may be eaten freely with impunity. From its colour and shape, it is sometimes called *wild lemon.* The root is the officinal portion, and is said to be most efficient when collected after the falling of the leaves. It shrinks considerably in drying.

Properties. The dried root is in pieces about two lines in thickness, with swelling, broad, flattened joints at short intervals. It is much wrinkled lengthwise, is yellowish or reddish-brown externally, and furnished with fibres of a similar, but somewhat paler colour. The fracture is short and irregular, and the internal colour whitish. The powder is light yellowish-gray, resembling that of jalap. The root in its aggregate state is nearly inodorous; but in powder has a sweetish not unpleasant smell. The taste is at first sweetish, afterwards bitter, nauseous, and slightly acrid. Both the decoction and tincture are bitter; but alcohol is said to be the best solvent of the active matter. A bitter substance was extracted from the root by William Hodgson, jun., of Philadelphia, by boiling it with quicklime in water, straining the decoction, precipitating the lime with sulphate of zinc, evaporating the clear solution to the consistence of an extract, treating this with cold alcohol of 0·817, filtering and evaporating the alcoholic solution, and treating the residue with boiling distilled water, which deposited the substance referred to on cooling. (*Journ. of the Phil. Col. of Pharm.*, iii. 273.) Though the alcoholic solution of this substance is very bitter,

it has upon trial been found not to be the purgative principle of the root. Analyzed by Mr. John R. Lewis, podophyllum yielded albumen, gum, starch, extractive, lignin, gallic acid, fixed oil, traces of volatile oil, salts of potassa and lime, and two resinous principles, one soluble in alcohol and ether, and the other soluble in alcohol only. Both resins were found to possess the active properties of the root. Six grains operated as a drastic cathartic, with some emetic effect. (*Am. Journ. of Pharm.*, xix. 165.) Dr. Manlius Smith recommends that the resin should be prepared by forming an alcoholic tincture of the root, evaporating the tincture till most of the alcohol is driven off, and throwing the residue into water, by which the resin is precipitated. The concentration should not be carried too far; as otherwise the resin separates in clots, which cannot be easily washed. According to Dr. Smith, the resin, when pure, is white, and purges actively in the dose of two or three grains. It is called by some *podophyllin.* (*Ibid.*, xxiv. 306.)

Medical Properties and Uses. Podophyllum is an active and certain cathartic, producing copious liquid discharges without much griping, or other unpleasant effect. In some cases it has given rise to nausea and even vomiting, but the same result is occasionally experienced from every active cathartic. Its operation resembles that of jalap; but is rather slower, and is thought by some to be more drastic. It is applicable to most inflammatory affections which require brisk purging; and is much employed in various parts of the country, especially combined with calomel, in bilious fevers and hepatic congestions. It is also frequently used in connexion with bitartrate of potassa in dropsical, rheumatic, and scrofulous complaints.

The dose of the powdered root is about twenty grains. An extract is prepared from it possessing all its virtues in a smaller bulk. (See *Extractum Podophylli.*) In minute doses, frequently repeated, podophyllum is said to diminish the frequency of the pulse, and to relieve cough; and for these effects is sometimes used in hæmoptysis, catarrh, and other pulmonary affections.

Off. Prep. Extractum Podophylli. W.

POLYGALA RUBELLA. *U. S. Secondary.*

Bitter Polygala.

The root and herb of Polygala rubella. *U. S.*

Polygala. See SENEGA.

Polygala rubella. Willd. *Sp. Plant.* iii. 875; Bigelow, *Am. Med. Bot.* iii. 129.—*P. polygama.* Walter, *Flor. Car.* 179; Pursh, *Flor. Am. Sept.* 465. This species of Polygala is an indigenous, perennial plant, with a branching, somewhat fusiform root, which sends up annually numerous simple, smooth, and angular stems, from four to eight inches in height. The leaves are scattered, sessile, obovate or linear-lanceolate, attenuated towards the base, obtuse, and mucronate. The flowers are purple, and in elongated terminal racemes. From the base of the stem proceed other racemes, which lie upon the ground, or are partially buried under it, and bear incomplete but fertile flowers, the calyx of which is without wings.

This plant is found in many parts of the United States, preferring a dry sandy or gravelly soil, and flowering in June and July. The whole plant is officinal. It has a strong and permanent bitter taste, which it yields to water and alcohol.

Medical Properties and Uses. In small doses bitter polygala is tonic, in larger, laxative and diaphoretic. The infusion of the dried plant has been usually employed to impart tone to the digestive organs. (*Bigelow.*) It appears to be closely analogous in medical virtues to the *Polygala amara* of Europe, which is used for a similar purpose. W.

POTASSIUM.

Potassium.

Potassium, *Fr.;* Kalium, Kalimetall, *Germ.;* Potassio, *Ital.;* Potasio, *Span.*

Potassium is a peculiar metal, forming the radical of a number of important medicinal preparations. It was discovered in 1807 by Sir H. Davy, who obtained it by decomposing hydrate of potassa by galvanic electricity. It was afterwards procured in larger quantity by Gay-Lussac and Thenard, by bringing the fused alkali in contact with white-hot iron, which attracted the oxygen and set free the metal. The best process is that of Brunner, as modified by Wöhler, which consists in decomposing potassa in the state of carbonate, mixed with charcoal. The mixture of carbonate and charcoal is obtained by heating cream of tartar to redness in a covered crucible. For an account of some improvements in Brunner's process by MM. Mareska and Donny, see *Am. Journ. of Pharm.*, xxv. 70.

Potassium is solid, softer and more ductile than wax, easily cut with a knife, and of a silver-white colour. A newly cut surface is brilliant; but the metal quickly tarnishes by combining with the oxygen of the air, and assumes the appearance of lead. It possesses a remarkably strong affinity for oxygen, and is capable of taking that element from every other substance. On account of this property it must be kept in liquids, such as naphtha, which are devoid of oxygen as a constituent. Its sp. gr. is 0·865, its melting point 136°, its equivalent number 39·2, and symbol K. When thrown upon water it swims, takes fire, and burns with a rose-coloured flame, combining with oxygen, and generating potassa which dissolves in the water. It forms numerous combinations, uniting with most of the non-metallic elements, and with several of the metals. It combines in two proportions with oxygen, forming a protoxide (*dry potassa*) of a gray, and a *teroxide* of a yellowish-brown colour. It also unites with chlorine, and forms officinal compounds with iodine, bromine, sulphur, cyanogen, and ferrocyanogen, under the names of iodide, bromide, sulphuret, cyanuret, and ferrocyanuret of potassium. Its protoxide (dry potassa) is a strong salifiable base, existing in nature always in combination, and forming with acids a numerous and important class of salts. Of these, the acetate, bichromate, carbonate, bicarbonate, chlorate, citrate, hydrate (caustic potassa), nitrate, sulphate, sulphuretted sulphate, bisulphate, tartrate, and bitartrate are officinal, and will be described under their respective titles, to which, for their properties, the reader is referred. B.

POTASSÆ BICHROMAS. *Dub.*

Bichromate of Potassa.

Red chromate of potassa; Kali chromicum rubrum, *Lat.;* Bichrômate de potasse, *Fr.;* Zweifach chromsaures kali, *Germ.*

This salt is most conveniently prepared from the neutral or yellow chromate of potassa, by acidulating its solution with sulphuric acid, and setting it aside for a day or two. The acid withdraws one eq. of potassa from two of the neutral chromate, thus generating one eq. of the bichromate, which separates in orange-red crystals. The yellow chromate is obtained by igniting four parts of powdered chrome-iron ore (FeO,Cr_2O_3) with one part of nitre, and lixiviating the resulting mass with water. The solution, by evaporation, yields the yellow salt in crystals. In this process, the nitric acid of the nitre furnishes oxygen to convert the sesquioxide of chromium into chromic acid, which then unites with the potassa of the same salt. The iron, in the mean time, is sesquioxidized and

rendered insoluble. Sometimes impure carbonate of potassa (pearlash) is substituted for part of the nitre in the calcination. It is said that, recently, lime has been used with economical results, instead of the nitre and pearlash, in performing the ignition. When lime is employed, chromate of lime is formed, which is extracted by lixiviation, and decomposed by a soluble salt of potassa. When desired, the bichromate may be obtained directly from the solution of chromate of potassa, derived from the treatment of the ore, by acidulating it with sulphuric acid, without first crystallizing it.

Bichromate of potassa is in the form of orange-red, anhydrous, prismatic crystals, soluble in ten parts of cold and much less boiling water, but insoluble in alcohol. Its taste is cooling and bitter. Exposed to a red heat, it fuses, without decomposition, into a red liquid, which congeals on cooling into a crystalline mass, and then falls to powder. It consists of two eqs. of chromic acid and one of potassa, and its formula is $KO,2CrO_3$.

Medical Properties, &c. Bichromate of potassa, in small doses, is alterative, in larger emetic. Externally it acts as an irritant and caustic. It was first used internally, in 1850, by M. Robin, who gave it in secondary syphilis; and Prof. Heyfelder, of Erlangen, afterwards employed it in the same disease with encouraging results. It acts like the mercurials on the syphilitic poison, but without producing salivation. It was recommended, in 1827, by Dr. Cumin, in saturated solution, as a caustic application to tubercular elevations, excrescences and warts, and more recently (1850) by M. Puche in syphilitic vegetations. It causes the morbid parts to shrivel and fall off. The dose as an alterative is one-fifth of a grain daily, in the form of pill made with extract of gentian, to be increased gradually to five or six pills a day. As an emetic the dose is three quarters of a grain. It may be used as a caustic in the form of powder.

Bichromate of potassa is an energetic poison. When the stomach does not relieve itself by vomiting, bicarbonate of soda, magnesia, or a solution of soap should be immediately given as an antidote.

Bichromate of potassa is manufactured largely for the use of calico-printers. The workmen engaged in making it are liable to painful ulcerations of the hands. It was introduced into the Dublin Pharmacopœia of 1850, not as a therapeutic agent, but to be used in forming artificial valerianic acid by reacting with fusel oil (*Alcohol Amylicum*), as a step in the process for preparing valerianate of soda. (See *Sodæ Valerianas.*) B.

POTASSÆ BITARTRAS. *U. S., Lond., Ed., Dub.*

Bitartrate of Potassa.

Supertartrate of potassa, Crystals of tartar, Cream of tartar; Cremor tartari, *Lat.;* Tartrate acide de potasse, Crême de tartre, *Fr.;* Doppelt weinsaures Kali, Weinsteinrahm, *Germ.;* Cremore di tartaro, *Ital.;* Cremor de tartaro, *Span.*

During the fermentation of wines, especially those that are tart, a peculiar matter is deposited on the bottom and sides of the casks, forming a crystalline crust, called *crude tartar* or *argol.* That deposited from red wines is of a reddish colour, and called in commerce *red tartar;* while that derived from white wines is of a dirty white colour, and denominated *white tartar.* Both kinds consist of potassa, united with an excess of tartaric acid, forming bitartrate of potassa, rendered impure by tartrate of lime, more or less colouring matter, and the lees and other matters which are deposited during the clarification of the wine. The deposition of the tartar is thus explained. The bitartrate exists naturally in the juice of the grape, held in solution by saccharine matter. When the juice is submitted to fermentation in the process for converting it into wine, the sugar disappears, and is replaced by alcohol, which, not being competent to

dissolve the salt, allows it to precipitate as a crystalline crust. It is from this substance that bitartrate of potassa is obtained by a process of purification.

The process is conducted on a large scale at Montpellier, in France, and is founded upon the greater solubility of bitartrate of potassa in hot than in cold water. The tartar, previously pulverized, is boiled with water in copper boilers. The solution, when saturated, is transferred to earthen pans, where it deposits on cooling a crystalline layer, nearly free from colour. This is redissolved in boiling water; and the solution, having been mixed with four or five per cent. of pipe-clay, is evaporated to a pellicle. The clay precipitates with the colouring matter, and the clear solution, as it cools, deposits white crystals in crusts, which, upon being exposed to the air on linen for several days, acquire an increased degree of whiteness. These constitute the *crystals of tartar* of pharmacy. The salt, however, as met with in the shops, is generally, for greater convenience, in the form of powder, to which the name of *cream of tartar* is properly applied.

Properties. Bitartrate of potassa occurs in commerce in white crystalline crusts, or masses of aggregated crystals, and is received in that state from France by our wholesale druggists, who procure its pulverization for the use of the apothecaries. In crystals it is hard and gritty between the teeth, and dissolves slowly in the mouth; in powder it has a white colour. It is a permanent salt, of an acid not ungrateful taste, and acid reaction, soluble in 184 parts of cold, and 18 of boiling water, but insoluble in alcohol. When exposed to a red heat it is decomposed, exhales a peculiar odour, gives rise to a solid pyrogenous acid, and the usual products of the destructive distillation of vegetable matter; and carbonate of potassa, mixed with charcoal, is left. Its solution is precipitated by solutions of baryta, strontia, and lime, which form insoluble tartrates, and by acetate of lead, forming tartrate of lead. With salifiable bases which form soluble tartrates, it gives rise to double salts, consisting of neutral tartrate of potassa, and the tartrate of the base added. Several of them are important medicines, and will be described under their respective titles. Cream of tartar, though sparingly soluble in water, becomes abundantly so by the addition of borax or boracic acid. (See *Sodæ Boras.*)

The cream of tartar of commerce is not a pure bitartrate of potassa. It usually contains from two to five per cent. of tartrate of lime, which should not be viewed as an adulteration. But it is said to be purposely mixed with various substances, among which are sand, clay, gypsum, flour, chalk, alum, and sulphate of potassa. Sand, clay, and gypsum may be detected by their insolubility in a hot solution of potassa; flour, by striking a blue colour with iodine; chalk, by its effervescing with dilute acids; alum, an unlikely sophistication, probably by its astringent taste; and any soluble sulphate, by a precipitate being produced by chloride of barium, not entirely soluble in nitric acid. The action of the last mentioned test is explained by the fact, that the tartrate of baryta is soluble in nitric acid, but not the sulphate. The best security against fraud is to purchase the crystals, which are not subject to the same adulterations as the powder.

Composition. Cream of tartar consists of two eqs. of tartaric acid 132, one of potassa 47·2, and one of water 9=188·2. The water cannot be expelled without decomposing the salt, and is supposed to act the part of a base.

Medical Properties and Uses. Bitartrate of potassa is cathartic, diuretic, and refrigerant. In small doses it acts as a cooling aperient, in large ones as a hydragogue cathartic, producing copious watery stools; and from this latter property, as well as its tendency to excite the action of the kidneys, it is very much used in dropsical affections. It is frequently prescribed in combination with senna, sulphur, or jalap. (See *Pulvis Jalapæ Compositus.*) Its solution in boiling water, sweetened with sugar and allowed to cool, forms an acid, not unpleasant, refrigerant drink, advantageously used in some febrile affections, and frequently

employed as a domestic remedy. The beverage called *imperial* (*potus imperialis*) is a drink of this kind, made by dissolving half an ounce of the salt in three pints of boiling water, and adding to the solution four ounces of white sugar, and half an ounce of fresh lemon peel. *Cream of tartar whey* is prepared by adding about two drachms of the bitartrate to a pint of milk. It may be given, diluted with water, in dropsical complaints. The dose of cream of tartar is a drachm or two as an aperient; and from half an ounce to an ounce as a hydragogue cathartic, mixed with molasses or suspended in water. As a diuretic in dropsical cases, it may be given in the dose of a drachm and a half or two drachms, several times a day.

In pharmacy, cream of tartar is employed to obtain the neutral tartrate of potassa (soluble tartar), tartrate of potassa and soda (Rochelle salt), tartrate of antimony and potassa (tartar emetic), and tartrate of iron and potassa (tartarized iron). Deflagrated with nitre, or incinerated alone, it is converted into a pure form of carbonate of potassa, called salt of tartar. (See *Potassæ Carbonas Purus.*) In the laboratory it is used to procure potassa in a pure state, and for making black and white flux. *Black flux* is prepared by deflagrating cream of tartar with half its weight of nitre; and *white flux*, by deflagrating it with twice its weight of the same salt.

Off. Prep. Acidum Tartaricum; Antimonii et Potassæ Tartras; Confectio Sulphuris; Decoctum Scoparii; Ferri et Potassæ Tartras; Potassæ Carbonas Purus; Potassæ Tartras; Pulvis Jalapæ Compositus; Pulvis Scammonii Compositus; Sodæ et Potassæ Tartras. B.

POTASSÆ CARBONAS IMPURUS. *U. S.*

Impure Carbonate of Potassa.

The impure carbonate of potassa known in commerce by the name of *pearlash*. *U. S.*

Off. Syn. LIXIVUS CINIS. Impure Potash; Pearlash. *Dub.*

Pearlash, Pearlashes, Impure potassa, Impure subcarbonate of potassa; Potasse du commerce, *Fr.;* Rohe Pottasche, *Germ.;* Potasch, *Dutch;* Potaske, *Dan.;* Potaska, *Swed.;* Potassa del commercio, *Ital.;* Cenizas claveladas, *Span.*

The alkali potassa, using this term in its strict sense, is the protoxide of the metal potassium. (See *Potassium.*) It exists in various states of combination and purity. In its most impure state, it is the common potash of commerce. This, subjected to calcination, becomes somewhat purer, and is then called *pearlash*, the form of the alkali intended to be designated by the officinal name at the head of this article.

Natural State and Preparation. Potash and pearlash of commerce are procured from the ashes of wood by lixiviation, and the subsequent evaporation of the solution obtained. The alkali exists in the wood, principally in the state of acetate; and, being of a fixed and incombustible nature, is left behind after the incineration. The wood is burnt on the ground, in a place sheltered from the wind. The ashes consist of a soluble and insoluble portion. The soluble part is made up of carbonate of potassa, together with the sulphate, phosphate, and silicate of potassa, and the chlorides of potassium and sodium; the insoluble portion, of carbonate and subphosphate of lime, alumina, silica, oxidized iron and manganese, and a little carbonaceous matter that has escaped combustion. The ashes are lixiviated in barrels with the addition of a portion of lime, and the soluble substances above mentioned are taken up. The lixivium is then evaporated in large iron kettles, which for several days are kept constantly full. The evaporation is continued until the mass has become of a black colour, and of the consistence of brown sugar. It is now subjected to as powerful a heat as can be

raised by the best wood fire for a number of hours, by which it is fused. During the progress of the fusion, the combustible impurities are for the most part burnt out, and a gaseous matter is emitted, which agitates the more fluid part. When the fusion is complete, the liquid becomes quiescent, and looks like melted iron. It is now transferred, by means of large iron ladles, to iron pots, where it congeals in cakes. These are broken up and packed in tight barrels, and constitute the *potash* of commerce. (*Dr. G. A. Rogers*, in Silliman's Journal.)

If it be intended to make *pearlash*, the process is varied. In this case the black matter, above mentioned as of the consistence of brown sugar, called *black salts* by our manufacturers, instead of being fused, is transferred from the kettles to a large oven-shaped furnace, so constructed that the flame may be made to play over the alkaline mass, which in the mean time is stirred by means of an iron rod. The ignition is in this way continued, until the combustible impurities are burnt out, and the mass, from being black, becomes of a dirty bluish-white colour. (*Rogers.*)

The ashes of plants amount generally to not more than a few parts in the hundred; and of these a portion only consists of potassa. The different parts of the same vegetable, and, for a stronger reason, different plants, furnish variable quantities of ashes. Ligneous plants yield less than herbaceous, the trunk less than the branches, and the branches less than the leaves. The bark yields more ashes than the wood; and the leaves of trees which drop their foliage in winter more than the leaves of evergreens. The following table gives the quantity of potassa contained in the ashes of one thousand parts of the undernamed plants:

Pine	0·45	Barley straw	5·8
Poplar	0·75	Beech bark	6·0
Birch	1·29	Fern	6·2
Beech	1·45	Stalks of Indian corn	17·5
Oak	2·03	Sun-flower stalks	19·4
Oak bark	2·08	Dry oak leaves	24·0
Box	2·26	Common nettle	25·0
Willow	2·85	Black elder	25·5
Linden	3·27	Vetch	27·5
Elm	3·9	Poke	45·6
Maple	3·9	Wheat stalks, young	47·0
Wheat straw	4·18	Dried stems of potatoes	55·0
Flax	5·0	Wormwood	73·0
Rush	5·08	Fumitory	79·0
Common thistle	5·37	Angelica	96·2
Vine branches	5·5		

Commercial History. Potash and pearlash are made in those countries in which forests abound. Accordingly, the alkali is extensively manufactured in Canada and the United States, and constitutes a very important export of this country. It is prepared chiefly in the State of New York, which is supposed to furnish three-fourths of our exports of this alkali. It is also produced in considerable quantities in the northern countries of Europe, especially in Russia, and on the shores of the Baltic. It is of different qualities as it occurs in commerce; and is distinguished by the country or place of manufacture, as *American, Russian, Dantzic potash, &c.*

Properties. Potash is in the form of fused masses of a stony appearance and hardness, and caustic burning taste. Its colour is variegated; but reddish and dark-brown are the predominant hues. When exposed to the air it absorbs moisture and deliquesces; and, if sufficiently long exposed, finally becomes liquid. *Pearlash* is of a white colour, with usually a tinge of blue. As it occurs in commerce, it is in tight casks, containing about three hundred and fifty pounds, in which it forms one entire, hard, concrete mass. In the shops it is found in coarse

powder, intermingled with lumps as dug out of the casks, presenting an opaque granular appearance, like table salt or Havana sugar. It is a deliquescent salt, and has a burning alkaline taste. It is soluble in water, with the exception of impurities. The soluble matter in one hundred grains of the salt of medium quality will neutralize about fifty-eight grains of sulphuric acid. It differs from potash principally in containing less combustible impurities, and in being less caustic and deliquescent. The colouring matter of both these forms of alkali is derived from carbonaceous impurities, and small portions of iron and manganese.

Composition. The basis of both pot and pearlash is carbonate of potassa; but this is associated with certain salts, and with insoluble impurities. Several varieties of potash found in commerce were analyzed by Vauquelin, whose principal results are contained in the following table. The quantity examined of each kind was 1152 parts.

Kinds of Potash.	Caustic Hydrate of Potassa.	Sulphate of Potassa.	Chloride of Potassium.	Insoluble Residue.	Carbonic Acid and Water.
American potash . . .	857	154	20	2	119
Russian potash . . .	772	65	5	56	254
Pearlash	754	80	4	6	308
Dantzic potash . . .	603	152	14	79	304

These results, calculated for 100 parts, show that the American potash contains 74 per cent. of pure hydrated alkali, and the Russian 67 per cent. Pearlash, it is seen, is more rich in carbonic acid than potash; and this result of analysis corresponds with the qualities of the two substances as prepared in the United States; potash being known to be far more caustic than pearlash. Besides the impurities shown by the table, silicate of potassa is present. According to Mr. Stevenson Macadam, the potashes of commerce contain iodine and a trace of bromine, which shows that the forest trees from which the alkali is obtained must contain a very minute proportion of these non-metallic elements. (*Chem. Gaz.*, Aug. 2, 1852, p. 284.)

As the potash of commerce is valuable in the arts in proportion to the quantity of real alkali which it contains, it is important, in so variable a substance, to possess an easy method of ascertaining its quality in that respect. The process by which this is accomplished is called *alkalimetry*, and the instrument used an *alkalimeter*. The best mode of proceeding, which is applicable to the commercial forms of soda as well as those of potassa, is that proposed by Faraday, and described by Turner as follows. Take a cylindrical tube, sealed at one end, nine and a half inches long, and three-quarters of an inch in diameter, and pour into it one thousand grains of water, marking with a file the point at which the water stands. Divide the space occupied by the water into one hundred equal parts, graduating from above downwards; and, opposite to the numbers 23·44, 48·96, 54·63, and 65, severally write the words soda, potassa, carbonate of soda, and carbonate of potassa. Then prepare a dilute sulphuric acid having the specific gravity 1·127, which may be formed by adding to the strong acid about four times its volume of distilled water. An acid of this strength, if added to the tube so as to reach to any one of the heights denoted by the above numbers, will be just sufficient to neutralize one hundred grains of the alkali written opposite to it. Suppose, for example, that the dilute acid be added until it stands opposite to the word carbonate of potassa, we shall then have the exact quantity necessary to neutralize one hundred grains of that carbonate; and if we add pure water, until the liquid reaches to 0, or the beginning of the scale, it is evident that the acid has been brought to the bulk of a hundred measures, each of which

would be competent to neutralize one grain of the carbonate in question. All that is now necessary, in order to ascertain the quality of any commercial sample of this carbonate, is to dissolve one hundred grains of it in warm water, filter the solution to remove insoluble impurities, and add by degrees the dilute acid from the tube until the solution is exactly neutralized, as shown by litmus paper. The number of divisions of acid, expended in attaining this point, may be read off from the tube; and for each division one grain of pure carbonate is indicated.

This method of testing the potash of commerce indicates its alkaline strength, assuming this to be dependent solely on potassa; but soda, a cheaper alkali, may be present as an adulteration, and its proportion is important to be known. To solve this problem, M. O. Henry proposes that the saturating power of a given weight should be first determined in relation to sulphuric acid, and afterwards the proportion of carbonate of potassa in an equal weight, by first converting it into an acetate, and then precipitating the potassa by hyperchlorate (oxychlorate) of soda, the reacting salts being in alcoholic solution. The precipitated hyperchlorate of potassa indicates the proportion of carbonate of potassa. The amount of the latter determines how much of the sulphuric acid was expended in saturating the potassa; and the soda is indicated by the amount of this alkali, equivalent to the remainder of the acid. (*Journ. de Pharm.*, vii. 214.) Another method of detecting soda in the potash of commerce, proposed by Pagenstecher, is to convert the suspected alkali into a sulphate, and wash the sulphate formed with a saturated solution of sulphate of potassa. If the whole of the saline matter be sulphate of potassa, the washing will cause no loss of weight; but if part of it be sulphate of soda, this will be washed away, on account of its solubility in a saturated solution of sulphate of potassa. (*Journ. de Pharm.*, Mars, 1848, 239.) Frémy has proposed the metantimoniate of potassa as a test for soda in potash. In applying this test, the potash is converted into a neutral chloride of potassium, and treated with a recent solution of the metantimoniate. If the alkali examined contain two or three per cent. of soda, a precipitate is almost instantly formed. If a less proportion of soda be present, time and agitation will be necessary to effect the precipitation. Frémy states that, by this test, he can detect the half of one per cent. of soda in commercial potash. (*Phil. Mag.*, Oct. 1848, 325.)

Pharmaceutical Uses. Pearlash is never used as a medicine, being considered as too impure. It is directed to be purified in the U. S., Edinburgh, and Dublin Pharmacopœias, in order to form the carbonate of potassa.

Off. Prep. Potassæ Carbonas. B.

POTASSÆ CHLORAS. *U. S., Lond., Dub.*

Chlorate of Potassa.

Hyperoxymuriate of potassa; Chlorate de potasse, *Fr.;* Chlorsaures Kali, *Germ.*

Chlorate of potassa may be prepared by passing an excess of chlorine through a solution of caustic hydrate or carbonate of potassa. At first two eqs. of chlorine react with two eqs. of potassa, so as to form one eq of chloride of potassium, and one eq. of hypochlorite of potassa (2Cl and 2KO=KCl and KO,ClO). Afterwards, by the further action of the chlorine, more chloride of potassium is formed, and the oxygen separated from the potassa converts the hypochlorous acid into the chloric, and consequently the hypochlorite into chlorate of potassa. Thus, 4Cl, reacting with 4KO and KO,ClO, will form 4KCl and KO,ClO_5. The chlorate, being but sparingly soluble in water, is separated from the chloride of potassium by priority of crystallization. When carbonate of potassa is used, the carbonic acid is first transferred from a part of the alkali to the remainder, and finally evolved.

Graham has devised an improved process for obtaining this salt. It consists in mixing the carbonate of potassa with an equivalent quantity of hydrate of lime, before submitting it to the action of chlorine. The gas is absorbed with avidity, and the mass becomes hot, while water is given off. The lime converts the carbonate into caustic potassa, and the reaction then takes place between six eqs. of potassa and six of chlorine, with the result of forming five eqs. of chloride of potassium, and one of chlorate of potassa. (6KO and 6Cl = 5KCl and KO,ClO_5.) The products are, therefore, carbonate of lime, chloride of potassium, and chlorate of potassa. The chloride and chlorate are separated from the carbonate by solution in hot water, and the chlorate from the chloride by priority of crystallization as before.

In the above process, a large proportion of the potassa is lost by being converted into chloride of potassium. Prof. F. C. Calvert, of Manchester, has almost entirely avoided this loss by his new process, in which he reacts upon one eq. of caustic potassa, mixed with five and a half eqs. of lime, with a stream of chlorine. The potassa is dissolved in sufficient water to form a solution, containing 10¼ per cent. of the alkali (sp. gr. 1·110), and mixed with the lime; and the mixture, after having been gradually heated to 122°, is subjected to a rapid current of chlorine to saturation, the reaction caused by which raises the temperature to about 194°. The product is then evaporated nearly to dryness, the residue dissolved in boiling water, and the solution filtered and set aside to crystallize. The strength of the solution of potassa and the temperature, employed in Prof. Calvert's process, determine the combination of part of the chlorine with calcium, instead of potassium; and the oxygen from the lime converts the remaining chlorine into chloric acid. A higher or lower density of the potassa solution was found not to give as favourable results. This process has been used on a large scale, and is said to have perfectly succeeded. While the old process gives but 43 parts of chlorate to 100 of anhydrous potassa, the new yields 260 parts.

Properties. Chlorate of potassa is a white anhydrous salt, of a cooling and slightly acerb taste. It crystallizes in rhomboidal plates of a pearly lustre. It is soluble in 16 parts of water at 60°, and in two and a half parts of boiling water. When thrown on burning coals, it augments their combustion remarkably. This property is due to the presence of oxygen, which may be evolved from the salt in the proportion of nearly 39 per cent., by heating it a little above its point of fusion. The residue is chloride of potassium.

Chlorate of potassa is characterized by giving out oxygen upon fusion, and leaving a residue of chloride of potassium; by becoming first yellow, and then red by admixture with a little sulphuric acid, and by the action of that acid evolving chlorous acid gas (quadroxide of chlorine), known by its yellow colour, and explosive property when heated; by its bleaching power when mixed first with muriatic acid and then with water; and by its property of exploding violently when triturated with a small portion of sulphur or phosphorus. Its usual impurity is chloride of potassium, which may be detected by a precipitate of chloride of silver being produced on the addition of nitrate of silver. This test does not precipitate the chlorine of the chloric acid. Chlorate of potassa consists of one eq. of chloric acid 75·42, and one of potassa 47·2 = 122·62.

Medical Properties and Uses. Chlorate of potassa is ranked as a refrigerant and diuretic. From experiments made by Dr. O'Shaughnessy and others, it gives a bright scarlet colour to the venous blood, and passes undecomposed into the urine. The first trials made with it as a medicine were founded upon the supposition that it would prove an oxidizing remedy; and hence it was employed in scurvy, which was supposed to depend upon a deficiency of oxygen in the system, and in syphilis and liver complaint as a substitute for mercury, which

mineral was held by some to act in these affections by imparting oxygen. In scurvy it appears to have acted beneficially, but not on the principle which induced its trial; as it would seem not to be decomposed in the system. It has been employed by Dr. Stevens and others as a remedy for certain fevers, and for malignant cholera, to supply a supposed deficiency of saline matter in the blood. Dr. Henry Hunt recommends it strongly in cancrum oris, given in solution, in divided doses, to the amount of from twenty to sixty grains in twenty-four hours, according to the age of the child. It lessens the fetor and salivation attendant on the disease, and promotes the granulation of the sores. (*Braithwaite's Retrospect*, viii. 148.) A similar practice in this disease was followed by Dr. J. H. Babington, of Ireland, with great success. (See *Am. Journ. of Med. Sci.*, April, 1853, p. 491.) Dr. R. L. Scruggs, of Germantown, Tenn., praises its effects, used internally and as a mouth-wash, in the erysipelatous inflammation of the mouth and fauces, which occurs in the disease called *black tongue*. (*Med. Exam.*, April, 1849.) The dose of chlorate of potassa is from ten to thirty grains. The mouth-wash may be made by dissolving a teaspoonful of the salt in four fluid-ounces of water.

Chlorate of potassa is used to obtain pure oxygen; to make matches which take fire by friction, or when dipped in sulphuric acid; and to prepare priming for cannon and fire-arms. B.

POTASSÆ NITRAS. *U. S., Lond., Ed., Dub.*

Nitrate of Potassa.

Nitre, Saltpetre; Nitrate de potasse, Azotate de potasse, Saltpêtre, *Fr.;* Salpetersaures Kali, Salpeter, *Germ., Dutch, Dan., Swed.;* Nitro, *Ital., Span., Port.*

Nitre or saltpetre is both a natural and artificial production. It is found ready formed in many countries, existing in the soil on which it forms a saline efflorescence, in the fissures of calcareous rocks, and in caves. It has been found in different parts of Europe, in Egypt, and in Peru; but the country in which it is most abundantly produced is India, whence the principal part is furnished for the demands of commerce. In the United States it is found, for the most part, in caverns situated in limestone rock, called saltpetre caves, and is associated with nitrate of lime. The earths contained in them are lixiviated, and yield, according to their richness, from one to ten pounds of crude nitre to the bushel. These caves are particularly numerous in Kentucky, and furnished a large proportion of the nitre consumed in the United States during the last war with England. It exists also in the vegetable kingdom, having been found in borage, tobacco, bugloss, parietaria, hemlock, and the sun-flower. The artificial sources of nitre are certain mixtures of animal and vegetable substances with wood-ashes and calcareous matter, called nitre-beds; and certain materials, impregnated with saltpetre, consisting principally of plaster rubbish, derived from the demolition of old buildings.

Preparation from its Natural Sources. In India the saline earth, which on an average contains seven parts of nitre in a thousand, is lixiviated in large mud filters, lined with stiff clay, and furnished with false bottoms of bamboo, covered with grass mats, on which wood-ashes are laid. The filters being then filled with the saline earth, water is added, and the solution filters through the wood-ashes, with the effect of converting any nitrate of lime present, which amounts to nearly one per cent., into nitrate of potassa. The solution obtained is evaporated in earthen pots, filtered, and set aside to crystallize. The impure nitre thus obtained contains from 45 to 70 per cent. of the pure salt. It is redissolved and crystallized by the native merchants, and thrown into commerce under the name of crude nitre, or crude saltpetre.

Artificial Preparation. The plan of forming saltpetre in artificial nitre-beds is principally practised in Germany; while the method of obtaining it from old plaster rubbish is followed in France. *Artificial nitre-beds* are formed of animal and vegetable remains, together with ashes and calcareous earth, which are mixed up with a portion of loose soil and placed under sheds, to shelter the mixture from the rain; while the sides are left open to permit the free access of air. The mixture is disposed in little ranges or heaps, which are frequently turned over with a spade, and sprinkled with urine, as a substance containing a large quantity of nitrogen. At the end of two or three years the nitrogen is converted into nitric acid, and this, by uniting with the potassa existing in the vegetable remains, forms nitre. When the contents of the bed contain about four ounces of the salt for every cubic foot of the materials, they are deemed fit to be lixiviated. The lixiviation is performed with boiling water, which is repeatedly thrown upon fresh portions of the mass, until the solution obtained is sufficiently strong. The lixivium is of a brown colour, and contains chiefly the nitrate of potassa; but at the same time more or less of the nitrates of lime and magnesia, and of common salt. The earthy nitrates are then decomposed by a solution of wood-ashes, the potassa of which converts them into nitre, and precipitates the earths. The solution being further evaporated, the common salt rises to the surface as a scum, and is removed. The solution is then allowed to cool, and the nitrate crystallizes in dirty white crystals, called crude nitre.

Nitrate of lime may be converted into nitre by adding it to a solution of sulphate of potassa. Sulphate of lime is precipitated, and nitrate of potassa remains in solution.

When obtained from old plaster rubbish, the material is reduced to powder and lixiviated, in order to exhaust it of everything soluble. The solution is found to contain the nitrates of potassa and lime, and common salt, and is treated with wood-ashes, which convert the nitrate of lime into nitrate of potassa, with precipitation of the earth as a carbonate. The liquor is separated from the precipitate and concentrated by heat; and the common salt, as it rises to the surface, is skimmed off. When the solution is so strong as to mark 45° of Baumé's areometer, it is allowed to cool and crystallize; and the crystals form the crude nitre of this process. The salt obtained in this way generally contains from 85 to 88 per cent. of pure nitre; the remainder being made up of chloride of sodium, and certain deliquescent salts. The details of this process, as practised in Paris, are given by Thenard.

The artificial preparation of saltpetre is carried on to a considerable extent in Hungary. Prof. Szabo, of Pesth, describes three kinds:—*gay saltpetre*, obtained by washing the earth, dug from the earth floors of the huts of the poorer classes; *plantation saltpetre*, generated in uncovered heaps, composed of two-thirds washed gay earth, and one-third ashes; and *kehr saltpetre*, which is formed, in certain districts, in the surface soil, prepared by strewing it, from time to time, with ashes. (*Chem. Gaz.*, Feb. 2, 1852, p. 47.)

Theory of Nitrification. It is now generally admitted that the continuous formation of nitre in nitre earths, and in artificial nitre-beds, depends upon the oxidation of the nitrogen of ammonia, thus generating nitric acid, the formation of which is facilitated by the presence of alkaline and earthy bases, with which the acid unites. The ammonia is derived, for the most part, from the organic remains in the nitre earths, and from the animal matter which is an essential ingredient in the artificial mixtures.

Purification. Nitrate of potassa, as first obtained, either from natural or artificial sources, is called in commerce crude saltpetre, and requires to be purified or refined before it can be used in medicine, or in most of the arts. The process, which is founded principally on the fact that nitre is more soluble than

common salt in hot water, is conducted in the following manner in France. Thirty parts of the saltpetre are boiled with six parts of water, and the portion which remains undissolved, or is deposited, consisting of common salt, is carefully removed. As the ebullition proceeds, a little water is added from time to time, to hold the nitre in solution. When common salt ceases to be separated, the solution is clarified with glue, and more water is added at intervals, until the whole amounts, including that previously added, to ten parts. The clear solution is now transferred to large, shallow copper coolers, where it is agitated with wooden instruments to hasten the cooling, and to cause the nitre to crystallize in small grains. The purification is completed by washing the salt with water, or a saturated solution of nitre, in a kind of wooden hopper, with holes in the bottom stopped with pegs. The liquid employed is allowed to remain in contact with the nitre for several hours, at the end of which time it is permitted to drain off by taking out the pegs. The salt being now dried, its purification is completed.

In Sweden, the process of purification is conducted in a different manner. The solution of the crude nitre is boiled, until a saline crust (common salt) forms on its surface, and until it is so far concentrated that a small portion of it crystallizes upon cooling. The crust being removed, the solution is filtered, and diluted with 1-48th of water, with a view to retain in solution the common salt, which, being somewhat less soluble in cold than in boiling water, would otherwise be in part precipitated on refrigeration. The solution is now allowed to cool, and, at the moment crystals begin to form, is stirred constantly to cause the salt to crystallize in small grains. The granular salt is then washed after the French method, as above described, dried, and, being fused, is cast in sheet iron moulds so as to form masses, each weighing from ten to twenty pounds. The preparation of nitre in this manner by fusion is, according to Berzelius, attended with several advantages; such as its occupying less space, its losing nothing by waste in transportation, and its presenting, in this state, an obvious index of its quality. This index is the character of its fracture. When the salt is perfectly pure, the fracture is radiated, the radii being generally large. The presence of 1-80th of common salt renders the radii smaller; and of 1-40th, or a larger quantity, produces a zone in the substance of the mass, devoid of the radiated structure, or causes this structure to disappear entirely. On the other hand, the process by fusion has the disadvantage of converting the salt in part into hyponitrite, when heated too high, and of rendering it difficult to pulverize.

Commercial History. Nitre is received in this country from Calcutta in the state of crude saltpetre, packed in grass cloth bags, containing from one hundred and fifty to one hundred and seventy-five pounds. The greater portion of it arrives in Boston. Its quality varies considerably. That which comes in dirty yellow crystals is called *crude saltpetre;* while the finer lots, in small, comparatively clear crystals, approaching to white, are called *East India refined.* Very little crude saltpetre is at present obtained from native sources in the United States, on account of the low price of that from India. The *refined saltpetre* is almost exclusively prepared by our own chemists; and a considerable portion of it is exported.

As connected with the subject of saltpetre, it may be proper in this place to notice what is incorrectly called *South American saltpetre,* considerable quantities of which have been received within a few years from Peru and Chili. It is *nitrate of soda,* and comes in bags containing about two hundred and seventy pounds of the salt in the crude state. This nitrate is coming into use with our manufacturing chemists, and is better suited than nitre for preparing nitric and sulphuric acids, on account of the greater proportional quantity of acid which it contains. It is, however, not applicable to the purpose of making gunpowder, from its tendency to absorb moisture.

Nitrate of soda may be decomposed, so as to yield nitre, by means of *caustic* American potash (red potash of commerce), by Mr. Rotch's patented process. This process gives a nitre equal in purity to the East India refined. For the details see the *Pharm. Journ. and Trans.*, xi. 36. The same salt will furnish nitre by double decomposition with carbonate of potassa (pearlash). (*Ibid.*, xi. 236, from *Pharm. Cent. Blatt.*) Mr. Hill decomposes nitrate of soda by means of chloride of potassium, forming, by double decomposition, nitrate of potassa and chloride of sodium. The latter is got rid of, in the usual manner, by the evaporation of the solution of the mixed salts.

Properties. Nitre is a white salt, possessing a sharp, cooling, and slightly bitterish taste, and generally crystallized in long, striated, semi-transparent, six-sided prisms, with dihedral summits. It dissolves in four or five times its weight of cold, and in about two-fifths of its weight of boiling water. It is sparingly soluble in rectified spirit, but insoluble in absolute alcohol. It undergoes no alteration in the air, unless this be very moist. It yields a yellow precipitate with chloride of platinum, showing that potassa forms its base. It contains no water of crystallization; but is apt to hold a portion of liquid, mechanically lodged within the substance of the crystals. This is particularly the case with the *large* crystals, and, according to Berzelius, is a source of impurity; as the liquid in question is a portion of the mother-waters in which they were formed. It is on this account that Berzelius recommends that the solution of the purified salt should be stirred during crystallization, so as to cause it to shoot into *small* crystals. When exposed to heat, nitre fuses without losing weight at about 662°. The fused mass, when cast in moulds, or formed into little circular cakes, constitutes that form of nitre, kept in the shops under the name of *crystal mineral* or *sal prunelle.** If the heat be increased, the salt is decomposed, evolves pure oxygen, and is reduced to the state of hyponitrite, which, when rubbed to powder, emits orange-coloured fumes of nitrous acid and nitric oxide, on the addition of sulphuric acid. Upon a further continuance of the heat, the hyponitrous acid itself is decomposed, and a large additional quantity of oxygen is evolved, contaminated, however, with more or less nitrogen. On account of the large proportion of oxygen which it contains, nitre increases the combustion of many substances in a remarkable degree. When thrown on burning coals, it deflagrates with bright scintillations. Nitre may be readily recognised by its effect in increasing the combustion of live coals, when thrown upon them; and by evolving white or reddish vapours on the addition of sulphuric acid. Its most usual impurity is common salt, which is seldom entirely absent, and which injures it for the manufacture of gunpowder. The presence of this salt or of chloride of potassium will cause a precipitate with nitrate of silver. If a sulphate be present, a precipitate will be formed with chloride of barium. One hundred grains of the pure and dry salt, treated with sixty grains of sulphuric acid, and the whole ignited until it ceases to lose weight, yield eighty-six grains of sulphate of potassa. If the residue weighs less, part of it is probably sulphate of soda, and the nitre tested may be assumed to have contained nitrate of soda. The refined or purified saltpetre of commerce is sufficiently pure for medical use. Nevertheless, the Dublin College, with needless refinement, has given a formula for its purification. (See *Potassæ Nitras Purum.*) Nitrate of potassa is composed of one eq. of nitric acid 54, and one of potassa 47·2=101·2.

* *Sal prunelle*, as directed to be made in the French Codex, is a mixture of nitrate and sulphate of potassa. It is prepared by fusing nitre in a Hessian crucible, adding 1-128th part of sulphur, and pouring out the product on a smooth marble slab, where it is allowed to congeal. The sulphur immediately takes fire, and, by combining with oxygen from a part of the nitric acid of the nitre, becomes sulphuric acid, which then unites with a small portion of potassa, to form sulphate of potassa.

Medical Properties. Nitre is considered refrigerant, diuretic, and diaphoretic, and is much used in inflammatory diseases. It is known to be a powerful antiseptic. It generally promotes the secretion of urine and sweat, lessens the heat of the body and the frequency of the pulse, and has a tendency to keep the bowels in a soluble condition. When taken in health, in quantities increasing gradually from one to five drachms daily, for the space of from eight to twelve days, it was found by F. Löffler to produce general weakness, lowness of spirits, constant disposition to sleep, and slow and weak pulse. Towards the end of the experiment, the pulse several times fell to twenty beats in the minute. During the use of the medicine, the appetite and digestion continued good, and the bowels were regular; though, occasionally, some pain was experienced in the abdomen, followed by purging. The blood, drawn at the end of the period, resembled cherry juice in colour, exhibited paler blood corpuscles than in health, coagulated very quickly, forming a clot of diminished firmness, was more watery than natural, and diminished in the proportion of its fat. (*Am. Journ. of Med. Sci.*, xviii. 204, from *Schmidt's Jahrb.*)

Nitre is very frequently prescribed with tartar emetic and calomel, forming a combination usually called the *nitrous powder*, which promotes most of the secretions, particularly those of the liver and skin, and which in many cases is advantageously employed in lessening and modifying febrile excitement. The formula usually preferred is eight or ten grains of nitre, the eighth of a grain of tartar emetic, and from the fourth to the half of a grain of calomel, exhibited every two or three hours. Nitre is frequently given in active hemorrhages, particularly hæmoptysis, and is a useful ingredient of gargles, in certain stages of inflammatory sorethroat. Dr. Frisi, an Italian physician, found it very efficacious in a case of obstinate spasmodic asthma, in affording speedy relief, and cutting short the attack as often as it was repeated. In the same disease, nitrous fumigation has been found useful, performed by inhaling for a quarter of an hour the fumes from burning touch paper, prepared by dipping blotting paper in a saturated solution of nitre, and afterwards drying it. In the form of sal prunelle, it is rubbed on chapped lips. The dose is from ten to fifteen grains, dissolved in water or some mucilaginous liquid, and repeated every two or three hours. From one to three drachms may be exhibited in the course of the day. If given too freely, or for too long a period, it is apt to excite pain in the stomach. In an overdose (half an ounce to an ounce or more), taken in concentrated solution, it causes heat and pain in the stomach, vomiting and purging of blood, great prostration, convulsions, and sometimes death. On dissection, the stomach and intestines are found inflamed. The treatment consists in the speedy removal of the poison from the stomach, and in the administration of mucilaginous drinks, laudanum to allay pain and irritation, and cordials to sustain the system. No antidote is known.

Notwithstanding the toxical properties of nitre when taken in a large dose in concentrated solution, it may be given, in divided doses, to the extent of one or two ounces in twenty-four hours, provided it be largely diluted with water. It is principally in acute rheumatism that large doses of this salt have been given; and both M. Gendrin and M. Martin-Solon bear testimony to its remarkable efficacy in that disease, after ample experience with its use in two of the hospitals of Paris. Dr. Henry Bennett, of London, also speaks highly of its efficacy in the same disease. It may be given in quantities, varying from six to sixteen drachms in twenty-four hours, dissolved in sweetened barley water, in the proportion of half an ounce of the salt to a pint and a half or two pints of the liquid. Administered in this way, the principal action of the salt is that of a sedative on the circulation, decreasing the force and frequency of the pulse.

Pharmaceutical Uses, &c. In pharmacy nitre is employed to form crocus of

antimony, and to procure nitric acid. It is also used in the formula of the U. S. Pharmacopœia for obtaining sweet spirit of nitre. It enters into the composition of moxa, and is employed in preparing the sulphate of potassa with sulphur of the Edinburgh College. In the laboratory it is used as an oxidizing agent, and to yield oxygen at a red heat. In the arts it is employed in the production of aqua fortis (common nitric acid), the manufacture of sulphuric acid, and the fabrication of gunpowder.

Off. Prep. Acidum Nitricum Purum; Collodium; Potassæ Nitras Purum; Potassæ Sulphas cum Sulphure; Spiritus Ætheris Nitrici; Unguentum Sulphuris Compositum. B.

POTASSÆ SULPHAS. *U. S., Lond., Ed., Dub.*

Sulphate of Potassa.

Vitriolated tartar; Tartarum vitriolatum, Arcanum duplicatum, Sal de duobus, *Lat.;* Sulfate de potasse, Potasse vitriolée, *Fr.;* Schwefelsaures Kali, Vitriolisirtir Weinstein, *Germ.;* Solfato di potassa, *Ital.*

Several chemical processes give rise to sulphate of potassa as a secondary product. Thus, it is produced in the distillation of nitric acid from a mixture of nitre with sulphuric acid; in the decomposition of sulphate of magnesia by carbonate of potassa, in one of the processes for preparing carbonate of magnesia; during the combustion of the mixture of nitre and sulphur in the manufacture of sulphuric acid; and in the decomposition of tartrate of potassa by sulphate of lime. (See *Acidum Nitricum*, *Acidum Sulphuricum*, and *Acidum Tartaricum.*) When nitric acid is obtained by calcining a mixture of nitre and sulphate of iron, the residue consists of sesquioxide of iron and sulphate of potassa, the latter of which, being alone soluble, is separated by means of water, and crystallized from its solution. The residue of the combustion of sulphur and nitre, in making sulphuric acid, is an impure sulphate of potassa mixed with sulphur, which is sold to the alum makers.

The U. S. and London Pharmacopœias place sulphate of potassa in the list of the Materia Medica; the Edinburgh and Dublin, among the preparations, obtaining it from the salt which remains after the distillation of nitric acid. This salt is a supersulphate of potassa, and must be so treated as to bring it to the neutral state. The Edinburgh College brings it to that state by removing the excess of acid by the addition of white marble, which converts it into an insoluble sulphate of lime. The Dublin College saturates the supersalt in boiling solution with slaked lime; strains the solution to separate the sulphate of lime; adds carbonate of potassa at the boiling temperature, to remove lime and sulphate of lime; strains again; exactly neutralizes the strained liquor with diluted sulphuric acid; and, finally, having evaporated it to a pellicle, sets it aside for twenty-four hours to crystallize.

The manufacturer of tartaric acid who avails himself of sulphate of lime to decompose the tartrate of potassa, forms sulphate of potassa as a collateral product. For the manner in which the latter salt may be economically crystallized for use in the arts, see *Am. Journ. of Pharm.*, xxiii. 343.

Properties. Sulphate of potassa is a white, anhydrous salt, in the form of small, aggregated, transparent, very hard crystals, permanent in the air, having the shape usually of short six-sided prisms, terminated by six-sided pyramids, and possessing a nauseous, somewhat bitter taste. Insoluble in alcohol, it is slowly soluble in about nine and a half times its weight of cold, and in less than four times its weight of boiling water. (*Gay-Lussac.*) Its solution is precipitated yellow by chloride of platinum, and white by chloride of barium. Added to a solution of sulphate of alumina, it generates alum, recognised by the octo-

hedral shape of its crystals. It is decomposed by tartaric acid, which forms bitartrate of potassa, and by the soluble salts of baryta, strontia, lime, silver, and lead, forming insoluble or sparingly soluble sulphates. This salt is not subject to adulteration. It consists of one eq. of sulphuric acid 40, and one of potassa 47·2=87·2.

Medical Properties and Uses. Sulphate of potassa is a mild purgative, operating without heat, pain, or other symptoms of irritation. In small doses of from a scruple to half a drachm, it operates as an aperient, and is useful in removing obstructions; in larger doses, of four or five drachms, it acts slowly as a purge. Combined with rhubarb, in the proportion of about a drachm of the salt to ten grains of the root, Dr. Fordyce found it an excellent alterative cathartic in the visceral obstructions of children, characterized by a tumid abdomen, and defective digestion and nutrition; and we can bear testimony to its efficacy in these cases. The late Dr. A. T. Thomson found this salt, in combination with rhubarb or aloes, "more useful than any of the other saline purgatives, in jaundice and dyspeptic affections." On the continent of Europe it is frequently given as an aperient after delivery, and for the purpose of drying up the milk. It enters into the composition of Dover's powder.

Notwithstanding the general sentiment of practitioners as to the mildness and safety of sulphate of potassa as a purgative, several cases have been reported in the Journals of supposed poisoning from its use. M. Moritz attributed the poisonous effects of the salt, in the case which came under his notice, to the presence of a notable quantity of sulphate of zinc; but his explanation cannot be admitted as adequate. In other cases, the salt, though found to be pure, seemed to act as a poison. Still, we are not disposed to admit that sulphate of potassa is poisonous. In the cases in which it apparently acted as such, its effects may be attributed sometimes to the largeness of the dose in which it was administered, and perhaps also to the insufficiency of the water used to dissolve it; at other times, where the dose used was moderate, to the existence of a predisposition to gastric inflammation. For further information in relation to this subject, the reader is referred to a paper by Dr. T. Romeyn Beck, in the *Amer. Journ. of the Med. Sci.*, N. S., vii. 88.

Off. Prep. Pilulæ Colocynthidis Compositæ; Pilulæ Opii sive Thebaicæ; Potassæ Bisulphas; Pulvis Ipecacuanhæ et Opii; Pulvis Salinus Compositus.

B.

POTASSII FERROCYANURETUM. *U.S.*

Ferrocyanuret of Potassium.

Off. Syn. POTASSII FERROCYANIDUM. *Lond., Ed., Dub.*

Ferrocyanide of potassium, Ferrocyanate of potassa, Ferroprussiate of potassa, Prussiate of potassa; Proto-cyanure jaune de fer et de potassium, *Fr.;* Cyaneisenkalium, *Germ.*

This is the yellow double cyanuret of potassium and iron, the salt from which the cyanuret of potassium is obtained by calcination at a low red heat. (See *Potassii Cyanuretum.*)

Ferrocyanuret of potassium is prepared on a large scale by calcining animal matters, such as dried blood, hoofs, chips of horn, woollen rags, old leather, the refuse of tallow-chandlers, called *greaves*, and other substances rich in nitrogen, with the pearlash of commerce, in an egg-shaped iron pot, called a shell, dissolving the calcined mass, after cooling, in water, and evaporating the solution so that crystals may form. The requisite iron for forming the salt is derived from the pots and stirrers used in the process. Occasionally iron filings are added.

A new process for manufacturing this salt, carried into successful operation at New Castle-on-Tyne by MM. Possoz and Boissière, dispenses with the use of

animal matters; the necessary nitrogen being obtained by a current of atmospheric air. In this process fragments of charcoal, impregnated with thirty per cent. of carbonate of potassa, are heated to white redness in a cylinder, through which a current of air is drawn by a suction pump. For further details in relation to this process, see the paper of Mr. Ambrose Smith on the manufacture of this salt, contained in the *Am. Journ. of Pharmacy*, for July, 1848, p. 178.

Properties. Ferrocyanuret of potassium is in large, beautiful, transparent, permanent, four-sided, tabular crystals, of a lemon-yellow colour, devoid of odour, but possessing a sweetish, yet somewhat bitter, saline taste. It dissolves in between three and four times its weight of cold water, and in about its own weight of boiling water, but is insoluble in alcohol. It acts but slightly, if at all, on turmeric paper. The alkaline reaction, when it occurs, is probably owing to the presence of a little free potassa retained by the water of crystallization. When heated to 140° it loses its water of crystallization, amounting to 12·6 per cent., and becomes white. When ignited, the insoluble residue amounts to 18·7 per cent. of sesquioxide of iron, resulting from the oxidation of the iron of the salt. It is characterized by striking a deep blue colour with the salts of sesquioxide of iron, a deep brown one with the salts of copper, and a white one with those of zinc, the several precipitates formed being ferrocyanurets of the respective metals. Heated with eight or ten times its weight of concentrated sulphuric acid, a large quantity of pure carbonic oxide is evolved. (*Fownes.*) When boiled with dilute sulphuric acid, it emits the smell of hydrocyanic acid. Ferrocyanuret of potassium consists of two eqs. of cyanuret of potassium 130·4, one of cyanuret of iron 54, and three of water 27 = 211·4. The water present is just sufficient to convert the iron and potassium into protoxides, and the cyanogen into hydrocyanic acid. Apart from the water present, it is generally considered to consist of a compound radical, called *ferrocyanogen*, formed of three eqs. of cyanogen and one of iron (tercyanuret of iron), united with two eqs. of potassium. Hence its officinal name. This salt is remarkably pure as it occurs in commerce.

Medical Properties, &c. Judging from the experiments of the German physicians, this salt possesses but little activity. Callies, as quoted by Pereira, found the commercial salt slightly poisonous, but the pure salt unproductive of harm in the dose of several ounces. It should be borne in mind that it is the commercial salt which is used medicinally. Westrumb and Hering proved that it passed with rapidity into the blood and urine.

Notwithstanding these statements, the late Dr. Burleigh Smart, of Kennebec, Maine, found this salt to possess active medicinal powers. (*Am. Journ. of Med. Sci.*, xv. 362.) Its primary effect was that of a sedative, diminishing the fulness and frequency of the pulse, and allaying pain and irritation. It acted also, under favourable circumstances, as a diaphoretic and astringent. Dr. Smart used it with success in a case of chronic bronchitis in a child, with the effect, in a few days, of diminishing the frequency of the pulse, and of lessening the sweating, cough, and dyspnœa. It sometimes acted as a diaphoretic, but only in cases attended with excessive vascular action and increased heat of skin. As an astringent its power was most conspicuous in the colliquative sweats of chronic bronchitis and phthisis. The same power was evinced in several cases of leucorrhœa cured by its use. It sometimes produced ptyalism, unattended, however, by swelling of the salivary glands or fetor of the breath. Its properties as an anodyne and sedative rendered it applicable to cases of neuralgic pains and whooping cough, in which diseases, especially the latter, Dr. Smart found it useful. When given in an overdose he stated that it occasioned vertigo, coldness, and numbness, with a sense of gastric sinking.

The form of administration which Dr. Smart preferred was that of solution, in the proportion of two drachms to the fluidounce of water. Of this the dose for an

adult was from 30 to 45 drops, equivalent to from 10 to 15 grains of the salt, repeated every four or six hours.

This salt is manufactured on a large scale, chiefly for the use of dyers and calico-printers. In pharmacy it is employed to prepare diluted hydrocyanic acid, Prussian blue, and the cyanurets of potassium and silver.

Off. Prep. Acidum Hydrocyanicum Dilutum; Argenti Cyanuretum; Ferri Ferrocyanuretum; Potassii Cyanuretum. B.

PRINOS. *U. S. Secondary.*

Black Alder.

The bark of Prinos verticillatus. *U. S.*

Prinos. *Sex. Syst.* Hexandria Monogynia.—*Nat. Ord.* Aquifoliaceæ.

Gen. Ch. Calyx small, six-cleft. *Corolla* monopetalous, subrotate, six-parted. *Berry* six-seeded; seeds nuciform. *Nuttall.*

Prinos verticillatus. Willd. *Sp. Plant.* ii. 225; Bigelow, *Am. Med. Bot.* iii. 141; Barton, *Med. Bot.* i. 203. The black alder is an indigenous shrub, with a stem six or eight feet high, furnished with alternate, spreading branches, and covered with a bluish-gray bark. The leaves, which stand alternately or irregularly on short petioles, are oval, pointed, tapering at the base, acutely serrate, of a dark-green colour, smooth on their upper surface, but downy on the veins beneath. The flowers are small, white, nearly sessile, and grow three or four together at the axils of the leaves. They are often diœcious. The calyx is persistent; the segments of the corolla obtuse; the stamens usually six in number, and furnished with oblong anthers; the germ large, green, roundish, and surmounted by a short style, terminating in an obtuse stigma. The fruit when ripe consists of glossy, scarlet, roundish berries, about the size of a pea, containing six cells and six seeds. Several of these berries are clustered together so as to form little bunches at irregular intervals on the stem. In the latter part of autumn, after the leaves have fallen, they still remain attached to the stem, and render the shrub a striking object in the midst of the general nakedness of vegetation. Hence the plant has received the name of *winter-berry*, by which it is frequently designated.

It grows in all parts of the United States, from Canada to Florida, frequenting low wet places, such as swamps, and the borders of ponds, ditches, and streams. Its flowers appear in June. The berries, which have a bitter, sweetish, somewhat acrid taste, are sometimes used medicinally for the same purposes with the bark, which is the officinal portion.

The dried bark is in slender pieces, more or less rolled, brittle, greenish-white internally, and covered with a smooth epidermis, easily separable, and of a whitish-ash colour, alternating or mingled with brown. It has no smell, but a bitter and slightly astringent taste. Boiling water extracts its virtues.

Medical Properties and Uses. Black alder is usually considered tonic and astringent; and is among the remedies proposed as substitutes for Peruvian bark, with which, however, it has very little analogy. It has been recommended in intermittent fever, diarrhœa, and other diseases connected with debility, especially gangrene and mortification. It is a popular remedy in gangrenous or flabby and ill-conditioned ulcers, and in chronic cutaneous eruptions, in which it is given internally, and applied locally in the form of a wash or poultice. It may be used in substance or decoction. The dose of the powder is from thirty grains to a drachm, to be repeated several times a day. The decoction, which is usually preferred both for internal and external use, may be prepared by boiling two ounces of the bark with three pints of water to a quart, and given in the dose of two or three fluidounces. A saturated tincture, as well of the berries as of the bark, is sometimes employed. W.

PRUNUM. *U. S., Lond.*

Prunes.

The dried fruit of Prunus domestica. *U. S.* The prepared fruit. *Lond.*

Off. Syn. PRUNA. Dried fruit of Prunus domestica. *Ed., Dub.*

Pruneaux, *Fr.;* Pflaumen, *Germ.;* Pruni, *Ital.;* Ciruelas secas, *Span.*

PRUNUS. *Sex. Syst.* Icosandria Monogynia.—*Nat. Ord.* Amygdaleæ.

Gen. Ch. Calyx inferior, bell-shaped, deciduous, with five obtuse, concave segments. *Petals* five, roundish, concave, spreading, larger than the segments of the calyx, into the rim of which they are inserted. *Filaments* awl-shaped, nearly as long as the corolla, from the rim of the calyx within the petals. *Anthers* short, of two round lobes. *Ovary* superior, roundish. *Style* of the length of the stamens. *Stigma* orbicular, peltate. *Drupe* roundish or elliptical. *Nut* hard, somewhat compressed, of one cell, and two more or less distinct sutures with an intermediate furrow. *Leaves* rolled up when young. (*Lindley.*)

Prunus domestica. Willd. *Sp. Plant.* ii. 995; Woodv. *Med. Bot.* p. 520, t. 187. The cultivated prune or plum tree is so well known as to render a minute description unnecessary. We merely give the specific character. "*Peduncles* subsolitary; *leaves* lanceolate-ovate, convolute; *branches* not spiny." The varieties of the tree produced by cultivation are very numerous. Nearly one hundred are to be found in the British gardens. Though at present growing wild in various parts of Europe, it is thought to have been brought originally from Asia Minor and Syria. It is the dried fruit only that is officinal.

The prunes brought to our market come chiefly from the South of France, the best from the port of Bordeaux. They are derived from the variety of the tree named *Juliana* by Linnæus. The fresh fruit, called *Prune de Saint Julien* by the French, is of an oval shape, nearly an inch in length, and of a deep violet colour. It is prepared by drying in the sun, after having been exposed to the heat of an oven. The finest prunes, used on the tables in France, are prepared from the larger kinds of plums, such as the *Saint Catharine* and *Reine-Claude* or *green-gage.* An inferior sort is brought from Germany.

Prunes have a feeble odour, and a sweet mucilaginous taste, which is generally also somewhat acid. They contain uncrystallizable sugar, malic acid, and mucilaginous matter. In Germany there is obtained from this fruit a kind of brandy, which in some districts is largely consumed. Bonneberg, a German chemist, has extracted from prunes crystallizable sugar, equal to that of the cane.

Medical Properties and Uses. Prunes are laxative and nutritious, and stewed with water form an excellent diet in costiveness, especially during convalescence from febrile and inflammatory diseases. Imparting their laxative property to water in which they are boiled, they serve as a pleasant and useful addition to purgative decoctions. Their pulp is used in the preparation of laxative confections. Too largely taken in a debilitated state of the digestive organs, they are apt to occasion flatulence, and griping pain in the stomach and bowels.

Off. Prep. Pruni Pulpa. W.

PRUNUS VIRGINIANA. *U. S.*

Wild-cherry Bark.

The bark of Cerasus serotina (*De Cand.*), Cerasus Virginiana (*Michaux*). *U. S.*

CERASUS. See LAURO-CERASUS.

This genus, which is now generally admitted, includes a large number of species formerly embraced in the genus Prunus of Linnæus.

Cerasus serotina. De Candolle. *Prodrom.* ii. 540; Torrey and Gray, *Flora of N. America*, i. 410.—*Cerasus Virginiana.* Michaux, *N. Am. Sylv.* ii. 205. According to Torrey and Gray, the name *Prunus Virginiana*, which has frequently been applied to this species, was given by Linnæus to the *choke-cherry*, a small tree or shrub, growing in the Northern States, and bearing a dark-red, globular, astringent fruit, about as large as that of the *wild-cherry*. This is described in the Flora of N. America of these authors, under the name of *Cerasus Virginiana*. The officinal species, or wild-cherry tree, is, according to Michaux, one of the largest productions of the American forest. Individuals were seen by that botanist on the banks of the Ohio from eighty to one hundred feet high, with trunks from twelve to fifteen feet in circumference, and undivided to the height of twenty-five or thirty feet. But, as usually met with in the Atlantic States, the tree is much smaller. In the open fields it is less elevated than in forests, but sends out more numerous branches, which expand into an elegant oval summit. The trunk is regularly shaped, and covered with a rough blackish bark, which detaches itself semicircularly in thick narrow plates, and by this peculiar character serves as a distinguishing mark of the tree, when the foliage is too high for inspection. The leaves are oval-oblong, or lanceolate-oblong, acuminate, unequally serrate, smooth on both sides, of a beautiful brilliant green, and supported alternately upon petioles, which are furnished with from two to four reddish glands. The flowers are small, white, and collected in long erect or spreading racemes. They appear in May, and are followed by globular drupes about the size of a pea, and when ripe of a shining blackish-purple colour.

This tree grows throughout the Union, flourishing most in those parts where the soil is fertile and the climate temperate, and abounding in the Middle Atlantic States, and in those which border on the Ohio. In the neighbourhood of Philadelphia, it affects open situations, growing solitarily in the fields and along fences, and seldom aggregated in woods or groves. It is highly valued by the cabinet-makers for its wood, which is compact, fine-grained, susceptible of polish, and of a light-red tint, which deepens with age. The fruit has a sweetish, astringent, bitter taste; and is much employed in some parts of the country to impart flavour to spirituous liquors. The inner bark is the part employed in medicine, and is obtained indiscriminately from all parts of the tree, though that of the roots is thought to be most active. Mr. J. S. Perot has ascertained that it is much stronger when collected in autumn than in the spring. Thus, from a portion gathered in April he obtained ·0478 per cent. of hydrocyanic acid, and from another in October ·1436 per cent., or about three times as much from the latter as the former. The parcels tried were taken from the same tree, and the same part of the tree. (*Am. Journ. of Pharm.*, xxiv. 111.) The bark should be preferred recently dried, as it deteriorates by keeping.

Properties. Wild-cherry bark, as kept in the shops, is in pieces of various sizes, more or less curved laterally, usually destitute of epidermis, of a lively reddish-cinnamon colour, brittle, and pulverizable, presenting a reddish-gray fracture, and affording a fawn-coloured powder. In the fresh state, or when treated with water, it emits an odour resembling that of peach leaves. Its taste is agreeably bitter and aromatic, with the peculiar flavour of the bitter almond. It imparts its sensible properties to water, either cold or hot, producing a clear reddish infusion, closely resembling Madeira wine in appearance. Its peculiar flavour as well as medical virtues are injured by boiling, in consequence partly of the volatilization of the principle upon which they depend, partly upon a chemical change effected by the heat. From an analysis by Dr. Stephen Procter, it appears to contain starch, resin, tannin, gallic acid, fatty matter, lignin, red colouring matter, salts of lime and potassa, and iron. He obtained also a volatile oil, associated with hydrocyanic acid, by distilling the same portion of water succes-

sively from several different portions of the bark. This oil was of a light-straw colour, and very analogous in its properties to the volatile oil of bitter almonds. In the quantity of two drops it proved fatal to a cat in less than five minutes. (*Journ. of the Phil. Col. of Pharm.*, vi. 8.) Prof. William Procter proved that, as in the case of bitter almonds, the volatile oil and hydrocyanic acid do not exist ready formed in the bark, but are the result of the reaction of water upon amygdalin, which he ascertained to be one of its constituents. In order, however, that this change may take place, the agency of another principle, probably analogous to if not identical with *emulsin*, or the *synaptase* of Robiquet, is also essential; and, as this principle becomes inoperative at the boiling temperature, we can understand how decoction may interfere with the virtues of the bark. (*Am. Journ. of Pharm.*, x. 197.) The conjecture was advanced, in former editions of this work, that wild-cherry bark might contain also *phloridzin*, a bitter principle proved to exist in the bark of the apple, pear, cherry, and plum trees. (See *Phloridzin* in the Appendix.) But Mr. Perot sought for this principle, without success, in specimens of the bark of different ages, and taken from different parts of the tree; so that the tonic property, which is undoubtedly possessed by the bark, must reside either in the portion of amygdalin which may remain undecomposed, in the pure volatile oil resulting from its reaction with water, or in some yet undiscovered principle. The sedative properties of the bark depend upon the hydrocyanic acid which it yields. (*Ibid.*, xxiv. 111.)

Medical Properties and Uses. This bark is among the most valuable of our indigenous remedies. Uniting with a tonic power the property of calming irritation and diminishing nervous excitability, it is admirably adapted to the treatment of diseases in which debility of the stomach, or of the system, is united with general or local irritation. When largely taken it is said to diminish the action of the heart, an effect ascribable to the hydrocyanic acid. Dr. Eberle found copious draughts of the cold infusion, taken several times a day, and continued for nearly two weeks, to reduce his pulse from seventy-five to fifty strokes in the minute. The remedy is highly useful, and has been much employed in this country, in the hectic fever of scrofula and consumption. In the general debility which often succeeds inflammatory diseases, it is also advantageous; and it is well adapted to many cases of dyspepsia. It has been given successfully in intermittent fever, but is much inferior to cinchona.

It may be used in powder or infusion. The dose of the powder is from thirty grains to a drachm. The infusion is properly directed by our national Pharmacopœia to be prepared with cold water. (See *Infusum Pruni Virginianæ.*) A syrup of wild-cherry bark was introduced into the last edition of the Pharmacopœia, and is considerably used. (See *Syrupus Pruni Virginianæ.*)

Off. Prep. Infusum Pruni Virginianæ; Syrupus Pruni Virginianæ. W.

PULEGIUM. *Lond., Ed., Dub.*

European Pennyroyal.

Mentha Pulegium. The herb in flower, recent and dried. *Lond.* The herb. *Ed., Dub.*

Menthe-pouliot, Pouliot, *Fr.;* Poleymünze, *Germ.;* Puleggio, *Ital.;* Poleo, *Span.*

MENTHA. See MENTHA PIPERITA.

Mentha Pulegium. Willd. *Sp. Plant.* iii. 82; Woodv. *Med. Bot.* p. 342, t. 122. This species of mint is distinguished by its roundish prostrate stems, its ovate, obtuse, somewhat crenate leaves, and its verticillate flowers. It is a native of Europe, and neither cultivated nor employed in this country. Our native pennyroyal belongs to a different genus. (See *Hedeoma Pulegioides.*) Pulegium

possesses similar properties, and is employed for the same purposes with the other mints.

Off. Prep. Aqua Pulegii; Oleum Pulegii. W.

PYRETHRUM. *U. S. Secondary, Lond., Ed.*

Pellitory.

The root of Anacyclus Pyrethrum. *U. S., Lond., Ed.*

Pyrèthre, *Fr.;* Bertram Wurzel, *Germ.;* Piretro, *Ital.;* Pelitre, *Span.*

ANACYCLUS. Differing from Anthemis by its winged and obcordate *Achænia. Lindley.* See ANTHEMIS.

Anacyclus Pyrethrum. De Cand. *Prodrom.* vi. 15.—*Anthemis Pyrethrum.* Willd. *Sp. Plant.* iii. 2184; Woodv. *Med. Bot.* p. 50, t. 20. The root of this plant is perennial, and sends up numerous stems, usually trailing at the base, erect in their upper portion, eight or ten inches high, and terminated by one large flower. The leaves are doubly pinnate, with narrow nearly linear segments of a pale-green colour. The florets of the disk are yellow; the rays white on their upper surface, and reddish or purple beneath and at their edges.

The plant is a native of the Levant, Barbary, and the Mediterranean coast of Europe. The root is the part used under the name of pellitory, or *pellitory of Spain.* According to Hayne, the pellitory of the shops is derived from the *Anacyclus officinarum*, a plant cultivated in Thuryngia for medical purposes. This remark, however, can apply only to Germany.

Properties. The dried root of *A. Pyrethrum* is about the size of the little finger, cylindrical, straight or but slightly curved, wrinkled longitudinally, of an ash-brown colour externally, whitish within, hard and brittle, and sometimes furnished with a few radicles. It is destitute of odour, though, when fresh, of a disagreeable smell. Its taste is peculiar, slight at first, but afterwards acidulous, saline, and acrid, attended with a burning and tingling sensation over the whole mouth and throat, which continues for some time, and excites a copious flow of saliva. Its analysis by Koene gives, in 100 parts, 0·59 of a brown, very acrid substance, of a resinous appearance, and insoluble in caustic potassa; 1·60 of a dark-brown, very acrid fixed oil, soluble in potassa; 0·35 of a yellow acrid oil, also soluble in potassa; traces of tannin; 9·40 parts of gum; inulin; 7·60 parts of sulphate and carbonate of potassa, chloride of potassium, phosphate and carbonate of lime, alumina, silica, &c.; and 19·80 of lignin, besides loss. (See *Am. Journ. of Pharm.*, viii. 175.)

Medical Properties and Uses. Pellitory is a powerful irritant, used almost exclusively as a sialagogue in certain forms of headache, rheumatic and neuralgic affections of the face, toothache, &c., or as a local stimulant in palsy of the tongue or throat, and in relaxation of the uvula. For these purposes it may be chewed, or employed as a gargle in decoction or vinous tincture. The dose as a masticatory is from thirty grains to a drachm. An alcoholic extract is sometimes employed by dentists as a local application to carious teeth, with a view to its benumbing effect before plugging. W.

QUASSIA. *U. S., Lond., Ed., Dub.*

Quassia.

The wood of Simaruba excelsa. *U. S.* Picræna excelsa. The wood. *Lond., Dub.* Wood chiefly of Picræna excelsa, seldom of Quassia amara. *Ed.*

Bois de quassie, *Fr.;* Quassienholz, *Germ.;* Legno della quassia, *Ital.;* Leno de quassia, *Span.*

QUASSIA. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Simarubaceæ.

Gen. Ch. Calyx five-leaved. *Petals* five. *Nectary* five-leaved. *Drupes* five, distant, bivalve, one-seeded, inserted into a fleshy receptacle. *Willd.*

Of the species included by Linnæus in this genus, some, as *Quassia amara*, are hermaphrodite; others, as *Q. excelsa* and *Q. Simaruba*, are monœcious or polygamous. The latter have been associated together by De Candolle, in a distinct genus, with the title *Simaruba*. This has been again divided by Lindley into *Simaruba* with monœcious, and *Picræna* with polygamous flowers. To the last-mentioned genus the proper quassia plant, the Q. excelsa of Linnæus, belongs.

The medicine was formerly thought to be obtained from *Quassia amara;* but more than twenty years since, Lamarck stated that, in consequence of the scarcity of this tree, *Quassia excelsa* had been resorted to as a substitute, and the Pharmacopœias at present agree in acknowledging the latter as the officinal plant. Martius, however, thinks that the genuine quassia plant of Surinam is the *Q. amara;* and we shall, therefore, give a brief description of both species.

Quassia excelsa. Willd. *Sp. Plant.* ii. 569.—*Simaruba excelsa*, De Cand. *Prodrom.* i. 733; Hayne, *Darstel. und Beschreib.* &c. ix. 16.—*Picræna excelsa.* Lindley, *Flor. Med.* 208. As its name imports, this is a lofty tree, attaining sometimes not less than one hundred feet in height, with a straight, smooth, tapering trunk, which is often three feet in diameter near its base, and covered with a smooth gray bark. The leaves are pinnate, with a naked petiole, and oblong pointed leaflets standing upon short footstalks, in opposite pairs, with a single leaflet at the end. The flowers are small, of a yellowish-green colour, and disposed in panicles. They are polygamous and pentandrous. The fruit is a small black drupe. This species inhabits Jamaica and the Caribbean islands, where it is called *bitter ash.* The wood is the officinal portion.

Quassia amara. Willd. *Sp. Plant.* ii. 567; Woodv. *Med. Bot.* p. 574, t. 204. The bitter quassia is a small branching tree or shrub, with alternate leaves, consisting of two pairs of opposite pinnæ, with an odd one at the end. The leaflets are elliptical, pointed, sessile, smooth, of a deep-green colour on their upper surface, and paler on the under. The common footstalk is articulated, and edged on each side with a leafy membrane. The flowers, which are hermaphrodite and decandrous, have a bright-red colour, and terminate the branches in long racemes. The fruit is a two-celled capsule, containing globular seeds. Quassia amara is a native of Surinam, and is said also to grow in some of the West India islands. Its root, bark, and wood were formerly officinal. They are excessively bitter, as in fact are all parts of the plant. It is uncertain whether any of the produce of this tree reaches our markets.

Quassia comes in cylindrical billets of various sizes, from an inch to near a foot in diameter, and several feet in length. These are frequently invested with a whitish smooth bark, brittle, and but slightly adherent, and possessing in at least an equal degree the virtues of the wood. Their shape and structure clearly evince that they are derived from the branches or trunk, and not, as some have supposed, from the root of the tree. In the shops they are usually kept split into small pieces, or rasped.

Properties. The wood is at first whitish, but becomes yellow by exposure. It is inodorous, and has a purely bitter taste, surpassed by that of few other substances in intensity and permanence. It imparts its active properties, with its bitterness and yellow colour, to water and alcohol. Its virtues depend upon a peculiar bitter crystallizable principle, denominated *quassin*, which was first discovered by Winckler. It may be obtained pure by the following process of Wiggers. A filtered decoction of quassia is evaporated to three-quarters of the weight of the wood employed, slaked lime is added, and the mixture having

been allowed to stand for a day, with occasional agitation, is again filtered. A considerable quantity of pectin, besides other substances, is thus separated. The clear liquor is evaporated nearly to dryness, and the resulting mass exhausted by alcohol of the sp. gr. 0·835, which leaves behind gum, common salt, nitre, &c., in large amount, and dissolves quassin with some common salt and nitre, and an organic substance of a brown colour. In order to separate the quassin from these latter principles, which are soluble in water, the solution is evaporated to dryness, the resulting mass is dissolved in the least possible quantity of absolute alcohol, a large proportion of ether is added, and the liquor, previously separated by filtration from the brown mass which the ether has thrown down, is evaporated to dryness; and this process is repeated till the quassin remains behind quite colourless, and affords no evidence of the presence of the above-mentioned salts. Lastly, in order to obtain it in a crystalline form, to which it is not strongly disposed, pour the alcoholic solution mixed with ether upon a little water, and allow it to evaporate spontaneously. *Quassin* is white, opaque, unalterable in the air, inodorous, and of an intense bitterness, which in the solutions of this principle is almost insupportable. The bitterness is pure, and resembles that of the wood. When heated, quassin melts like a resin. It is but slightly soluble in water, 100 parts of which at 54° dissolve only 0·45, and that slowly. By the addition of salts, especially of those with which it is associated in quassia, its solubility is strikingly increased. It is also but slightly soluble in ether, but is very soluble in alcohol, more so in that liquid hot than cold, and the more so the purer it is. Quassin is perfectly neuter, though both alkalies and acids increase its solubility in water. It is precipitated by tannic acid from its aqueous solution, which is not disturbed by iodine, chlorine, corrosive sublimate, solutions of iron, sugar of lead, or even the subacetate of lead. Its ultimate constituents are carbon, hydrogen, and oxygen.

Medical Properties and Uses. Quassia has in the highest degree all the properties of the simple bitters. It is purely tonic, invigorating the digestive organs, with little excitement of the circulation, or increase of animal heat. It has not been very long known as a medicine. About the middle of the last century, a negro of Surinam, named Quassi, acquired considerable reputation in the treatment of the malignant fevers of that country, by a secret remedy, which he was induced to disclose to Mr. Rolander, a Swede, for a valuable consideration. Specimens were taken to Stockholm by this gentleman in the year 1756; and the medicine soon became popular in Europe. The name of the negro has been perpetuated in the generic title of the plant. But the quassia of Surinam is not now in use, having been superseded by the product of Quassia excelsa, from the West Indies. This medicine is useful whenever a simple tonic impression is desirable. It is particularly adapted to dyspepsia, and to that debilitated state of the digestive organs which sometimes succeeds acute disease. It may also be given with advantage in the remission of certain fevers in which tonics are demanded. No one at present would expect from it any peculiar controlling influence over malignant fevers. It is said to be largely employed in England by the brewers, to impart bitterness to their liquors.

It is most conveniently administered in infusion or extract. (See *Infusum Quassiæ* and *Extractum Quassiæ.*) The difficulty of reducing the wood to powder is an objection to its use in substance. It may, however, be employed in a dose varying from a scruple to a drachm, repeated three or four times a day. Some dyspeptic patients, who have become habituated to its bitterness, chew the wood occasionally with benefit.

Off. Prep. Extractum Quassiæ; Infusum Quassiæ; Tinctura Quassiæ; Tinctura Quassiæ Composita. W.

QUERCUS ALBA. *U. S.*

White-oak Bark.

The bark of Quercus alba. *U. S.*

QUERCUS TINCTORIA. *U.S.*

Black-oak Bark.

The bark of Quercus tinctoria. *U. S.*

Off. Syn. QUERCUS. Quercus pedunculata. The bark. *Lond., Dub.;* QUERCÛS CORTEX. Bark of Quercus pedunculata. *Ed.*

Ecorce de chêne, *Fr.;* Eichenrinde, *Germ.;* Corteccia della quercia, *Ital.;* Corteza de roble, *Span.*

QUERCUS. *Sex. Syst.* Monœcia Polyandria.—*Nat. Ord.* Amentaceæ, *Juss.;* Cupuliferæ, *Richard;* Corylaceæ, *Lindley.*

Gen. Ch. MALE. *Calyx* commonly five-cleft. *Corolla* none. *Stamens* five to ten. FEMALE. *Calyx* one-leafed, entire, rough. *Corolla* none. *Styles* two to five. *Nut* coriaceous, surrounded at the base by the persistent calyx. *Willd.*

This extensive genus comprises not less than eighty species, of which between thirty and forty are within the limits of the United States. Many of these are applied to important practical purposes. In the northern hemisphere, the oak is the most valuable, as it is the most widely diffused of all forest trees. Notwithstanding the great number of species, few, comparatively, have found a place in the officinal catalogues. *Q. robur*, or common European oak, was formerly recognised by the British Colleges; but at present they admit only *Q. pedunculata*, or European white oak. As these do not grow in the United States, and their products are not imported, it is unnecessary to treat of them particularly in this work. According to Michaux, they grow in the same countries, frequently together, constituting the greater part of the forests of Europe, and spreading over almost the whole northern section of Asia, and the northern coast of Africa. *Q. pedunculata* is the common British oak, celebrated as well for its majestic growth and the venerable age which it attains, as for the strength and durability of its timber. Our own Pharmacopœia recognises only *Q. alba* or white oak, and *Q. tinctoria* or black oak; but several other species afford barks which are equally useful, and perhaps as much employed. Such are *Q. falcata* or Spanish oak, *Q. prinus* or white chestnut oak, and *Q. montana* or rock chestnut oak. The remarks which follow in relation to the white-oak bark, will apply also to that of the three last-mentioned species. The bark of *Q. tinctoria* is somewhat peculiar.

1. *Quercus alba.* Willd. *Sp. Plant.* iv. 448; Michaux, *N. Am. Sylv.* i. 17. Of all the American species, the *white oak* approaches nearest, in the character of its foliage, and the properties of its wood and bark, to the *Q. pedunculata* of Great Britain. When allowed to expand freely in the open field, it divides at a short distance from the ground into numerous widely spreading branches, and attains under favourable circumstances a magnificent size. Its trunk and large branches are covered with a whitish bark, which serves to distinguish it from most of the other species. The leaves are regularly and obliquely divided into oblong, obtuse, entire lobes, which are often narrowed at their base. When full grown, they are smooth and light green on their upper surface, and glaucous beneath. Some of the dried leaves remain on the tree during the whole winter. The acorns are large, ovate, contained in rough, shallow, grayish cups, and supported singly or in pairs upon peduncles nearly an inch in length.

The white oak abounds in the Middle States, and extends also through the whole Union, though comparatively rare in the northern, southern, and western sections. It is the most highly valued for its timber of all the American oaks, with the exception of the *live oak* (*Q. virens*), which is preferred in ship-building. The bark is sometimes used for tanning, but that of the *red* and *Spanish oaks* is preferred for this purpose. All parts of the tree, with the exception of the epidermis, are more or less astringent, but this property predominates in the fruit and bark.

White-oak bark, deprived of its epidermis, is of a light-brown colour, of a coarse fibrous texture, and not easily pulverized. It has a feeble odour, and a rough, astringent, and bitterish taste. Water and alcohol extract its active properties. The chief soluble ingredients are tannin, gallic acid, and extractive matter. It is upon the tannin that its medical virtues, as well as its use in the preparation of leather, chiefly depend. The proportion of this ingredient varies with the size and age of the tree, the part from which the bark is derived, and even the season when it is gathered. It is most abundant in the young bark; and the English oak is said to yield four times as much in spring as in winter. Sir H. Davy found the inner bark most abundant in tannin, the middle portion or cellular integument much less so, and the epidermis almost wholly destitute as well of this principle as of extractive.

Gerber has discovered, in European oak bark, a peculiar bitter principle upon which he has conferred the name of *quercin*. It is obtained by boiling the bark with water acidulated with one hundredth of sulphuric acid, adding first milk of lime until the sulphuric acid is removed, and then a solution of carbonate of potassa so long as a white precipitate is produced, filtering the liquor, evaporating to the consistence of a thin extract, adding alcohol, and finally evaporating the spirituous solution down to a small volume, and allowing it to rest for some days. Yellow crystals form, which may be obtained colourless by repeated crystallizations. Quercin thus obtained is in small white crystals, inodorous, very bitter, readily soluble in water, less so in alcohol containing water, insoluble in absolute alcohol, ether, and oil of turpentine, and without acid or alkaline reaction. (*Arch. der Pharm.*, xxxiv. 167.)

2. *Quercus tinctoria.* Willd. *Sp. Plant.* iv. 444; Michaux, *N. Am. Sylv.* i. 91. The *black oak* is one of our largest trees, frequently attaining the height of eighty or ninety feet. Its trunk is covered with a deeply furrowed bark, of a black or dark-brown colour. The leaves are ovate-oblong, pubescent, slightly sinuated, with oblong, obtuse, mucronate lobes. The fructification is biennial. The acorn is globose, flattened at top, and placed in a saucer-shaped cup.

Black-oak bark has a more bitter taste than that of the other species, and may be distinguished also by staining the saliva yellow when it is chewed. Its cellular integument contains a colouring principle, capable of being extracted by boiling water, to which it imparts a brownish-yellow colour, which is deepened by alkalies and rendered brighter by acids. Under the name of *quercitron*, large quantities of this bark, deprived of its epidermis and reduced to coarse powder, are sent from the United States to Europe, where it is used for dyeing wool and silk of a yellow colour. The colouring principle is called *quercitrin*, or, from its property of combining with salifiable bases, *quercitric acid*. When quite pure it is colourless, but becomes yellow by absorbing oxygen. It is sweetish, with a bitter after-taste, and is very soluble in water, alcohol, and ether. M. Preisser obtained it by precipitating the tannin of a decoction of the bark by means of gelatin, filtering the liquor, adding a very little hydrated oxide of lead, which produced a brown precipitate, decanting the golden-yellow liquid left, precipitating with an additional quantity of the hydrated oxide, and decomposing the resulting quercitrate of lead by hydrosulphuric acid. A colourless liquid re-

mained, which, evaporated in vacuo, yielded white needle-shaped crystals of pure quercitrin. (*Journ. de Pharm. et de Chim.*, v. 251.) Besides this principle, the bark contains also much tannin; but it is less used in tanning than the other barks, in consequence of the colour which it imparts to the leather.

Medical Properties and Uses. Oak bark is astringent and somewhat tonic. It has been given with advantage in intermittent fever, obstinate chronic diarrhœa, and certain forms of passive hemorrhage; but it is not much employed as an internal remedy. Externally applied it is often productive of benefit. The decoction may be advantageously used as a bath, particularly for children, when a combined tonic and astringent effect is desirable, and the stomach is not disposed to receive medicines kindly. It has been employed in this way in marasmus, scrofula, intermittent fevers, chronic diarrhœa, and cholera infantum. As an injection in leucorrhœa, a wash in prolapsus ani and hemorrhoidal affections, and as a gargle in slight inflammation of the fauces, attended with prolapsed uvula, the decoction is often highly useful. It has also been recommended as an injection into dropsical cysts. Reduced to powder and made into a poultice, the bark was recommended by the late Dr. Barton as an excellent application in cases of external gangrene and mortification; and the infusion obtained from tanners' vats has been used beneficially as a wash for flabby, ill-conditioned ulcers. The bark may be given internally in the form of powder, extract, or decoction. The dose of the powder is from thirty grains to a drachm, of the extract about half as much, of the decoction two fluidounces. (See *Decoctum Quercûs.*)

Black-oak bark is considered inferior to the white-oak bark as an internal remedy, in consequence of being more disposed to irritate the bowels.

Acorns, besides the bitter and astringent principles of the bark, contain also a peculiar saccharine matter, which is insusceptible of the vinous fermentation. (*Journ. de Pharm.*, 3*e sér.*, xx. 335.) They are sometimes used as a tonic or astringent; and a decoction made from roasted acorns has been long employed in Germany as a remedy in scrofula. Before roasting they should be deprived of their shells; and the cotyledons, according to Dausse, should lose, during the process, 140 parts of their weight out of 500. (*Pharm. Cent. Blatt.*, Oct. 9, 1850, p. 687.) From half an ounce to an ounce may be prepared as coffee, and the whole taken at breakfast with cream and sugar. (*Richter.*)

Off. Prep. Decoctum Quercûs Albæ. W.

RANUNCULUS. *U. S. Secondary.*

Crowfoot.

The cormus and herb of Ranunculus bulbosus. *U. S.*

Ranunculus. *Sex. Syst.* Polyandria Polygynia.—*Nat. Ord.* Ranunculaceæ.

Gen. Ch. Calyx five-leaved. *Petals* five, having the inner side of each claw furnished with a melliferous pore. *Seeds* naked, numerous. *Nuttall.*

Most of the plants belonging to this genus have the same acrid properties. Several of them grow together in our fields and pastures, and, from their close resemblance, are confounded under the common name of *butter-cup*, applied to them from the colour and shape of their flowers. Those which are most abundant are believed to have been introduced from Europe. Such are *R. bulbosus*, *R. acris*, and *R. repens*, which, with *R. sceleratus*, may be indiscriminately used. In Europe, *R. sceleratus* appears to have attracted most attention; in this country, *R. bulbosus*. The latter is the only one designated by our Pharmacopœia. *R. acris* and *R. Flammula* were formerly directed by the Dublin College, but were discarded from their Pharmacopœia at the last revision.

Ranunculus bulbosus. Willd. *Sp. Plant.* ii. 1324; Bigelow, *Am. Med. Bot.* iii. 60. This species of crowfoot is perennial, with a solid, fleshy root (cormus),

which sends up annually several erect, round, and branching stems, from nine to eighteen inches high. The radical leaves, which stand on long footstalks, are ternate or quinate, with lobed and dentate leaflets. The leaves of the stem are sessile and ternate, the upper more simple. Each stem supports several solitary, bright-yellow, glossy flowers, upon furrowed, angular peduncles. The leaves of the calyx are reflexed, or bent downwards against the flowerstalk. The petals are obcordate, and arranged so as to represent a small cup in shape. At the inside of the claw of each petal is a small cavity, which is covered with a minute wedge-shaped emarginate scale. The fruit consists of numerous naked seeds, in a spherical head. The stem, leaves, peduncles, and calyx are hairy.

In the months of May and June our pastures are everywhere adorned with the rich yellow flowers of this species of Ranunculus. Somewhat later *R. acris* and *R. repens* begin to bloom, and a succession of similar flowers is maintained till September. The two latter species prefer a moister ground, and are found most abundantly in meadows. *R. sceleratus* is found in ponds and ditches. In all these species, the whole plant is pervaded by a volatile acrid principle, which is dissipated by drying or by heat, and may be separated by distillation. Dr. Bigelow found that water distilled from the fresh plant had an acrid taste, and produced when swallowed a burning sensation in the stomach; and that it retained these properties for a long time, if kept in closely stopped bottles. The plant itself, when chewed, excites violent irritation in the mouth and throat; inflaming and even excoriating the tongue and inside of the cheeks and lips, if not quickly discharged. Both the root and herb of *R. bulbosus* are officinal.

Medical Properties and Uses. Crowfoot, when swallowed in the fresh state, produces heat and pain in the stomach, and, if the quantity be considerable, may excite fatal inflammation. It is, however, never used internally; though the juice and distilled water of some species of Ranunculus are said to act as a prompt and powerful emetic. The property for which it has attracted the attention of physicians is that of inflaming and vesicating the skin; and, before the introduction of the Spanish fly into use, it was much employed for this purpose. But the uncertainty and occasional violence of its action have nearly banished it from regular practice. While on some individuals it appears to produce scarcely any effect, on others it acts very speedily, exciting extensive and troublesome inflammation, which sometimes terminates in deep and obstinate ulcers. It probably varies in strength with the season; and, in the dried state, or boiled with water, is wholly inert. The decoction, moreover, is inert in consequence of the escape of the acrid principle. Nevertheless, the plant has been very properly retained in the Pharmacopœia, in the catalogue of medicines of secondary importance; as occasions may occur when the practitioner in the country may find advantage in having recourse to its powerful rubefacient and epispastic operation. W.

RESINA. *U. S., Lond., Ed., Dub.*

Resin.

The residuum after the distillation of the volatile oil from the turpentine of Pinus palustris and other species of Pinus. *U. S.* The residue of turpentine after the oil has been distilled. *Lond.* Residue of the distillation of the turpentines of various species of Pinus and Abies. *Ed.* Resin from the turpentine of Pinus sylvestris. *Dub.*

Resine blanche, Resine jaune, *Fr.;* Fichtenharz, *Germ.;* Ragea di pino, *Ital.;* Resina de pino, *Span.*

After the distillation of the volatile oil from the turpentines (see *Terebinthina*), a resinous matter remains, which on the continent of Europe is called *colophony*,

but in our language is commonly known by the name of *rosin*. It is the RESINA of the U. S. and British Pharmacopœias. It is sometimes called *resina flava* or *yellow resin*. When this, in a state of fusion, is strongly agitated with water, it acquires a distinct appearance, and is now denominated *resina alba* or *white resin*. Before describing this officinal substance, it may be proper to enumerate the characteristic properties of the proximate principles denominated resins.

Resins are solid, brittle, of a smooth and shining fracture, and generally of a yellowish colour and semitransparent. When perfectly pure, they are probably inodorous and often insipid; but, as usually found, they have a slight odour, and a somewhat acrid or bitterish taste. Their sp. gr. varies from 0·92 to 1·2. They are fusible by a moderate heat, decomposed at a higher temperature, and in the open air take fire, burning with a yellow flame and much smoke. Insoluble in water, they are dissolved by ether and the volatile oils, and generally by alcohol; and their alcoholic and ethereal solutions afford precipitates upon the addition of water. With pure potassa and soda they unite to form soaps, which are soluble in water; and the same result takes place when they are heated with solutions of the alkaline carbonates. Concentrated sulphuric acid dissolves them with mutual decomposition; and nitric acid converts them into artificial tannin. They readily unite by fusion with wax and the fixed oils.

Common or *yellow resin*, in its purest state, is beautifully clear and pellucid, but much less so as commonly found in the shops. Its odour and taste are usually in a slight degree terebinthinate; its colour yellowish-brown with a tinge of olive, and more or less dark according to its purity, and the degree of heat to which it has been exposed in its preparation. Sometimes it is almost black. It is rather heavier than water. At 276° F. it fuses, is completely liquid at 306°, begins to emit bubbles of gas at 316°, and is entirely decomposed at a red heat. Its ultimate constituents are carbon, hydrogen, and oxygen, in variable proportions. It appears, from the researches of Unverdorben, to contain three distinct resinous bodies, two of which, denominated *pinic* and *sylvic acids*, pre-existed in the turpentine, and the third, called *colophonic acid*, is formed by the agency of the heat in the process of distillation. The *pinic acid* is dissolved by cold spirit of the sp. gr. 0·865, and is thus separated from the sylvic acid. It is obtained pure by adding to the solution a spirituous solution of acetate of copper, dissolving the precipitated pinate of copper in strong boiling alcohol, decomposing this salt with a little muriatic acid, and adding water, which throws down the pinic acid in the form of a resinous powder. The *sylvic acid* is obtained by treating the residue of the common resin with boiling spirit of 0·865, which dissolves it, and lets it fall upon cooling. Both of these resinous acids are colourless. Pinic acid is soluble in weak cold alcohol; sylvic acid is insoluble in the same menstruum when cold, but is dissolved by it when boiling hot, and by strong alcohol at all temperatures. The salts which they form with the alkalies are soluble, those with the earths and metallic oxides, insoluble in water. *Colophonic acid* differs from the others in having stronger acid properties, and in being less soluble in alcohol. It is of a brown colour; and common resin is more or less coloured in proportion to the quantity of this acid which it contains. (*Kane's Chemistry.*) The experiments of Unverdorben were made with European colophony. It is somewhat uncertain whether exactly the same results would be afforded by the common resin of this country, which is obtained from a different species of pine. By the destructive distillation of resin an oleaginous product is obtained, called *resin oil*, which in various degrees of purity is employed in currying leather, lubricating machinery, preparing printers' ink, &c.

White resin differs from the preceding only in being opaque and of a whitish colour. These properties it owes to the water with which it is incorporated, and which gradually escapes upon exposure, leaving it more or less transparent.

Medical Uses. Resin is important as an ingredient of ointments and plasters, but is never used internally. According to Professor Olmsted, it has the property of preventing the oxidation of fatty substances, and thus contributes to the preservation of ointments. (*Am. Journ. of Pharm.*, xxii. 325.)

Off. Prep. Ceratum Cantharidis; Ceratum Resinæ; Ceratum Resinæ Compositum; Emplastrum Cantharidis; Emplastrum Cantharidis Comp.; Emplast. Ferri; Emplast. Hydrargyri; Emplast. Picis; Emplast. Resinæ; Emplast. Saponis; Emplast. Simplex; Unguentum Infusi Cantharidis; Unguent. Picis.

W.

RHAMNI BACCÆ. *Ed.*

Buckthorn Berries.

Fruit of Rhamnus catharticus. *Ed.*

RHAMNI SUCCUS. *Lond.*

Buckthorn Juice.

Rhamnus catharticus. The juice of the fruit. *Lond.*

Baies du nerprun, *Fr.;* Kreutzbeeren, *Germ.;* Bacche del spino cervino, *Ital.;* Bayas de ramno catartico, *Span.*

Rhamnus. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Rhamnaceæ.

Gen. Ch. Calyx tubular. *Corolla* scales defending the stamens, inserted into the calyx. *Berry. Willd.*

Rhamnus catharticus. Willd. *Sp. Plant.* i. 1092; Woodv. *Med. Bot.* p. 594, t. 210. The purging buckthorn is a shrub seven or eight feet high, with branches terminating in a sharp spine. The leaves are in fascicles, on short footstalks, ovate, serrate, veined. The flowers are usually dicœcious, in clusters, small, greenish, peduncled, with a four-cleft calyx, and four very small scale-like petals, placed in the male flower, behind the stamens, which equal them in number. The fruit is a four-seeded berry.

The shrub is a native of Europe, and is said to have been found growing wild in this country. It was first discovered in the Highlands of New York by Dr. Barratt. (*Eaton's Manual.*) It flowers in May and June, and ripens its fruit in the latter part of September. The berries and their juice are officinal. When ripe they are about the size of a pea, round, somewhat flattened on the summit, black, smooth, shining, with four seeds, surrounded by a green, juicy parenchyma. Their odour is unpleasant, their taste bitterish, acrid, and nauseous. The expressed juice has the colour, odour, and taste of the parenchyma. It is reddened by the acids, and from deep-green is rendered light-green by the alkalies. Upon standing it soon begins to ferment, and becomes red in consequence of the formation of acetic acid. Evaporated to dryness, with the addition of lime or an alkali, it forms the colour called by painters *sap green.* The dried fruit of another species, *R. infectorius*, yields a rich yellow colour, for which it is much employed in the arts under the name of *French berries.*

Vogel obtained from the juice of the berries a peculiar colouring matter, acetic acid, mucilage, sugar, and a nitrogenous substance. Hubert found green colouring matter, acetic and malic acids, brown gummy matter, and a bitter substance which he considered as the purgative principle. M. Fleury obtained a peculiar crystallizable principle, which is contained both in the expressed juice and the residue remaining after expression, and for which he proposed the name of *rhamnin;* but he did not ascertain whether it possessed cathartic properties. (See *Journ. de Pharm.*, xxvii. 666.) Winckler obtained from the ripe fruit a

principle which he called *cathartin*, and believes that the rhamnin of Fleury, which was obtained from the unripe berries, is converted into that principle and grape sugar as the fruit matures. (*Chem. Gaz.*, viii. 232.) The *cathartin* of Winckler, which must not be confounded with the substance of the same name at one time supposed to be the purgative principle of senna, may be produced by evaporating the expressed juice of the berries to the consistence of syrup, treating this repeatedly with boiling absolute alcohol till it ceased to yield bitterness to the menstruum, mixing the tinctures, allowing the liquor to become cold, filtering, adding a large excess of ether, allowing the mixed liquids to stand, then filtering, evaporating in a water-bath, and repeating the process with the residue. The cathartin thus obtained is a pale-yellow powder, very bitter, soluble in water and alcohol but not in ether, and actively cathartic in a dose of from one to three grains. (See *N. Y. Journ. of Pharm.*, April, 1853, and *Am. Journ. of Pharm.*, xxv. 526.)

Medical Properties and Uses. Both the berries and the expressed juice are actively purgative; but, as they are apt to occasion nausea and severe griping, with much thirst and dryness of the mouth and throat, they are now little employed. They formerly enjoyed considerable reputation as a hydragogue cathartic in dropsy; and were given also in rheumatism and gout. The only shape in which they are used in this country is that of the syrup, which is sometimes, though rarely, added to hydragogue or diuretic mixtures. (See *Syrupus Rhamni.*) The dose of the recent berries is about a scruple, of the dried a drachm, and of the expressed juice a fluidounce.

Under the name of *cortex frangulæ*, the bark of *Rhamnus Frangula* is sometimes used in Germany as a cathartic. Buchner found in this bark a peculiar yellow volatile colouring principle which he called *rhamnoxanthin;* and which may be obtained by subjecting the alcoholic and ethereal extract to distillation. (*Journ. de Pharm.*, 3e *sér.*, xxiv. 293.)

Off. Prep. Syrupus Rhamni. W.

RHEUM. *U. S., Lond., Ed., Dub.*

Rhubarb.

The root of Rheum palmatum, and other species of Rheum. *U. S.* Root of an undetermined species of Rheum. *Ed., Lond., Dub.*

Rhabarbarum; Rhubarbe, *Fr.;* Rhabarber, *Germ.;* Rabarbaro, *Ital.;* Ruibarbo, *Span.;* Hai-houng, *Chinese;* Schara-modo, *Thibet.*

RHEUM. *Sex. Syst.* Enneandria Trigynia.—*Nat. Ord.* Polygonaceæ.

Gen. Ch. Calyx petaloid, six-parted, withering. *Stamens* about nine, inserted into the base of the calyx. *Styles* three, reflexed. *Stigmas* peltate, entire. *Achenium* three-cornered, winged, with the withered calyx at the base. *Embryo* in the centre of the albumen. (*Lindley.*)

Notwithstanding the length of time that rhubarb has been in use, it has not yet been determined from what precise plant the Asiatic drug is derived. The remoteness of the region where it is collected, and the jealous care with which the monopoly of the trade is guarded, have prevented any accurate information on the subject. All that we certainly know is that it is the root of one or more species of Rheum. The U. S. Pharmacopœia refers it to *R. Palmatum*, with other species not designated. The British Colleges recognise at present no particular species.

The terms *rha* and *rheon*, from the former of which were derived the names *rhabarbarum* and *rhubarb*, and from the latter the botanical title *Rheum*, were applied by the ancients to a root which came from beyond the Bosphorus, and which is supposed, though upon somewhat uncertain grounds, to have been the

product of the *Rheum Rhaponticum*, growing on the banks of the Caspian Sea and the Wolga. This species was also at one time believed to be the source of the medicine now in use; but the true rhubarb has long been known to be wholly distinct from the Rhapontic, and derived from a different source. It was not till the year 1732 that any probable information was obtained as to its real origin. At that time plants were received from Russia by Jussieu in France, and Rand in England, which were said to be of the species which afforded the genuine rhubarb, and were named by Linnæus, under this impression, *Rheum Rhabarbarum*, a title which has since given way to *Rheum undulatum*. At a subsequent period, Kauw Boerhaave obtained from a merchant, who dealt in the rhubarb of Tartary, some seeds which he said were those of the plant which produced the root he sold. These seeds, having been planted, yielded two species of Rheum, *R. undulatum*, and another which Linnæus named *R. palmatum*. Seeds transmitted by Dr. Mounsey from St. Petersburg to Dr. Hope, and planted in the botanic garden at Edinburgh, produced the latter species; and the same was also raised at Upsal from a root received by Linnæus from De Gorter, and was described A. D. 1767 by the younger Linnæus, two years after the appearance of Dr. Hope's paper in the Philosophical Transactions. Thus far the evidence appears equally in favour of *R. palmatum* and *R. undulatum*. The claims of another species were afterwards presented. Pallas, upon exhibiting the leaves of *R. palmatum* to some Bucharian merchants of whom he was making inquiries relative to the rhubarb plant, was told that the leaves of the latter were entirely different in shape; and the description he received of them corresponded more closely with those of *R. compactum*, than of any other known species. Seeds of this plant were, moreover, sent to Miller from St. Petersburg, as those of the true Tartarian rhubarb. A few years since the attention of naturalists was called to a fourth species, for which the same honour has been claimed. Dr. Wallich, superintendent of the botanical garden at Calcutta, received seeds which were said to be those of the plant which yielded the Chinese rhubarb, growing on the Himalaya mountains and the highlands of Tartary. These produced a species not previously described, which Dr. Wallich named *R. Emodi*, from the native title of the plant. It is the *R. australe* of Mr. Don and of Colebrooke, and has been ascertained to afford a root which, though purgative, is very unlike the officinal rhubarb. Other species have been found to grow in the Himalaya mountains, from which a kind of rhubarb used by the natives is said to be procured; but none of it reaches the markets of this country or Europe. From what has been said, it is obvious that no species yet mentioned can be considered as the undoubted source of commercial rhubarb; the plant having, in no instance, been seen and examined by naturalists in its native place. Sievers, an apothecary, sent to Siberia in the reign of Catharine II., with the view of improving the cultivation of the native rhubarb, asserts from the information given him by the Bucharians, that all the seeds procured under the name of true rhubarb are false, and pronounces "all the descriptions in the Materia Medicas to be incorrect." This assertion, however, has no relation to *R. australe* which has been subsequently described; but it is said that the roots of that plant, dried by the medical officers of the British army, differ from true rhubarb in appearance and power.

All the plants of this genus are perennial and herbaceous, with large branching roots, which send forth vigorous stems from four to eight feet or more in height, surrounded at their base with numerous very large petiolate leaves, and terminating in lengthened branching panicles, composed of small and very numerous flowers, resembling those of the Rumex or dock. There is some difficulty in arranging the species, in consequence of the tendency of the cultivated plants to form hybrids; and it is frequently impossible to ascertain to which of the wild

types the several garden varieties are to be referred. The following descriptions are from the *Flora Medica* of Dr. Lindley.

Rheum palmatum. Willd. *Sp. Plant.* ii. 489; Lindley, *Flor. Med.* p. 358; Carson, *Illust. of Med. Bot.* ii. 22, pl. 69. "Leaves roundish-cordate, half palmate; the lobes pinnatifid, acuminate, deep dull-green, not wavy, but uneven and very much wrinkled on the upper side, hardly scabrous at the edge, minutely downy on the under side; sinus completely closed; the lobes of the leaf standing forwards beyond it. Petiole pale green, marked with short purple lines, terete, obscurely channeled quite at the upper end. Flowering stems taller than those of any other species." This species is said to inhabit China in the vicinity of the great wall. It has been cultivated in England and France for the sake of its root, which is generally admitted to approach more nearly in odour, taste, and the arrangement of its colours, than that of any other known species, to the Asiatic rhubarb.

R. undulatum. Willd. *Sp. Plant.* ii. 489; Lindley, *Flor. Med.* p. 357; Woodv. *Med. Bot.* 3d ed. v. 81. "Leaves oval, obtuse, extremely wavy, deep-green, with veins purple at the base, often shorter than the petiole, distinctly and copiously downy on each side, looking as if frosted when young, scabrous at the edge; sinus open, wedge-shaped, with the lower lobes of the leaves turned upwards. Petiole downy, blood-red, semi-cylindrical, with elevated edges to the upper side, which is narrower at the upper than the lower end." This is a native of Siberia, and probably of Tartary and China. It was cultivated by the Russian government as the true rhubarb plant; but the culture has been abandoned. It contributes to the rhubarb produced in France.

R. compactum. Willd. *Sp. Plant.* ii. 489; Lindley, *Flor. Med.* p. 358; Carson, *Illust. of Med. Bot.* ii. 24, pl. 71. "Leaves heart-shaped, obtuse, very wavy, deep-green, of a thick texture, scabrous at the margin, quite smooth on both sides, glossy and even on the upper side; sinus nearly closed by the parenchyma. Petiole green, hardly tinged with red except at the base, semi-cylindrical, a little compressed at the sides, with the upper side broad, flat, bordered by elevated edges, and of equal breadth at each end." This plant is said to be a native of Tartary and China. It is one of the garden rhubarbs, and is cultivated in France for its root.

R. australe. Don, *Prod. Flor. Nepal.* p. 75. —*R. Emodi.* Wallich; Lindley, *Flor. Med.* p. 354; Carson, *Illust. of Med. Bot.* ii. 24, pl. 70. "Leaves cordate, acute, dull-green, but little wavy, flattish, very much wrinkled, distinctly rough, with coarse short hairs on each side; sinus of the base distinctly open, not wedge-shaped but diverging at an obtuse angle, with the lobes nearly turned upwards. Petioles very rough, rounded-angular, furrowed; with the upper side depressed, bordered by an elevated edge, and very much narrower at the upper than the lower end." The root of this species was at one time conjectured to be the source of officinal Asiatic rhubarb; but has been found to have scarcely any resemblance to it. The plant has been cultivated both in Europe and this country, and its petioles answer well for tarts, &c.

R. Rhaponticum. Willd. *Sp. Plant.* ii. 488; Lindley, *Flor. Med.* p. 357; Loudon's *Encyc. of Plants,* p. 335. "Leaves roundish-ovate, cordate, obtuse, pale-green, but little wavy, very concave, even, very slightly downy on the under side, especially near the edge, and on the edge itself; scabrous at the margin; sinus quite open, large, and cuneate. Petiole depressed, channeled on the upper side, with the edges regularly rounded off, pale green, striated, scarcely scabrous. Panicles very compact and short, always rounded at the ends, and never lax as in the other garden species. Flowering stem about three feet high." The Rhapontic rhubarb grows upon the banks of the Caspian Sea, in the deserts between the Wolga and the Oural, and in Siberia. It is said also to grow upon

the borders of the Euxine. It is cultivated as a garden plant in Europe and this country; and large quantities of the root are produced for sale in France. It is said by Royle to be the source of the English rhubarb.

Besides the species above described, *R. leucorrhizum*, growing in the Kirghese desert in Tartary, *R. Caspicum* from the Altaï mountains, *R. Webbianum*, *R. speciforme*, and *R. Moorcraftianum*, natives of the Himalaya mountains, and *R. crassinervium* and *R. hybridum*, cultivated in Europe, but of unknown origin, yield roots which have either been employed as purgatives, or possess properties more or less analogous to those of officinal rhubarb, though they have not entered into general commerce.

The leafstalks of the different species of Rheum have a pleasant acid taste, and are used for making tarts and pies, which are not unlike those made with gooseberries. It is for this purpose only that the plants are cultivated in the United States. Lindley states that R. Rhaponticum, R. hybridum, and R. compactum, and hybrid varieties of them, are the common garden rhubarbs.

In relation to the culture and preparation of rhubarb, our information is almost as uncertain as on the subject of its natural history. The accounts received from the Bucharian merchants are very discordant, and few intelligent travellers have penetrated into the country where the medicine is collected. We shall present, however, a brief abstract of what we have been able to collect upon the subject from the authorities we have consulted.

Rhubarb is produced abundantly in the elevated lands of Tartary, about the lake Koko Norr, and is said to be cultivated in the neighbouring Chinese province of Shen-see, and in that of Setchuen. From these sources it is generally supposed that our supplies of Russian and Chinese rhubarb are exclusively derived; but the root is also collected in Boutan and Thibet, on the north of the Himalaya mountains; and it is probable that the plant pervades the whole of Chinese Tartary. It flourishes best in a light sandy soil. We are told by Mr. Bell, who, on a journey from St. Petersburg to Pekin, had an opportunity of observing it in a growing state, that it is not cultivated by the Tartars, but springs up spontaneously in tufts at uncertain distances, wherever the seeds have fallen upon the heaps of loose earth thrown up by the marmots. In other places the thickness of the grass prevents their access to the soil. The root is not considered sufficiently mature for collection till it has attained the age of six years. It is dug up twice a year in Tartary, in the spring and autumn; in China not till the winter. After removal from the ground, it is cleaned, deprived of its cortical portion and of the smaller branches, and then divided into pieces of a convenient size. These are bored with holes, and strung upon cords to dry, according to Mr. Bell, about the tents and on the horns of sheep; according to Sievers, under sheds, by which the rays of the sun are excluded, while the air has free access. The Chinese are said first to place the pieces on a stone slab heated by fire beneath, and afterwards to complete the drying process by exposing them to the sun and air. In Boutan the roots are hung up in a kind of drying room, in which a moderate and regular heat is maintained. Much time and attention are devoted to the preparation of the root; and Sievers states that a year sometimes elapses from the period of its collection, before it is ready for exportation. A very large proportion of its weight is lost in drying, according to some accounts four-fifths, to others not less than seven-eighths. It is probably in order to favour the drying that the bark is removed. The trade in rhubarb is said to centre in the Chinese town of Si-nin, where a Bucharian company or family is established, which possesses a monopoly of this trade, in consideration of a certain tribute paid to the government. To this city the rhubarb is brought from the various places of its collection, and, having been duly assorted, and undergone further preparation, is transmitted partly to Russia, partly to the coast of China; so that the drug which reaches

us through St. Petersburg is procured from the same neighbourhood with that imported from Canton. But it will soon be seen that there are differences between the Russian and Chinese rhubarb, which would seem to indicate a different origin, and might authorize doubts as to the entire accuracy of the above accounts. It is at least probable that the drug produced in the province of Setchuen, whence the best China rhubarb is said to be brought, takes a more direct route to the coast than that through the town of Si-nin. Besides the two commercial varieties just mentioned, a third occasionally comes to us from Europe, where the cultivation of rhubarb has been carried on for some time with success, especially in France, Belgium, and Great Britain. Of these three varieties we shall treat under different heads.

1. *Chinese Rhubarb.*

India Rhubarb. Rheum Sinense vel *Indicum.* Much the largest proportion of rhubarb consumed in this country is brought from Canton. Though somewhat inferior to the Russian, its comparative cheapness gives it a decided preference in our markets; and, when of good quality, it does not disappoint the expectations of the physician.

It is in cylindrical or roundish pieces, sometimes flattened on one or both sides, of a dirty brownish-yellow colour externally, appearing as if the cortical portion of the root had been removed by scraping, and the surface rendered smooth and somewhat powdery by attrition. The best pieces are heavier than the Russian rhubarb, have a texture rather close and compact, and when broken present a ragged uneven surface, variegated with intermingled shades of dull-red, yellowish, and white, which are sometimes diversified or interrupted by darker colours. The pieces are generally perforated with small holes, intended for convenience of suspension during the drying process; and portions of the suspending cord are not unfrequently found remaining in the holes. Chinese rhubarb has a peculiar somewhat aromatic smell, and a bitter astringent taste, is gritty when chewed, imparts a yellow colour to the saliva, and affords a yellowish powder with a reddish-brown tinge. With the pieces of good quality others often come mingled, which are defective from decay or improper preparation. These are usually lighter, and of a dark or russet colour. Like all the other varieties of rhubarb, this is liable to be attacked by worms; and in almost every large parcel pieces may be found which have suffered from this cause. The want of proper care in its selection by the Chinese merchants, and the exposure incident to a long sea-voyage, are causes which contribute to its inferiority to the Russian rhubarb. As the whole contents of the chest imported are usually powdered together, including the worst as well as the best pieces, it follows that the powder is inferior in efficacy to the selected and sound pieces.

In former editions of this work, we have noticed a variety of rhubarb imported from Canton, which was evidently prepared, before leaving China, so as to resemble the Russian, having an angular surface as if pared with a knife. The pieces were obviously selected with great care, as they were remarkably free from defects. But in most of those which came under our notice, the small penetrating hole was observable, which characterizes the Chinese rhubarb, though it had in some instances been filled with the powdered root, so as in some measure to conceal it. Besides, the colours were not quite so bright as those of Russia rhubarb. This is undoubtedly the variety described by Pereira, under a distinct head, as the *Dutch-trimmed* or *Batavian rhubarb*, and considered by him as probably Bucharian or Russian rhubarb of inferior quality, sent by the way of Canton. A sufficient proof, we think, that this is not the case, is the presence in most pieces of the small penetrating hole, occasionally filled with remains of the cord, and

in some pieces almost shaved away in the paring process. We have never seen such a hole in any piece of true Russian rhubarb, which does not appear to be strung up like the Chinese when dried.

Under the title of *Canton stick rhubarb*, Pereira describes a variety of which small quantities have been imported from Canton into London. It bears much resemblance to the English stick rhubarb, and is supposed to be derived from the branches of the root of the plant which yields the true Chinese rhubarb.

2. *Russian Rhubarb.*

Turkey Rhubarb. Bucharian Rhubarb. Rheum Russicum vel *Turcicum.* The rhubarb taken to Russia from Tartary undergoes a peculiar preparation, in conformity with the stipulations of a contract with the Bucharian merchants who furnish the supply. The best is selected, and each piece perforated in order to ascertain whether it is sound in the centre. From Si-nin it is conveyed by the Bucharian merchants to the frontier town of Kiachta, where it undergoes a rigid inspection by an apothecary stationed at that place by the Russian government. All those pieces which do not pass examination are committed to the flames; and the remainder is sent to St. Petersburg. This variety is sometimes called *Turkey rhubarb*, from the circumstance that it was formerly derived from the Turkish ports, whither it is said to have been brought from Tartary by caravans through Persia and Natolia. The circumstance of the identity of the Russian and Turkey rhubarb, and their decided difference from the Chinese, would appear to indicate a distinct origin for the two varieties. Inferior parcels of the root, which will not pass the inspection of the Russian authorities, are said to enter Russia by Taschkent, and to be known to the druggists of that country by the name of *Taschkent rhubarb.*

The pieces of Russian rhubarb are irregular and somewhat angular, appearing as if the bark had been shaved off longitudinally by successive strokes of a knife, and a portion of the interior substance removed with each shaving. They have a cleaner and fresher appearance than the Chinese, and their colour both internally and externally, though of the same general character, is somewhat more lively. They are less compact and heavy; and are cut with less facility, owing to their giving away before the knife. Another distinction is the character of the perforations, which in the Russian rhubarb are large, frequently reaching only to the centre, and evidently made for the purpose of inspection; while in the Chinese they are small, penetrate completely through the pieces, and were intended for the passage of a suspending cord. The taste and smell of the former closely resemble those of the latter, except that the Russian is rather more aromatic. There is the same crackling under the teeth, and the same yellow stain imparted to the saliva; but the colour of the powder in this variety is a bright yellow, without the brownish tinge exhibited by the Chinese. When thin slices, previously boiled in water, are examined by the microscope, they exhibit numerous clusters of minute crystals of oxalate of lime. Mr. Quekett found between 35 and 40 grains of them in 100 grains of the root. They are observed both in the Russian and Chinese rhubarb.

The care which renders the Russian rhubarb so free from defects, tends greatly to enhance its price, and consequently to limit its consumption. Its great comparative value in the market has led to frequent attempts at adulteration; and the pieces of Chinese rhubarb are sometimes cut down and prepared so as to resemble the Russian. The fraud, however, may be detected by adverting to the peculiarities in texture, colour, and weight, by which the varieties are distinguished, and to the occasional presence of the small penetrating hole or vestiges of it. We have seen a specimen in which the hole was enlarged at its two

extremities, and closed by powder in the middle, with the view of imitating the larger perforations of the Russian pieces. Sometimes the worm-eaten pieces are made to resemble the sound, by filling up the holes with a mixture of pulverized rhubarb and mucilage, and covering over the surface with the powder. By removing this, the fraud is at once revealed.

3. *European Rhubarb.*

In various parts of Europe, particularly in England, France, Belgium, and Germany, the rhubarb plants have been cultivated for many years; and considerable quantities of the root are annually brought into the market. It is imported into this country from England and France.

English Rhubarb. This formerly came in two forms. In one the root was cut and perforated in imitation of the Russian. The pieces were of various shape and size, sometimes cylindrical, but more commonly flat, or somewhat lenticular, and of considerable dimensions. We have for a long time seen none of this variety in our markets. In the other, the pieces are somewhat cylindrical, five or six inches long by an inch or less in thickness, and more or less irregular upon the surface, as if they had shrunk unequally in drying. This is called *stick rhubarb* in England, and is still occasionally met with in our shops. English rhubarb is lighter than the Asiatic, more spongy, and often somewhat pasty under the pestle. It is of a redder colour, and when broken exhibits a more compact and regular marbling; the pinkish lines being arranged in a radiated manner from the centre towards the circumference. The powder also has a deeper reddish tint. The odour is feeble and less aromatic than that of the Asiatic varieties; the taste is astringent and mucilaginous with little bitterness; and the root, when chewed, scarcely feels gritty between the teeth, and but slightly colours the saliva. Few crystals of oxalate of lime are discoverable by means of the microscope. Most of the commercial English rhubarb is now cultivated near Banbury, and is said to be the product of R. Rhaponticum.

French Rhubarb. Rhapontic Rhubarb. Krimea Rhubarb. The rhubarb produced in France is at present, according to Guibourt, chiefly from *R. Rhaponticum*, *R. undulatum*, and *R. compactum;* that of *R. palmatum*, which most closely resembles the Asiatic, having been found to degenerate so much, as not to be a profitable object of culture. Most of the French rhubarb is produced in the neighbourhood of L'Orient, in the department of Morbihan; and the spot where it grows has, from this circumstance, received the name of *Rheumpole.* Two kinds are described by Guibourt, both under the name of *Rhapontic root.* One proceeds from the R. Rhaponticum, growing in the gardens in the environs of Paris; the other, from this and the two other species above mentioned, cultivated at Rheumpole. The former is in pieces of the size of the fist or smaller, ligneous in their appearance, of a reddish-gray colour on the outside, internally marbled with red and white arranged in the form of crowded rays proceeding from the centre to the circumference, of an odour like that of Asiatic rhubarb, but more disagreeable, of a mucilaginous and very astringent taste, not crackling under the teeth, but tinging the saliva yellow, and affording a reddish-yellow powder. The pieces of the latter are irregularly cylindrical, three or four inches long, and from one to two or even three inches thick, less ligneous in appearance than the preceding, and externally of a pale or brownish-yellow colour less inclining to redness. In exterior aspect, this variety bears considerable resemblance to Chinese rhubarb; but may be distinguished by its more disagreeable odour, its astringent and mucilaginous taste, its want of crackling under the teeth, and its radiating fracture, in which properties it is similar to the preceding variety. Considerable quantities of this drug have been imported into

the United States from France, under the name of *Krimea rhubarb;* and it is sometimes employed, we fear, to adulterate the powder of the Chinese rhubarb. It appears to have displaced in France the *Rhapontic root* formerly imported from the Euxine. Whether from difference in species, or from the influence of soil and climate, none of the European rhubarb equals the Asiatic in purgative power.*

Choice of Rhubarb. In selecting good rhubarb, without reference to the commercial variety, those pieces should be preferred which are moderately heavy and compact, of a lively colour, brittle, presenting when broken a fresh appearance, with reddish and yellowish veins intermingled with white, of an odour decidedly aromatic, of a bitter and astringent not mucilaginous taste, feeling gritty and staining the saliva yellow when chewed, and affording a powder either bright yellow, or yellow with but a slight reddish-brown tinge. When very light, rhubarb is usually rotten or worm-eaten; when very heavy and compact, it is of inferior species, culture, or preparation. Rotten, worm-eaten, or otherwise inferior rhubarb, is often powdered and coloured yellow with turmeric; and the shavings left when Chinese rhubarb is trimmed for powdering, or to imitate the Russian, are applied to the same purpose.

Chemical Properties. Rhubarb yields all its active properties to water and alcohol. The infusion is of a dark reddish-yellow colour, with the taste and odour of rhubarb; and the residue, after sufficient maceration, is whitish, inodorous, and insipid. By long boiling the virtues of the medicine are impaired. Many attempts have been made to analyze the root, with various results. Among them, are those of the two Henrys and Caventou of Paris, Brande of London, Peretti of Rome, and Hornemann, Brandes, and Schlossberger and Döpping of Germany. Brandes found in 100 parts of Chinese rhubarb, 2 of pure *rhabarbaric acid*, 7·5 of the same acid impure, 2·5 of gallic acid, 9·0 of tannin, 3·5 of colouring extractive, 11·0 of uncrystallizable sugar with tannin, 4·0 of starch, 14·4 of gummy extractive, 4·0 of pectic acid, 1·1 of malate and gallate of lime, 11·0 of oxalate of lime, 1·5 of sulphate of potassa and chloride of potassium, 1·0 of silica, 0·5 of phosphate of lime and oxide of iron, 25·0 of lignin, and 2·0 of water. The most recent elaborate analysis which has come to our notice is that of Schlossberger and Döpping. Besides extractive, tannic and gallic acids, sugar, starch, pectin, lignin, oxalate of lime, and various inorganic salts, they discovered three colouring principles, holding an intermediate place between resin and extractive matter, being freely soluble in alcohol, and slightly soluble in water. Two of these were uncrystallizable, and denominated *brown resin* and *red resin*, or *phæoretin* and *erythroretin*, the other crystallizable in granular crystals, and identical with the *chrysophanic acid*, previously discovered by Rochleder and

* Besides the varieties of rhubarb above described, others are noticed by writers. Pallas speaks of a *white rhubarb*, brought to Kiachta by the Bucharian merchants who conveyed to that place the drug for Russian commerce. It was white as milk, of a sweet taste, and equal to the best rhubarb in quality. It is supposed to be the product of *R. leucorrhizum.* At present, however, it is unknown at St. Petersburg. The *Himalaya rhubarb* is produced by R. australe, and other species mentioned in the text as growing in the Himalaya mountains. According to Dr. Royle, it makes its way to the lower countries in Hindostan, where it sells for one-tenth of the price of the best rhubarb. Mr. Twining tried it in the Hospital at Calcutta, and found it superior as a tonic and astringent to Russian rhubarb, and nearly equal to it in purgative power. A variety known in Russia as *Bucharian rhubarb*, differing from the variety which we call Russian, and which is known in Russia as Chinese rhubarb, is imported into that country from Tartary, and reaches St. Petersburg by Nishny. Parcels of it are said also to reach Vienna, by the way of Brody in Gallicia. Still another variety is that called *Siberian rhubarb*, which is known in Russia by the name of *Siberian rhapontic root.* As these are inferior kinds, and probably never reach our markets, we have not thought it necessary to swell our pages with descriptions of them. The reader who wishes further information is referred to papers by Pereira, in the *London Pharmaceutical Journal*, republished in the *Am. Journ. of Pharm.*, xviii. 63, and 123.

Heldt in the yellow lichen, or Parmelia parietina of Sprengel. Another resinous substance was also obtained, which was named *aporetin;* but, as it was insoluble in the alcohol from which it had been precipitated by ether, and was isomeric with phæoretin, there is reason to think that it was a product of the operation. The three principles above referred to were obtained by exhausting rhubarb with alcohol, evaporating the tincture, exhausting the extract with water, dissolving the residue in the least possible quantity of alcohol, and treating this solution with ether. A precipitate was produced, a portion of which (aporetin) was insoluble in alcohol, and the remainder was obtained separate by solution in that fluid and evaporation. This was *phæoretin.* It is a yellowish-brown powder, very slightly soluble in water and ether, freely soluble in alcohol and in alkaline solutions, with which it produces an intense reddish-brown colour, and from which it is thrown down yellow by the mineral acids. The ethereal solution of the alcoholic extract, after all the aporetin and phæoretin had been separated, was allowed to evaporate spontaneously, and a large quantity of crystalline granules was obtained, of a beautiful yellow colour. These being washed with ether constituted the *chrysophanic acid.* When the ethereal solution showed no longer a disposition to deposit crystals, it was evaporated, and yielded a product having all the properties of the resins, and forming beautiful purple combinations with potassa and ammonia. This was the *erythroretin,* or red resin of rhubarb. The matter dissolved by water from the alcoholic extract was found to have the odour and taste of rhubarb in a high degree. In this no doubt was contained the peculiar active principle or principles of rhubarb; but Schlossberger and Döpping were not more successful than their predecessors in isolating it. They obtained a slightly bitter extractive matter; but it had not the flavour of rhubarb. (*Pharm. Journ. and Trans.,* iv. 136, 232, 318, and viii. 190.)

Many distinguished chemists have sought for the purgative ingredient of rhubarb, and some not without supposed success; but scarcely has the new principle been described and named, before the fallacy of its claim has been determined. The *caphopicrite* of Henry, the *rhabarbarin* of Pfaff and others, the *rheumin* of Hornemann, the *rhabarbaric acid* of Brandes, and, lastly, the *rhein* of Professor Dulk, have all been shown to be bodies more or less complex; and certainly no one of them can be admitted to be the peculiar purgative principle. The astringency of rhubarb, there can be no doubt, resides in its tannic acid. Some have supposed that the tonic and cathartic properties reside in different principles; but we are disposed to think, from the correspondence of the bitterness with the purgative property, that they reside in the same substance; and, from the fact that exposure to heat diminishes the cathartic power, there is reason to believe that this substance when isolated will prove to be more or less volatile.

Chrysophanic acid is at present one of the most interesting constituents. Most of the hitherto supposed active principles have been mixtures of this with other substances. The rhabarbaric acid of Brandes probably approaches nearest to it in character. When pure it is beautifully yellow, without smell and taste, disposed to an imperfect granular crystallization, almost insoluble in cold water, more soluble in hot water and in ether, but most freely so in alcohol. When heated it emits yellow vapours. Alkaline solutions dissolve it with the production of a beautiful red colour; but the solution with potassa, when evaporated, changes first to violet, and then to blue. It is probably the chief ingredient in the fine yellow colouring matter which is produced by the reaction of nitric acid on rhubarb, and which, in consequence of the magnificent purples which it produces with the alkalies, M. Garot has recently proposed, under the name of *erythrose,* to introduce into the arts as a dyestuff. (See *Journ. de Pharm. et de Chim.,* xvii. 5.)

There are other interesting principles in rhubarb. Some have been disposed to ascribe its odour to a volatile oil; but this has not been isolated. Tannic acid is an important constituent. It is of that variety which precipitates the salts of

sesquioxide of iron of a greenish colour. The oxalate of lime is interesting from its quantity, and from the circumstance that, existing in distinct crystals, it occasions the grittiness of the rhubarb between the teeth. The proportion seems to vary exceedingly in different specimens. According to Scheele and Henry, it constituted nearly one-third, and Quekett found, as already stated, between 35 and 40 per cent.; while Brandes obtained only 11, and Schrader only 4·5 parts in the hundred. Little or no difference of composition has been found between the Russian and Chinese rhubarb. The European contains but a small proportion of oxalate of lime, and is therefore less gritty when chewed. It has, however, more tannin and starch than the Asiatic.

When powdered rhubarb is heated, odorous yellow fumes rise, which are probably in part the vapour of chrysophanic acid. Its infusion is reddened by the alkalies, in consequence of their union with this acid, and their reaction on the other colouring principles. It yields precipitates with gelatin, most of the acids, the salts of sesquioxide of iron, acetate of lead, nitrate of protoxide of mercury, nitrate of silver, protochloride of tin, lime-water, and solutions of quinia. Nitric acid occasions at first a turbidness, and afterwards the deposition of a yellow precipitate. The substances producing precipitates may be considered as incompatible with the infusion.

Medical Properties and Uses. The medical properties of rhubarb are peculiar and valuable. Its most remarkable singularity is the union of a cathartic with an astringent power; the latter of which, however, does not interfere with the former, as the purgative effect precedes the astringent. It is also tonic and stomachic; invigorating, in small doses, the process of digestion. It is not probable that these properties reside in a single proximate principle; and, as rhubarb owes its chief value to their combination, it is not to be expected that chemical analysis will be productive of the same practical advantages in this, as in some other medicines, the virtues of which are concentrated in one ingredient. In its purgative operation rhubarb is moderate, producing fecal rather than watery discharges, and appearing to affect the muscular fibre more than the secretory vessels. It sometimes occasions griping pains. Its colouring principle is absorbed, and may be detected in the urine. By its long continued use, the perspiration, especially that of the axilla, is said to become yellow, and the milk of nurses to acquire a purgative property. It gives a yellow colour to the alvine discharges.

The circumstances of disease to which it is applicable may be inferred from its peculiar properties. When the stomach is enfeebled, or the bowels relaxed, at the same time that a gentle cathartic is required, rhubarb, as a general rule, is preferable to all others. Hence its use in dyspepsia attended with constipation, in diarrhœa when purging is indicated, in the secondary stages of cholera infantum, in chronic dysentery, and in almost all typhous diseases when fecal matter has accumulated in the intestines, or the use of cathartic medicine is necessary to prevent such accumulation. When employed in cases of habitual constipation, its astringent tendency should be counteracted by combining it with soap. Magnesia is also an excellent associate in disorders of the stomach and bowels. By combination with other cathartics, rhubarb frequently acquires additional activity, while it gives increased efficiency to the substance with which it is associated. A mixture of calomel and rhubarb is a brisk and powerful cathartic, much used in the commencement of our bilious fevers. As a general rule, rhubarb is not applicable to cases attended with much inflammatory action. Its griping effect may be counteracted by combining it with aromatics.

The dose of rhubarb as a purgative is from twenty to thirty grains, as a laxative and stomachic from five to ten grains. European rhubarb must be given in double or treble the dose to produce an equal effect. Few medicines are used in a greater variety of forms. It is most effectual in substance. It is frequently

given in the shape of pill, combined with an equal proportion of soap, when its laxative effect is desired. The infusion is much used in cases of delicate stomach, and is peculiarly adapted to children. The syrup and tincture are also highly useful preparations. They are all officinal.

By the roasting of rhubarb its cathartic property is diminished, probably by the volatilization of the purgative principle, while its astringency remains unaffected. This mode of treatment has, therefore, been sometimes resorted to in cases of diarrhœa. By long boiling the same effect is said to be produced.

Powdered rhubarb has been usefully applied to indolent and sloughing ulcers. It is said to have proved purgative when sprinkled over a large ulcerated surface; and the same effect is asserted to have been produced by rubbing it, mingled with saliva, over the abdomen.

Off. Prep. Extractum Rhei; Extract. Rhei Fluidum; Infusum Rhei; Pilulæ Rhei; Pil. Rhei Comp.; Pulvis Rhei Comp.; Syrupus Rhei; Syrupus Rhei Aromaticus; Tinctura Rhei; Tinctura Rhei Comp.; Tinctura Rhei et Aloës; Tinctura Rhei et Gentianæ; Tinctura Rhei et Sennæ; Vinum Rhei. W.

RHŒAS. *Lond., Ed.*

Red Poppy.

Papaver Rhœas. The recent petals. *Lond.* The petals. *Ed.*

Off. Syn. PAPAVER RHŒAS. The petals. *Dub.*

Coquelicot, *Fr.;* Wilder Mohn, Klapperrose, *Germ.;* Rosolaccio, *Ital.;* Amapola, *Span.*

PAPAVER. See OPIUM.

Papaver Rhœas. Willd. *Sp. Plant.* ii. 1146; Woodv. *Med. Bot.* p. 387, t. 139. The *red* or *corn poppy* is distinguished by its hairy stem, which is branched and rises about a foot in height, by its incised pinnatifid leaves, by its urn-shaped capsule, and by the full, bright, scarlet colour of its petals. It is a native of Europe, where it grows wild in great abundance, adorning especially the fields of grain with its brilliant flower. It has been introduced and naturalized in this country.

Its capsules contain the same kind of milky juice as that found in *P. somniferum*, and an extract has been prepared from them having the properties of opium; but the quantity is too small to repay the trouble of its preparation. M. Tilhoi has shown that the extract contains morphia, but in a proportion exceedingly minute compared with that in which it exists in opium. (*Journ. de Pharm. et de Chim.*, ii. 513.) The petals are the officinal portion. They have a narcotic smell, and a mucilaginous, slightly bitter taste. By drying, they lose their odour, and assume a violet-red colour. Chevalier detected a very minute proportion of morphia in an extract obtained from them; but their operation on the system is exceedingly feeble, and they are valued more for their beautiful scarlet colour, which they communicate to water, than for their medical virtues. According to Leo Meier, the colouring principles of the flowers are two acids, which he denominates *rhœadic* and *papaveric acids.* (See *Am. Journ. of Pharm.*, xviii. 211.) A syrup is prepared from them, which was formerly prescribed as an anodyne in catarrhal affections; but is now little esteemed, except for its colour.

Off. Prep. Syrupus Rhœados. W.

RHUS GLABRUM. *U. S. Secondary.*

Sumach.

The fruit of Rhus glabrum. *U. S.*

RHUS. *Sex. Syst.* Pentandria Trigynia.—*Nat. Ord.* Anacardiaceæ.

Gen. Ch. Calyx five-parted. *Petals* five. *Berry* small, with one nuciform seed. *Nuttall.*

Of this genus there are several species which possess poisonous properties, and should be carefully distinguished from that here described. For an account of them the reader is referred to the article *Toxicodendron.*

Rhus glabrum. Willd. *Sp. Plant.* i. 1478. This species of Rhus, called variously *smooth sumach, Pennsylvania sumach,* and *upland sumach,* is an indigenous shrub from four to twelve feet high, with a stem usually more or less bent, and divided into straggling branches, covered with a smooth light-gray or somewhat reddish bark. The leaves are upon smooth petioles, and consist of many pairs of opposite leaflets, with an odd one at the extremity, all of which are lanceolate, acuminate, acutely serrate, glabrous, green on their upper surface, and whitish beneath. In the autumn their colour changes to a beautiful red. The flowers are greenish-red, and disposed in large, erect, terminal, compound thyrses, which are succeeded by clusters of small crimson berries covered with a silky down.

The shrub is found in almost all parts of the United States, growing in old neglected fields, along fences, and on the borders of woods. The flowers appear in July, and the fruit ripens in the early part of autumn. The bark and leaves are astringent, and said to be used in tanning leather and in dyeing. Mr. W. J. Watson found in the bark of the root, albumen, gum, starch, tannic and gallic acids, caoutchouc, resin, colouring matter, and evidences of volatile oil. (*Am. Journ. of Pharm.*, xxv. 194.) Excrescences are produced under the leaves resembling galls in character, and containing large quantities of tannic and gallic acids. These have been used as a substitute for the imported galls by Dr. Walters, of New York, who thought them, in every respect, preferable. They may be collected at little expense, as they are produced very abundantly, especially in the Western States. (*A. W. Ives's edition of Paris's Pharmacologia.*) The only officinal part of the plant is the berries.

These have a sour, astringent, not unpleasant taste, and are often eaten by the country people with impunity. According to Mr. Cozzens, of New York, the acid to which they owe their sourness is the malic, and is contained in the pubescence which covers their surface; as, when it is washed away by warm water, the berries are wholly free from acidity. Professor W. B. Rogers, of Virginia, found the acid combined with lime, in the state of bimalate.* Mr. W. J. Watson ascertained that free malic acid and bimalate of lime coexist in the berries, which contain also, upon the same authority, tannic and gallic acids, fixed oil, extractive, red colouring matter, and a little volatile oil.

Medical Properties and Uses. Sumach berries are astringent and refrigerant; and their infusion has been recommended as a cooling drink in febrile complaints, and a pleasant gargle in inflammation and ulceration of the throat. By Dr. Fahnestock an infusion of the inner bark of the root, employed as a gargle, is considered almost as a specific in the sore mouth attending inordinate mercurial salivation. (*Am. Journ. of Med. Sciences,* v. 61.) W.

* Prof. Rogers suggested that *malic acid* might be advantageously procured from this source. Prof. Procter informs us that he has obtained it by the following process. Pour boiling water on the ripe berries; macerate for twelve hours; strain, evaporate to one-fourth, and again strain; resume the evaporation and continue it till the liquid assumes the consistence of thin syrup; then set it aside to crystallize. Wash the crystals of bimalate of lime with a little water, and recrystallize from a boiling solution. Dissolve the salt in hot water, and decompose it with a solution of acetate of lead. Wash the precipitated malate of lead, suspend it in water, and pass sulphuretted hydrogen through the liquid until the whole of the lead is separated. Lastly, filter and evaporate to dryness, in a porcelain vessel. Malic acid thus obtained may be used in preparing the *malates of iron* and of *manganese,* both of which have been employed medicinally in Europe.

ROSA CANINA. *Lond.*

Dog Rose.

Rosa canina. The recent fruit. *Lond.*

Off. Syn. ROSÆ FRUCTUS. Hip of Rosa canina and of several allied species deprived of the carpels. *Hips. Ed.*

Rose sauvage, *Fr.;* Hundsrose, *Germ.*

Rosa. See ROSA CENTIFOLIA.

Rosa canina. Willd. *Sp. Plant.* ii. 1077; Woodv. *Med. Bot.* p. 493, t. 177. The *dog rose*, *wild briar*, or *heptree*, is a native of Europe, and distinguished as a species by its glabrous ovate germs, its smooth peduncles, its prickly stem and petioles, and its ovate, smooth, rigid leaves. It is eight or ten feet in height, and bears white or pale-red flowers, having usually five obcordate fragrant petals. The plant has been introduced into this country, but is not much cultivated.

The fruit is fleshy, smooth, oval, red, and of a pleasant, sweet, acidulous taste; and contains sugar, and uncombined citric and malic acids.

The pulp, separated from the seeds and the silky bristles in which they are embedded, is employed in Europe for the preparation of a confection, intended chiefly as an agreeable vehicle for other medicines.

Off. Prep. Confectio Rosæ Caninæ. W.

ROSA CENTIFOLIA. *U. S., Lond., Ed., Dub.*

Hundred-leaved Roses.

The petals of Rosa centifolia. *U. S., Ed., Dub.* The recent petals. *Lond.*

Roses a cent feuilles, *Fr.;* Hundertblätterige Rose, *Germ.;* Rosa pallida, *Ital.;* Rosa de Alexandria, *Span.*

Rosa. *Sex. Syst.* Icosandria Polygynia.—*Nat. Ord.* Rosaceæ.

Gen. Ch. Petals five. *Calyx* urceolate, five-cleft, fleshy, contracted at the neck. *Seeds* numerous, hispid, attached to the inner side of the calyx. *Willd.*

Rosa centifolia. Willd. *Sp. Plant.* ii. 1071; Woodv. *Med. Bot.* p. 495, t. 178. This species of rose has prickly stems, which usually rise from three to six feet in height. The leaves consist of two or three pairs of leaflets, with an odd one at the end, closely attached to the common footstalk, which is rough, but without spines. The leaflets are ovate, broad, serrate, pointed, and hairy on the under surface. The flowers are large, with many petals, usually of a pale-red colour, and supported upon peduncles beset with short bristly hairs. The germ is ovate, and the segments of the calyx semi-pinnate. The varieties of *R. centifolia* are very numerous, but may be indiscriminately employed. The plant is now cultivated in gardens all over the world; but its original country is not certainly known. It has sometimes been mistaken for the damask rose, which is a distinct species.

The petals are the officinal portion. They are extremely fragrant, and have a sweetish, slightly acidulous, somewhat bitterish taste. Their odour is said to be increased by iodine. It depends on a volatile oil, which may be separated by distillation with water. (See *Oleum Rosæ.*) They should be collected when the flower is fully expanded, but has not begun to fall. Their fragrance is impaired but not lost by drying. They may be preserved fresh, for a considerable time, by compressing them with alternate layers of common salt in a well-closed vessel, or beating them with twice their weight of that substance.

The petals are slightly laxative, and are sometimes administered in the form of syrup combined with cathartic medicines; but their chief use is in the preparation of rose water. (See *Aqua Rosæ.*)

Off. Prep. Aqua Rosæ; Syrupus Rosæ; Syrupus Sarsaparillæ Compositus. W.

ROSA GALLICA. *U. S., Lond., Ed., Dub.*

Red Roses.

The petals of Rosa Gallica. *U. S., Ed., Dub.* The unexpanded petals, recent and dried. *Lond.*

Roses rouges, *Fr.;* Französiche Rose, Essig rosen, *Germ.;* Rosa domestica, *Ital.;* Rosa rubra o Castillara, *Span.*

Rosa. See ROSA CENTIFOLIA.

Rosa Gallica. Willd. *Sp. Plant.* ii. 1071; Woodv. *Med. Bot.* p. 498, t. 179. This species is smaller than *R. centifolia*, but resembles it in the character of its foliage. The stem is beset with short bristly prickles. The flowers are very large, with obcordate widely spreading petals, which are of a rich crimson colour, and less numerous than in the preceding species. In the centre is a crowd of yellow anthers on thread-like filaments, and as many villose styles bearing papillary stigmas. The fruit is oval, shining, and of a firm consistence. The red rose is a native of the South of Europe, and is cultivated in gardens throughout the United States.

The petals, which are the part employed, should be gathered before the flower has blown, separated from their claws, dried in a warm sun or by the fire, and kept in a dry place. Their odour, which is less fragrant than that of *R. centifolia*, is improved by drying. They have a velvety appearance, a purplish-red colour, and a pleasantly astringent and bitterish taste. Their constituents, according to M. Cartier, are tannin, gallic acid, colouring matter, a volatile oil, a fixed oil, albumen, soluble salts of potassa, insoluble salts of lime, silica, and oxide of iron. (*Journ. de Pharm.*, vii. 531.) Their sensible properties and medical virtues are extracted by boiling water. Their infusion is of a pale reddish colour, which becomes bright red on the addition of sulphuric acid. As their colour is impaired by exposure to light and air, they should be kept in opaque well-closed bottles or canisters.

Medical Properties and Uses. Red roses are slightly astringent and tonic, and were formerly thought to possess peculiar virtues. They are at present chiefly employed in infusion, as an elegant vehicle for tonic and astringent medicines.

Off. Prep. Confectio Rosæ; Infusum Rosæ Compositum; Mel Rosæ; Syrupus Rosæ Gallicæ. W.

ROSMARINUS. *U. S., Ed., Dub.*

Rosemary.

The tops of Rosmarinus officinalis. *U. S., Ed., Dub.*

Romarin, *Fr.;* Rosmarin, *Germ.;* Rosmarino, *Ital.;* Romero, *Span.*

Rosmarinus. *Sex. Syst.* Diandria Monogynia.—*Nat. Ord.* Lamiaceæ or Labiatæ.

Gen. Ch. Corolla unequal, with the upper lip two-parted. *Filaments* long, curved, simple, with a tooth. *Willd.*

Rosmarinus officinalis. Willd. *Sp. Plant.* i. 126; Woodv. *Med. Bot.* p. 329, t. 117. Rosemary is an evergreen shrub, three or four feet high, with an erect stem, divided into many long, slender, ash-coloured branches. The leaves are numerous, sessile, opposite, more than an inch long, about one-sixth of an inch broad, linear, entire, obtuse at the summit, turned backward at the edges, of a firm consistence, smooth and green on the upper surface, whitish and somewhat downy beneath. The flowers are pale-blue or white, of considerable size, and placed in opposite groups at the axils of the leaves, towards the ends of the

branches. The seeds are four in number, of an oblong shape, and naked in the bottom of the calyx.

The plant grows spontaneously in the countries which border on the Mediterranean, and is cultivated in the gardens of Europe and this country. The flowering summits are the officinal portion. They have a strong balsamic odour, which is possessed, though in a less degree, by all parts of the plant. Their taste is bitter and camphorous. These properties are imparted partially to water, completely to alcohol, and depend on a volatile oil which may be obtained by distillation. (See *Oleum Rosmarini.*) The tops lose a portion of their sensible properties by drying, and become inodorous by age.

Medical Properties and Uses. Rosemary is gently stimulant, and has been considered emmenagogue. In the practice of this country it is scarcely used; but in Europe, especially on the continent, it enters into the composition of several syrups, tinctures, &c., to which it imparts its agreeable odour and excitant property. It is sometimes added to sternutatory powders, and is used externally in connexion with other aromatics in the form of fomentation. In some countries it is employed as a condiment; and its flowers, which are much sought after by the bees, impart their peculiar flavour to the honey of the districts in which the plant abounds.

Off. Prep. Oleum Rosmarini; Spiritus Rosmarini. W.

RUBIA. *U. S. Secondary.*

Madder.

The root of Rubia tinctorum. *U. S.*

Garance, *Fr.;* Krappwurzel, *Germ.;* Robbia, *Ital.;* Rubia de tintoreros, Granza, *Span.*

RUBIA. *Sex. Syst.* Tetrandria Monogynia.—*Nat. Ord.* Rubiaceæ. *Juss.*

Gen. Ch. Corolla one-petalled, bell-shaped. *Berries* two, one-seeded. *Willd.*

Rubia tinctorum. Willd. *Sp. Plant.* i. 603; Woodv. *Med. Bot.* p. 173, t. 67.

The root of the *dyers' madder* is perennial, and consists of numerous long, succulent fibres, varying in thickness from the size of a quill to that of the little finger, and uniting at top in a common head, from which also proceed side-roots that run near the surface of the ground, and send up many annual stems. These are slender, quadrangular, jointed, procumbent, and furnished with short prickles by which they adhere to the neighbouring plants upon which they climb. The leaves are elliptical, pointed, rough, firm, about three inches long and nearly one inch broad, having rough points on their edges and midrib, and standing at the joints of the stem in whorls of four, five, or six together. The branches rise in pairs from the same joints, and bear small yellow flowers at the summit of each of their subdivisions. The fruit is a round, shining, black berry.

The plant is a native of the South of Europe, and the Levant, and is cultivated in France and Holland. It is from the latter country that commerce derives its chief supply. The root, which is the part used, is dug up in the third summer, and, having been deprived of its cuticle, is dried by artificial heat, and then reduced to a coarse powder. In this condition it is packed in barrels, and sent into the market. Madder from the Levant is in the state of the whole root, from the South of France, either whole or in powder. The plant is also cultivated in this country, in the States of Delaware and Ohio.

The root consists of a reddish-brown bark, and a ligneous portion within. The latter is yellow in the recent state, but becomes red when dried. The powder, as kept in the shops, is reddish-brown.

Madder has a weak peculiar odour, and a bitterish astringent taste; and imparts these properties, as well as a red colour, to water and alcohol. It contains,

according to M. Runge, five distinct colouring substances; a red, a purple, an orange, a yellow, and a brown. According to M. Decaisne, only yellow colouring matter is found in the recent root; and it is under the influence of atmospheric air that this changes to red. The most interesting of the colouring substances is the *alizarin* of Robiquet and Collin. This is of an orange-red colour, inodorous, insipid, crystallizable, capable of being sublimed without change, scarcely soluble in cold water, soluble in boiling water, and very readily so in alcohol, ether, the fixed oils, and liquid alkalies. The alcoholic and watery solutions are rose-coloured; the ethereal, golden-yellow; the alkaline, violet and blue when concentrated, but violet-red when sufficiently diluted. A beautiful rose-coloured lake is produced by precipitating a mixture of the solutions of alizarin and alum. Rochleder finds a close analogy between alizarin and the chrysophanic acid of rhubarb. (See *Chem. Gaz.*, A.D. 1852, p. 243.) Madder also contains sugar; and Döbereiner succeeded in obtaining alcohol from it by fermentation and distillation, without affecting its colouring properties. It is much used by the dyers.

Medical Properties and Uses. Madder was formerly thought to be emmenagogue and diuretic; and was used in amenorrhœa, dropsy, jaundice, and visceral obstructions. It is still occasionally prescribed in suppressed menstruation; but physicians generally have no confidence in its efficacy in this or any other complaint. When taken into the stomach it imparts a red colour to the milk and urine, and to the bones of animals, without sensibly affecting any other tissue. The effect is observable most quickly in the bones of young animals, and in those nearest the heart. Under the impression that it might effect some change in the osseous system, it has been prescribed in rachitis, but without any favourable result. The dose is about half a drachm, repeated three or four times a day.

W.

RUBUS TRIVIALIS. *U. S. Secondary.*

Dewberry-root.

The root of Rubus trivialis. *U. S.*

RUBUS VILLOSUS. *U. S. Secondary.*

Blackberry-root.

The root of Rubus villosus. *U. S.*

Rubus. *Sex. Syst.* Icosandria Polygynia.—*Nat. Ord.* Rosaceæ.

Gen. Ch. Calyx five-cleft. *Petals* five. *Berry* compound, with one-seeded acini. *Willd.*

Of this extensive genus not less than twenty species are indigenous in the United States, where they are called by the various names of *raspberry*, *blackberry*, *dewberry*, *cloudberry*, &c. Most of them are shrubby or suffruticose briers, with astringent roots and edible berries; some have annual stems without prickles. The only officinal species are the *R. trivialis* and *R. villosus*, which, so far as relates to their medical properties, are so closely alike as not to require a separate description.

1. *Rubus trivialis.* Michaux, *Flor. Americ.* i. 296. The *dewberry*, sometimes also called *low blackberry*, or *creeping blackberry*, has a slender, prickly stem, which runs along the ground, and occasionally puts forth roots. The leaves are petiolate, and composed of three or five leaflets, which are oblong-oval, acute, unequally serrate, and somewhat pubescent. The stipules are awl-shaped. The flowers are large, white, and nearly solitary, with elongated pedicels, and peduncles

which, like the leafstalks, are armed with recurved, hispid prickles. The petals are generally obovate, and three times longer than the calyx. In one variety they are orbicular. The plant grows abundantly in old fields and neglected grounds in the Middle and Southern States. Its fruit is large, black, of a very pleasant flavour, and ripens somewhat earlier than that of *R. villosus.* According to Torrey and Gray, the dewberry of the Northern States is the *Rubus Canadensis* of Linn., or *R. trivialis* of Pursh. (*Flor. of N. Am.* i. 455.)

2. *R. villosus.* Willd. *Sp. Plant.* ii. 1085; Bigelow, *Am. Med. Bot.* ii. 160; Barton, *Med. Bot.* ii. 151. The stem of the blackberry is somewhat shrubby, from three to seven feet high, branching, more or less furrowed and angular, and armed with strong prickles. The smaller branches and young shoots are herbaceous. The leaves are ternate or quinate; the leaflets ovate, acuminate, unequally and sharply serrate, and pubescent on both sides; the footstalk and midrib usually armed with short recurved prickles. The flowers are large, white, and in erect racemes, with a hairy, prickly stalk. The calyx is short, with acuminate segments. The fruit is first green, then red, and, when perfectly ripe, of a shining black colour and very pleasant taste. It is a compound berry, consisting of numerous pulpy one-seeded globules or acini attached to the receptacle. This species of Rubus is, perhaps, the most abundant of those indigenous in the United States, growing in neglected fields, along fences, on the borders of woods, in forest glades, and wherever tillage or too much shade and moisture does not interfere with it. Its flowers appear from May to July, and its fruit is ripe in August.

The berries of both these species of Rubus are much used as food; and a jelly made from them is in great esteem as an article of diet, and even as a remedy in dysenteric affections. The roots only are officinal.

The blackberry root is branching, cylindrical, of various dimensions, from nearly an inch in thickness down to the size of a straw, ligneous, and covered with a thin bark, which is externally of a light-brownish or reddish-brown colour, and in the dried root is wrinkled longitudinally. The dewberry root is usually smaller, without the longitudinal wrinkles, but with transverse fissures through the epidermis, and of a dark-ash colour, without any reddish tinge. Both are inodorous. The bark in both has a bitterish strongly astringent taste, and the ligneous portion is nearly insipid, and comparatively inert. The smaller roots, therefore, should be selected for use; or, if the thicker pieces are employed, the cortical part should be separated, and the wood rejected. Their virtues are extracted by boiling water, and by diluted alcohol, and depend chiefly, if not exclusively, upon tannin, which experiment has proved to be an abundant constituent.

Medical Properties and Uses. Dewberry and blackberry roots are tonic and strongly astringent. They have long been a favourite domestic remedy in bowel affections; and from popular favour have passed into regular medical use. Given in the form of decoction, they are usually acceptable to the stomach, without being offensive to the taste; and may be employed with great advantage in cases of diarrhœa from relaxation of the bowels, whether in children or adults. We can add our own decided testimony to that of others who have spoken favourably of their use in this complaint; and there is no doubt that they are applicable to all other cases in which the vegetable astringents are found serviceable. The decoction may be prepared by boiling an ounce of the smaller roots, or of the bark of the larger, in a pint and a half of water down to a pint; of which from one to two fluidounces may be given to an adult three or four times, or more frequently, during the twenty-four hours. The dose of the powdered root is twenty or thirty grains. W.

RUMEX BRITANNICA. *U.S. Secondary.*

Water Dock.

The root of Rumex Britannica. *U. S.*

RUMEX OBTUSIFOLIUS. *U.S. Secondary.*

Blunt-leaved Dock.

The root of Rumex obtusifolius. *U. S.*

Rumex. *Sex. Syst.* Hexandria Trigynia.—*Nat. Ord.* Polygonaceæ.

Gen. Ch. Calyx three-leaved. *Petals* three, converging. *Seed* one, three-sided. *Willd. Calyx* six-parted, persistent, the three interior divisions petaloid, connivent. *Seed* one, three-sided, superior, naked. *Stigmata* multifid. *Nuttall.*

Several species of Rumex have acid leaves, and are distinguished by the common name of *sorrel* from the others, which are called *dock*. Of the former, *Rumex Acetosa* or *common English sorrel*, has but recently been dismissed from the London and Dublin Pharmacopœias. *R. Acetosella* is the common sorrel of our fields, though supposed to have been originally introduced from Europe. The leaves of both these plants are agreeably sour to the taste, and owe their acidity to binoxalate of potassa with a little tartaric acid. They quite lose this taste in drying. They are refrigerant and diuretic, and may be used advantageously as an article of diet in scorbutic complaints. For this purpose they are prepared in the form of salad. The juice of the leaves forms with water an agreeable acidulous drink, sometimes used in fevers. Taken very largely, the leaves are said to have produced poisonous effects. (See *Wood's Quarterly Retrospect*, i. 109.) *R. scutatus* also ranks among the sorrels.

Of the proper docks, though two only are recognised by the Pharmacopœia, several others have been used. The roots of *R. Patientia* and *R. Alpinus*, European plants, and of *R. aquaticus*, *R. crispus*, *R. acutus*, and *R. sanguineus*, belonging both to Europe and the United States, may be employed indiscriminately with those of the officinal species. *R. Hydrolapathum* (*Hudson*), which is the *R. aquaticus* of the late Dublin Pharmacopœia, is thought to be the *Herba Britannica* of the ancients, celebrated for the cure of scurvy and diseases of the skin. The docks are herbaceous plants with perennial roots. Their flowers are in terminal or axillary panicles. Some of the species are dicœcious; but those here described have perfect flowers.

1. *R. Britannica.* Willd. *Sp. Plant.* ii. 250. This species is distinguished in the vernacular language by the name of *yellow-rooted water dock*. The root is large, dark on the outside, and yellow within. The stem is two or three feet high, and bears broad-lanceolate, smooth, flat leaves, with the sheathing stipules slightly torn. The spikes of the panicle are leafless; the valves entire and all graniferous. The plant is indigenous, inhabiting low, wet places, and flowering in June and July.

2. *R. obtusifolius.* Willd. *Sp. Plant.* ii. 254; Loudon's *Encyc. of Plants*, p. 293. The root of the *blunt-leaved dock* is externally brown, internally yellow; the stem two or three feet high and somewhat rough; the radical leaves ovate-cordate, obtuse, and very large; the valves dentate, and one of them conspicuously graniferous. It is a common weed in our rich grounds and pastures, but is supposed to have been introduced from Europe. Its flowers appear in June and July.

Dock root, from whatever species derived, has an astringent, bitter taste, with

little or no smell. It readily yields its virtues to water by decoction. According to Riegel, the root of *R. obtusifolius* contains a peculiar principle called *rumicin*, resin, extractive matter resembling tannin, starch, mucilage, albumen, lignin, sulphur, and various salts, among which are the phosphate of lime, and different acetates and malates. (*Journ. de Pharm.*, 3*e sér.*, i. 410.) Rumicin is probably, like rhabarbaric acid, an impure form of chrysophanic acid. (See *Rheum.*) The leaves of most of the species are edible, and are occasionally used as spinage. They are somewhat laxative, and form an excellent diet in scorbutic cases. The roots are used to dye a yellow colour.

Medical Properties and Uses. The medical properties of dock root are those of an astringent and mild tonic. It is also supposed to possess an alterative property, which renders it useful in scorbutic disorders, and cutaneous eruptions, particularly the itch, in the cure of which it enjoyed at one time considerable reputation. It is said to have proved useful in scrofula and syphilis. Dr. Thomson found a decoction of the root of *R. Patientia* very efficacious in obstinate ichthyosis. *R. aquaticus* and *R. Britannica* are the most astringent. The roots of some species unite a laxative with the tonic and astringent property, resembling rhubarb somewhat in their operation. Such are those of *R. crispus* and *R. obtusifolius;* and *R. Alpinus* has in some parts of Europe the name of *mountain rhubarb.* This resemblance of properties is not singular, as the two genera belong to the same natural family. Dock root is given in powder or decoction. Two ounces of the fresh root bruised, or one ounce of the dried, may be boiled in a pint of water, of which two fluidounces may be given at a dose, and repeated as the stomach will bear it. The root has often been applied externally in the shape of ointment, cataplasm, and decoction, to the cutaneous eruptions and ulcerations for which it has been used internally. The powdered root is recommended as a dentifrice, especially when the gums are spongy. W.

RUTA. *U. S. Secondary, Lond., Ed.*

Rue.

The leaves of Ruta graveolens, *U.S.*, *Lond.* Leaves and unripe fruit. *Ed.*
Rue odorante, *Fr.;* Garten-Raute, *Germ.;* Ruta, *Ital.;* Ruda, *Span.*

RUTA. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Rutaceæ.

Gen. Ch. Calyx five-parted. *Petals* concave. *Receptacle* surrounded by ten melliferous points. *Capsule* lobed. *Willd.*

Ruta graveolens. Willd. *Sp. Plant.* ii. 542; Woodv. *Med. Bot.* p. 487, t. 174. Common rue is a perennial plant, usually two or three feet high, with several shrubby branching stems, which, near the base, are woody and covered with a rough bark, but in their ultimate ramifications are smooth, green, and herbaceous. The leaves are doubly pinnate, glaucous, with obovate, sessile, obscurely crenate, somewhat thick and fleshy leaflets. The flowers are yellow, and disposed in a terminal branched corymb upon subdividing peduncles. The calyx is persistent, with four or five acute segments; the corolla consists of four or five concave petals, somewhat sinuate at the margin. The stamens are usually ten, but sometimes only eight in number. The plant is a native of the South of Europe, but cultivated in our gardens. It flowers from June to September. The whole herb is active; but the leaves are usually employed.

These have a strong disagreeable odour, especially when rubbed. Their taste is bitter, hot, and acrid. When recent, and in full vigour, they have so much acrimony as to inflame and even blister the skin, if much handled; but the acrimony is diminished by drying. Their virtues depend chiefly on a volatile oil, which is very abundant, and is contained in glandular vesicles, apparent over

the whole surface of the plant. (See *Oleum Rutæ.*) They contain, also, according to Mähl, chlorophylle, albumen, an azotized substance, extractive, gum, starch or inulin, malic acid, and lignin; and, according to Bornträger, a peculiar acid which he calls *rutinic acid.* (See *Chem. Gazette, Sept.* 1845, p. 385.) Both alcohol and water extract their active properties.

Medical Properties and Uses. Rue is stimulant and antispasmodic, and, like most other substances which excite the circulation, occasionally increases the secretions, especially when deficient from debility. It appears to have a tendency to act upon the uterus; in moderate doses proving emmenagogue, and in larger doses producing a degree of irritation in that organ which sometimes determines abortion. Taken very largely it acts as an acrid narcotic poison. Three cases are recorded by Dr. Hélie in which it was taken by pregnant women, with the effect of producing dangerous gastro-intestinal inflammation and cerebral derangement, which continued for several days, but from which the patients ultimately recovered. In each instance miscarriage resulted. Great depression and slowness of the pulse attended the narcotic action of the poison. In one of the cases, three fresh roots of the size of the finger were used in the form of decoction. (*Ann. d'Hyg. Pub. et de Méd. Lég.*, xx. 180.) A case is recorded by Dr. G. F. Cooper in the *Nashville Journ. of Med. and Surg.*, in which a man, convalescent from dysentery, having added some brandy to a handful of the bruised herb, expressed it, and took the whole of the liquor with fatal effects. The prominent symptoms were vomiting, violent tormina, tenesmus, with bloody stools, abdominal distension with tenderness, and severe strangury. (*Med. Exam.*, N. S., ix. 720.) Rue is sometimes used in hysterical affections, worms, flatulent colic, and amenorrhœa, particularly in the last complaint. The ancients employed it as a condiment, and believed it to possess, besides other valuable properties, that of resisting the action of poisons. Its excitant and irritating properties require that it should be used with caution. The dose of the powder is from fifteen to thirty grains two or three times a day. The medicine is also given in infusion and extract.

Off. Prep. Confectio Rutæ; Oleum Rutæ. W.

SABADILLA. *U.S., Ed.*

Cevadilla.

The seeds of Veratrum Sabadilla. *U.S.* Fruit of Veratrum Sabadilla, Helonias officinalis, and probably of other Melanthaceæ. *Ed.*

Cévadille, *Fr.;* Sabadillsame, *Germ.;* Cebadilla, *Span.*

There has been much uncertainty in relation to the botanical origin of cevadilla. At one time, it was generally believed to be derived from *Veratrum Sabadilla*, which is recognised in the U. S. Pharmacopœia. But Schiede, during his travels in Mexico, ascertained that it was, in part at least, collected from a different plant, of the same natural order of Melanthaceæ, growing upon the eastern declivity of the Mexican Andes. This was considered by Schlechtendahl as another species of Veratrum, by Don as a Helonias, and by Lindley as belonging to a new genus which he named Asagræa. Hence it has been variously denominated *Veratrum officinale*, *Helonias officinalis*, and *Asagræa officinalis.* The Edinburgh College recognises this plant, under Don's title of Helonias officinalis, as one of the sources of cevadilla, but refers the drug also to Veratrum Sabadilla, and admits other plants of the same order as probable sources of it. More exact information, however, is wanted before we can determine its precise origin. It has been adopted in the Pharmacopœias solely on account

of its employment in the preparation of veratria. It is brought from Vera Cruz.*

Cevadilla seeds usually occur in commerce mixed with the fruit of the plant. This consists of three coalescing capsules or follicles, which open above, and present the appearance of a single capsule with three cells. It is three or four lines long and a line and a half in thickness, obtuse at the base, light-brown or yellowish, smooth, and in each capsule contains one or two seeds. A resemblance existing or supposed between this fruit and that of barley, is said to have given rise to the Spanish name cevadilla, which is a diminutive of barley. The seeds are elongated, pointed at each end, flat on one side and convex on the other, somewhat curved, two or three lines long, wrinkled, slightly winged, black or dark-brown on the outside, whitish within, hard, inodorous, and of an exceedingly acrid, burning, and durable taste. Cevadilla was found by Pelletier and Caventou to contain a peculiar organic alkali which they named *veratria*, combined with gallic acid; fatty matter, consisting of olein, stearin, and a peculiar volatile fatty acid denominated *cevadic* or *sabadillic acid;* wax; yellow colouring matter; gum; lignin; and salts of potassa and of lime, with a little silica. From 100 parts of the seeds, separated from their capsules, Meissner obtained 0·58 of veratria. M. Couërbe discovered another alkaloid in the seeds which he denominated *sabadillin*. Besides the principles above mentioned, a peculiar acid was discovered by Merck, called *veratric acid*, which is in colourless crystals, fusible and volatilizable without decomposition, but slightly soluble in cold water, more soluble in hot water, soluble in alcohol, insoluble in ether, having the properties of reddening litmus paper, and forming soluble salts with the alkalies. For an account of the mode of preparing veratria, its properties, and remedial applications, and for a more particular notice of sabadillin (*sabadillia*), see the article *Veratria* in the second part of this work.

Medical Properties and Uses. Cevadilla is an acrid drastic emeto-cathartic, operating occasionally with great violence, and in over-doses capable of producing fatal effects. It was made known as a medicine in Europe so early as the year 1572; but has never been much employed. It has been chiefly used as an anthelmintic, especially in cases of tænia, in which it has been given in doses varying

* Until more definite information is obtained on the subject, we give in a note a brief description of the two plants above referred to.

Veratrum Sabadilla. Retzius, *Obs.* i. 31; Carson, *Illust. of Med. Bot.* ii. 50, pl. 94. See *Veratrum Album.* The leaves of this plant are numerous, ovate-oblong, obtuse, with from eight to fourteen ribs, glaucous beneath, and all radical. The flower-stem is erect, simple, and round, rises three or four feet in height, and bears a spreading, simple, or but slightly branched panicle of somewhat nodding flowers, supported upon very short pedicels. The flowers, which are of a blackish-purple colour, approximate in twos and threes, the fertile turning at length to one side, and the sterile falling off. The segments of the corolla are ovate-lanceolate, and without veins. The capsules occupy only one side of the stem. This plant grows in Mexico and the West Indies, and was cultivated by Descourtilz at San Domingo, from seeds obtained in Mexico.

Asagræa officinalis. Lindley, *Botan. Reg.*, June, 1839. — *Veratrum officinale.* Schlechtendahl, *Linnæa*, vi. 45. — *Helonias officinalis.* Don. *Ed. New Phil. Journ.*, October, 1832, p. 234. The following is the generic character given by Lindley. "*Flowers* polygamous, racemose, naked. *Perianth* six-partite; segments linear, veinless, almost equal, with a nectariferous excavation at the base, equal to the stamens. *Stamens* alternately shorter; anthers cordate as if unilocular, after dehiscence shield-shaped. *Ovaries* three, quite simple, attenuated into an obscure stigma. *Follicles* three, acuminate, papery; seeds scimitar-shaped, corrugated, winged. Bulbous herbs, with grass-like leaves, and small, pale, and densely racemed flowers." The *A. officinalis*, which is the only known species, has linear, acuminate, subcarinate leaves, roughish at the margin, and four feet in length by three lines in breadth, and a round flower stem, about six feet high, terminating in a very dense, straight, spike-like raceme, eighteen inches long. The flowers are white, with yellow anthers.

from five to thirty grains. It has also been given in different nervous affections. It is the principal ingredient of the *pulvis Capucinorum*, sometimes used in Europe for the destruction of vermin in the hair. It is considered by the natives of Mexico useful in hydrophobia, and was employed by M. Fouilhoux, of Lyons, in a supposed case of that disease, in the dose of about nine grains, with asserted success. Externally applied, it is highly irritating, and is even said to be corrosive. Its chief employment at present is for the preparation of veratria.

Off. Prep. Veratria. W.

SABBATIA. *U.S.*

American Centaury.

The herb of Sabbatia angularis. *U. S.*

SABBATIA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Gentianaceæ.

Gen. Ch. Calyx five to twelve-parted. *Corolla* rotate, five to twelve-parted. *Stigmas* two, spiral. *Anthers* at length revolute. *Capsule* one-celled, two-valved, many-seeded. *Nuttall.*

Sabbatia angularis. Pursh, *Flor. Am. Sept.* 137; Bigelow, *Am. Med. Bot.* iii. 147; Barton, *Med. Bot.* i. 255.—*Chironia angularis.* Linn. The American centaury is an annual or biennial herbaceous plant, with a fibrous root, and an erect, smooth, four-sided stem, winged at the angles, simple below, sending off opposite axillary branches above, and rising one or two feet in height. The leaves, which vary considerably in length and width, are ovate, entire, acute, nerved, smooth, opposite, and sessile, embracing half the circumference of the stem at their base. The flowers are numerous, growing on the ends of the branches, and forming altogether a large terminal corymb. The calyx is divided into five lanceolate segments, considerably shorter than the corolla. This is deeply five-parted, with obovate segments of a beautiful delicate rose-colour, which is paler and almost white in the middle of their under surface. The anthers are yellow, and, after shedding their pollen, become revolute. The style, which is bent downward, and is longer than the stamens, terminates in two linear stigmas, which become spirally twisted together.

The plant is widely diffused through the Middle and Southern States, growing in low meadow grounds, and in wet seasons upon uplands, in woods and neglected fields. It flowers in July and August. In its general aspect as well as medical properties, it bears a close resemblance to *Erythræa Centaurium*, or European centaury, for which it was mistaken by the earlier settlers. The whole herb is employed, and should be collected when in flower.

All parts of it have a strongly bitter taste, without any admixture of astringency, or other peculiar flavour. Both alcohol and water extract its bitterness, together with its medical virtues.

Medical Properties and Uses. American centaury has the tonic properties of the simple bitters, and is very analogous in its action to the other plants belonging to the same natural family. It has long been popularly employed as a prophylactic and remedy in our autumnal intermittent and remittent fevers; and was formerly much esteemed by some physicians in the latter of these complaints. The condition to which it was considered applicable, was that existing between the paroxysms, when the remission was such as to call for the use of tonics, but was not deemed sufficient to justify a resort to the preparations of Peruvian bark. It is occasionally useful, during the progress of a slow convalescence, by promoting appetite and invigorating digestion; and may be employed for the same purpose in dyspepsia and diseases of debility.

The most convenient form for administration is that of infusion. A pint of

boiling water poured on an ounce of the herb and allowed to cool, may be given in the dose of two fluidounces, repeated every hour or two during the remission of fevers, and less frequently in chronic affections. The dose of the powder is from thirty grains to a drachm. The decoction, extract, and tincture are also efficient preparations. W.

SABINA. *U. S., Lond., Ed., Dub.*

Savine.

The tops of Juniperus Sabina. *U. S., Ed., Dub.* The recent and dried tops. *Lond.*

Sabine, *Fr.;* Sevenbaum, *Germ.;* Sabina, *Ital., Span.*

JUNIPERUS. See JUNIPERUS.

Juniperus Sabina. Willd. *Sp. Plant.* iv. 852; Woodv. *Med. Bot.* p. 10, t. 5. This is an evergreen shrub, from three to fifteen feet in height, with numerous erect, pliant branches, very much subdivided. The bark of the young branches is light-green, that of the trunk rough and reddish-brown. The leaves, which completely invest the younger branches, are numerous, small, erect, firm, smooth, pointed, dark-green, glandular in the middle, opposite, and imbricated in four rows. The flowers are male and female on different trees. The fruit is a blackish-purple berry, of an ovoid shape, marked with tubercles and the remains of the calyx and petals, and containing three seeds.

The savine is a native of the South of Europe and the Levant, and is said to grow wild in the neighbourhood of our north-western lakes. The ends of the branches, and the leaves by which they are invested, are collected for medical use in the spring. When dried they fade very much in colour.

There is reason to believe that the tops of *Juniperus Virginiana*, or common red cedar, are sometimes substituted in the shops for the savine, to which they bear so close a resemblance as to be with difficulty distinguished. The two species, however, differ in their taste and smell. In *J. Virginiana*, moreover, the leaves are sometimes ternate.

The tops and leaves of the savine plant have a strong, heavy, disagreeable odour, and a bitter, acrid taste. These properties, which are less striking in the dried than in the recent leaves, are owing to a volatile oil, which is obtained by distillation with water. (See *Oleum Sabinæ.*) The leaves impart their virtues to alcohol and water. From an imperfect analysis by Mr. C. H. Needles, they appear to contain volatile oil, gum, tannic or gallic acid, resin, chlorophylle, fixed oil, bitter extractive, lime, and salts of potassa. (*Am. Journ. of Pharm.*, xiii. 15.)

Medical Properties and Uses. Savine is highly stimulant, increasing most of the secretions, especially those of the skin and uterus, to the latter of which organs it is supposed to have a peculiar direction. It has been much used in amenorrhœa, and occasionally as a remedy for worms. Dr. Chapman strongly recommended it in chronic rheumatism; and it is employed in Germany, both internally and externally, in chronic gout. In overdoses it is capable of producing dangerous gastro-intestinal inflammation, and should therefore be used with caution. In no case should it be employed when much general or local excitement exists. In pregnancy it should always be given with great caution; though it has recently been recommended as an effective remedy in certain forms of menorrhagia, and is asserted to prove occasionally useful in preventing threatened abortion. (See *Am. Journ. of Med. Sci.*, N. S., viii. 475.) It is most conveniently administered in the form of powder, of which the dose is from five to fifteen grains, repeated three or four times a day.

As an external irritant it is useful, in the form of cerate, for maintaining a

discharge from blistered surfaces; but, as the preparation sold in this country under the name of savine ointment is often feeble, either from the age of the drug, or the substitution of red cedar, it has in some measure fallen into disrepute. (See *Ceratum Sabinæ.*) In powder or infusion, savine is used in Europe as an application to warts, indolent, carious, and gangrenous ulcers, psora, and tinea capitis; and the expressed juice of the fresh leaves, diluted with water, is sometimes applied to similar purposes.

Off. Prep. Ceratum Sabinæ; Oleum Sabinæ; Unguentum Sabinæ. W.

SACCHARUM. *U. S., Lond.*

Sugar.

The sugar of Saccharum officinarum, refined. *U. S.* The prepared, purified, crystalline juice of the stem. *Lond.*

Off. Syn. SACCHARUM PURUM. *Ed.* SACCHARUM PURIFICATUM. *Dub.*

White Sugar; Sucre pur, Sucre en pains, *Fr.;* Weisser Zucker, *Germ.;* Zucchero en pane, *Ital.;* Azucar de pilon, Azucar refinado, *Span.*

SACCHARUM COMMUNE. *Ed.*

Brown Sugar.

Impure sugar, from Saccharum officinarum. *Muscovado. Ed.*

Off. Syn. BROWN SUGAR. *Dub.*

Raw or muscovado sugar; Sucre brut, Cassonade rouge, Moscouade, *Fr.;* Gemeiner Zucker, *Germ.;* Zucchero brutto, *Ital.;* Azucar negro, *Span.*

SACCHARI FÆX. *Lond., Ed.*

Molasses.

Saccharum officinarum. The impure prepared juice. *Lond.* The concentrated uncrystallizable juice. *Ed.*

Off. Syn. THERIACA. *Treacle. Dub.*

Mélasse, *Fr.;* Zuckersatz, Zuckersyrup, *Germ.;* Melazzo, *Ital.;* Melaca, *Span.*

The saccharine principles distinguished by the chemist are cane sugar, or sugar properly so called, derived from the sugar cane, the beet, and the sugar maple; glucose or grape sugar, with which the crystallizable sugar of honey, starch sugar, and diabetic sugar are identical; uncrystallizable sugar, or *fruit sugar*, called by Soubeiran *chulariose* (from χυλαριον, syrup); *sorbin*, or the sugar of the berries of the mountain ash (*Sorbus aucuparia*); lactin, or sugar of milk; sugar of ergot, improperly called mushroom sugar; mannite; and glycerin. *Glucose* or *grape sugar* is less sweet than cane sugar. It is also less soluble in water, and much more soluble in alcohol. It has the sp. gr. of 1·386. Obtained from a concentrated aqueous solution, it forms crystalline grains. Strong mineral acids hardly act on grape sugar, but destroy cane sugar with facility. On the other hand, grape sugar is destroyed by alkalies, with which cane sugar forms definite compounds. Dissolved in water and subjected to prolonged ebullition, grape sugar undergoes very little alteration. Its solution rotates the plane of polarization of polarized light to the right, and is capable of undergoing the vinous fermentation directly, without passing through any intermediate state. *Uncrystallizable sugar* exists in honey and the juice of fruits, and is generated from cane sugar by solution in

water or weak acids, and long boiling. Hence it is present in molasses. The view of Liebig that uncrystallizable sugar, whether derived from fruits, or generated by weak acids, is really a combination of ordinary sugar with an acid, has been disproved by Soubeiran, who obtained it exempt from acid, and, therefore, considers it a distinct kind of sugar. An aqueous solution of this sugar turns the plane of polarization to the left, and, like grape sugar, is susceptible of the vinous fermentation without an intermediate change. Uncrystallizable sugar is transformed into grape sugar, when it is made to assume a crystalline structure, but not by mere solidification. (*Soubeiran.*) A solution of *cane sugar*, like that of grape sugar, has a rotating power to the right. When it ferments, it is not, as is generally supposed, first converted into grape sugar. It is found both by Mitscherlich and Soubeiran to be first changed into uncrystallizable sugar; and, as the change proceeds, the rotating power to the right of the cane sugar gradually lessens and disappears, and is replaced by the rotating power to the left of the uncrystallizable sugar formed. *Sorbin* was discovered by M. Pelouze. It is in perfectly transparent crystals, having the same taste as cane sugar, but is not susceptible of fermentation. *Lactin* or *sugar of milk* is now officinal with the Dublin College, *Pharm.* of 1850. (See *Saccharum Lactis.*) For a description of *mannite* and *glycerin*, see the articles *Manna* and *Glycerina.*

Cane sugar is manufactured extensively on the continent of Europe from the beet, and in considerable quantities, in Canada and the north-western parts of the United States, from the sap of the sugar maple (*Acer Saccharinum*). In relation to maple sugar, see a paper by Dr. George D. Gibb, in the *Brit. Am. Journ. of Med. Sci.* for July, 1851. Cane sugar may also be obtained from cornstalks. (*H. L. Ellsworth.*) In India, it is made from the sap of different species of palm. In 1844, more than 6000 tons of crude *palm sugar*, called *jaggary*, were manufactured. It is more easily refined, and at less cost than the sugar from the cane. (*Stevens.*) But the supply of sugar from these sources is insignificant when compared with that obtained from the sugar cane itself, which is extensively cultivated in the East and West Indies, Brazil, and some of our Southern States, particularly Louisiana. This plant is the *Saccharum officinarum* of botanists, and is the source of the officinal sugars of the Pharmacopœias.

SACCHARUM. *Sex. Syst.* Triandria Digynia.—*Nat. Ord.* Graminaceæ.

Gen. Ch. Calyx two-valved, involucred, with long down. *Corolla* two-valved. *Willd.*

Saccharum officinarum. Willd. *Sp. Plant.* i. 321; *Phil. Trans.* lxix. 207. The *sugar cane* is an herbaceous plant, possessing a jointed, succulent root, from which arise several shining, jointed, solid stems, from an inch to two inches in diameter, and from six to twelve feet high, and containing a white and juicy pith. The colour of the stem is yellow, greenish-yellow, purple, or striped. The joints are about three inches apart, and give origin to the leaves, which embrace the stem at their base, are three or four feet long and about an inch wide, flat, acuminate, longitudinally striated, furnished with a white midrib, glabrous, finely dentate, and of a green colour inclining to yellow. The flowers are pinkish, surrounded by a long silky down, and disposed in a large, terminal, nearly pyramidal panicle, composed of subdivided spikes, and two or three feet in length. The plant has a general resemblance to the Indian corn. Four varieties are mentioned; 1. the *common*, with a yellow stem; 2. the *purple*, with a purple stem and richer juice; 3. the *gigantic*, with a very large light-coloured stem; and 4. the *Otaheitan*, which was introduced into the West Indies from the island of Tahiti (Otaheite) by Bougainville and Bligh, and is distinguished by its greater height, the longer intervals between its joints, and by the greater length of the hairs which surround the flowers.

The sugar cane is cultivated by cuttings, which are planted in rows, and which, by giving rise to successive shoots, furnish five or six crops before the plants require to be renewed. At the end of a year the plant generally flowers, and in four or five months afterwards the canes are completely ripe, at which time they have a yellowish colour, and contain a sweet viscid juice. The quantity of sugar which they yield is variable. According to Avequin, of New Orleans, the proportion of cane sugar in the recent stalk is about 10 per cent., of uncrystallizable sugar from $3\frac{1}{2}$ to 4 per cent. Cane-juice is usually stated to contain from seventeen to twenty-three per cent. of crystallizable sugar, though scarcely seven per cent. is extracted in practice.

Preparation and Purification. The canes, when ripe, are cut down close to the earth, topped, and stripped of their leaves, and then crushed between vertical iron rollers in a kind of mill. The juice, constituting ninety per cent. of the cane, though fifty per cent. is scarcely obtained in practice, is of a pale-greenish colour, sweet taste, and balsamic odour, and has a sp. gr. varying from 1·033 to 1·106. As it runs out it is received in suitable vessels, and, being quickly removed, is immediately mixed with lime, in the form of milk of lime, in the proportion of about one part of the earth to eight hundred of the juice, and heated in a boiler to 140°. The exact proportion of the lime cannot be determined, as the juice varies in quality in different seasons; but the manufacturer should aim at making the liquor neutral, or very slightly alkaline. The gluten and albumen rise to the top, and form a thick scum, from underneath which the liquid is drawn off by a cock into a copper boiler, where it is concentrated by ebullition, the scum being carefully skimmed off as it forms. Filtering the juice through cloth filters before heating it is advantageous. When sufficiently concentrated, the juice is transferred to shallow vessels called coolers, from which, before it cools, it is drawn off into wooden vessels, with perforated bottoms, the holes in which are temporarily plugged. At the end of twenty-four hours, the liquid is strongly agitated with wooden stirrers, in order to accelerate the granulation of the sugar, which is completed in six hours. The stoppers are now removed, and the syrup is allowed to drain off from the sugar, which in this state is granular, of a yellowish colour, and moist. It is next dried in the sun, and, being introduced into hogsheads, forms the *brown sugar* of commerce. The syrup, by a new evaporation, furnishes an additional portion of sugar; and the liquid which finally remains, incapable of yielding more sugar with advantage, is called *molasses*. Eight pounds of the juice yield, on an average, one pound of brown sugar. In the process of extraction, it is important that the juice should be concentrated by a moderate heat, which prevents the cane sugar from being converted into uncrystallizable sugar, and, therefore, lessens the amount of the molasses. Sometimes the brown sugar undergoes an additional preparation, consisting in boiling it with lime-water, and, after sufficient concentration, allowing the syrup to crystallize in large inverted conical vessels, pierced at the apex and plugged. The surface of the crystalline mass being covered with a thin mixture of clay and water, the plug is removed, and the water from the clay, percolating the mass, removes the coloured syrup, which flows out at the hole. The sugar, as thus prepared, approaches to the white state, and constitutes the clayed sugar of commerce, usually called in this country *Havana sugar*.

There is no doubt that a large proportion of the sugar is lost in the ordinary process of manufacture; and several plans have been proposed to prevent this loss. In December 1847, Dr. John Scoffern, of England, took out a patent for the use of subacetate of lead as a purifying agent, added to the cane-juice in the proportion of one-sixth of one per cent.* As applied to cane-juice, it sepa-

* It is alleged that Mr. Sievier took out a patent for the same process in July, 1847, five months before the date of Dr. Scoffern's patent, and that the former employed the

rates the impurities completely, thus avoiding the labour of skimming, and furnishes the whole of the sugar, instead of about one-third, as by the ordinary process. When used in refining operations, it enables the refiner to work up residues, which would not furnish sufficient sugar to repay the cost of the old process. The lead is finally removed from the sugar solutions in the form of sulphite of lead, by the action of sulphurous acid gas, forced through them by mechanical means. In this way Dr. Scoffern alleges that the whole of the lead may be separated; but even if it is not, he believes that a minute proportion of sulphite of lead in the sugar would not prove injurious. In this opinion he is supported by several eminent chemists and physicians; but the position is controverted by others equally eminent, and, we think, on just grounds; as we should feel doubt of the wholesomeness of an aliment, so extensively used as sugar, containing a proportion of lead, however minute. Such is the view taken in France, where the process of Dr. Scoffern has been prohibited. Another patented process for the defecation of cane-juice, and of the syrups of sugar refineries, is that of R. & J. Oxland, in which acetate of alumina is used. The details of the process are given in the *Chem. Gazette* for Nov. 16, 1849, to which the reader is referred. M. Melsens, Professor of Chemistry at Brussels, has proposed a third process, which consists in the use of bisulphite of lime. This salt is said to act as an antiseptic, preventing the operation of any ferment; as an absorber of oxygen, opposing the action of that gas on the juice; as a clarifier, rendering insoluble at 212° all coagulable matters; as a bleacher of pre-existing colouring matters, and a preventive of the formation of new ones; and, lastly, as a substance furnishing a base to neutralize hurtful acids, which unite with the lime, displacing the weaker sulphurous acid. M. Melsens acknowledges that he has made his experiments, on the sugar-cane, on a small scale only, and, therefore, leaves the application of the principles of his method to the intelligence of the manufacturers themselves. (*Chem. Gaz.*, Jan. 15, 1850.)

The refining of brown sugar forms a distinct branch of business, and the methods pursued have undergone many improvements. By the original process, the sugar was boiled with lime-water, and clarified by heating it with bullocks' blood. The clarified syrup was then strained through cloth filters, whereby it was rendered limpid. It was next transferred to a boiler, where it was subjected to ebullition, until it was brought to a proper concentration; when it was allowed to cool in conical moulds, and to drain for the separation of the molasses. This last boiling required to be continued so long, that the action of the fire and air frequently decomposed the sugar to such an extent as to cause a loss of twenty-five per cent. in molasses. This disadvantage led to the abandonment of prolonged boiling; and now the sugar refiners boil the syrup in shallow boilers, which are suspended in such a way as to admit of their being emptied with the greatest quickness, without putting out the fire.

The process of refining was still further improved by Messrs. Philip Taylor and Howard. The former introduced the improvement of heating the syrup with great rapidity by means of steam, made to pass through a series of tubes traversing the boiler; and the latter devised the plan of causing the syrup to boil under a diminished pressure, created by a suction pump, set in motion by a steam engine, while it was heated by steam circulating round the boiler. In this way, the syrup was made to boil at a lower temperature, and with a diminished contact of the air; and the loss of the cane sugar, by its conversion into uncrystallizable sugar, was in a great measure avoided.

latter as a professional chemist to perfect the details of the process. (*Pharm. Journ. and Trans.*, ix. 220, Nov. 1849.) Subsequently Mr. Sievier compromised with Dr. Scoffern in regard to their conflicting claims, leaving to the latter undisputed possession of the patent.

After the syrup is sufficiently concentrated by any one of these methods, it is transferred to coolers, where it is agitated to cause it to granulate. In this state it is poured into unglazed earthenware moulds of a conical shape, with a hole in the apex, which is stopped with a paper plug. The moulds are placed, with the apex downwards, above stone-ware pots, intended to receive the uncrystallizable syrup. When the mass has completely concreted, the moulds are unstopped, to allow the coloured syrup to drain off. To remove the remains of this syrup, the operation called *claying* is performed. This consists in removing from the base of the loaf a layer of the sugar, about an inch thick, and replacing it with pure sugar in powder, which is covered with a mixture of pipe clay and water, of about the consistence of cream. The water gradually leaves the clay, dissolves the pure sugar, and percolates the mass as a pure syrup, removing in its progress the coloured syrup. Sometimes the purification is performed without the use of clay, by allowing a saturated solution of pure sugar to percolate the loaf. When all the coloured syrup is removed, the loaf is taken out of the mould and placed in stoves to dry. It now constitutes *white* or *purified sugar*. The syrup which drains from the loaves contains a considerable quantity of cane sugar, and is used in subsequent operations. The syrups of lowest quality are employed in forming inferior white sugar, from which a syrup finally drains, containing so little cane sugar as not to repay the expense of extracting it. This constitutes *sugar house molasses*. Good brown sugar, in the process of refining, yields about 70 per cent. of white sugar.

Of the several forms of sugar above mentioned, three only, *white* and *brown sugar*, and *molasses*, are officinal in the British and United States Pharmacopœias, and these are designated by the Latin names placed at the head of this article. The United States Pharmacopœia recognises white sugar only, giving it the name of *Saccharum;* the use of brown sugar and molasses being replaced by the employment of an officinal syrup of known strength. (See *Syrupus.*) The London Pharmacopœia recognises white sugar and molasses; and the Edinburgh and Dublin Colleges admit not only these, but also brown sugar.

Commercial History. Sugar has been known from the earliest ages, and was originally obtained from Asia. About the period of the Crusades, the Venetians brought it to Europe; but at that time it was so scarce as to be used exclusively as a medicine. Upon the discovery of the Cape of Good-Hope and the maritime route to the East Indies, the commerce in sugar passed into the hands of the Portuguese. Subsequently, the cultivation of the cane was extended to Arabia, Egypt, Sicily, Spain, and the Canaries, and finally, upon the discovery of the new world, to America, where it was pursued with the greatest success, and continues to be so to the present day. In America it is produced most abundantly in the West Indies, which supply the greater part of the consumption of Europe, little comparatively being taken thither from Brazil or the East Indies. The consumption of the United States is more than half supplied by Louisiana and some of the neighbouring States. The crop of sugar of Louisiana, in 1847, was estimated at 240,000 hogsheads; in 1853, at 322,000. The crop of Cuba for the latter year is supposed to have reached 600,000 hogsheads. Within a recent period, our planters have introduced into Louisiana the variety of cane called the Otaheite cane, which is hardier and more productive than the common cane, and better suited to the climate of our Southern States.

Properties. Sugar, in a pure state, is a solid of a peculiar grateful taste, permanent in the air, phosphorescent by friction, and of the sp. gr. 1·6. It dissolves readily in half its weight of cold water, and to almost an unlimited extent in boiling water. The solution, when thick and ropy, is called *syrup*. An aqueous solution of sugar possesses the property of dissolving a large quantity of hydrate

of lime, forming a compound, called *syrup of lime.* When a concentrated syrup is gently heated, and spirit added to it, the liquid, on cooling, forms white semi-transparent crystals of hydrated sugar, having the shape of oblique four-sided prisms, and called *sugar candy.* Sugar is nearly insoluble in absolute alcohol, but dissolves in four times its weight of boiling alcohol of the sp. gr. 0·83. When heated to 365°, it melts into a viscid, colourless liquid, which, on being suddenly cooled, forms a transparent amorphous mass, called *barley sugar.* At a higher temperature (between 400° and 420°) it loses two eqs. of water, and is converted into a black porous mass, having a high lustre like anthracite, called *caramel.* At a still higher heat it yields combustible gases, carbonic acid, empyreumatic oil, and acetic acid; and there remains one-fourth of its weight of charcoal, which burns without residue. Sugar renders the fixed and volatile oils to a certain extent miscible with water, and forms with the latter an imperfect combination, called in pharmacy *oleo-saccharum.* When in solution, it is not precipitated by subacetate of lead, a negative property which distinguishes it from most other organic principles.

Cane sugar may be distinguished from grape sugar by the combined action of sulphate of copper and caustic potassa. If solution of cane sugar be mixed with solution of sulphate of copper, and potassa be added in excess, a deep-blue liquid is obtained, which, on being heated, lets fall a little red powder after a time. Solution of grape sugar, similarly treated, yields, when heated, a copious greenish precipitate, which rapidly changes to scarlet, and eventually to dark-red. Dr. Donaldson's test for sugar in the *animal fluids* is formed of five parts of carbonate of soda, five of caustic potassa, six of bitartrate of potassa, four of sulphate of copper, and thirty-two of distilled water. A few drops of this solution, being added to an animal fluid, and the mixture heated over a spirit-lamp, a yellowish-green colour is developed, if sugar be present.

Action of Acids and Alkalies, &c. The mineral acids act differently on cane sugar, according as they are concentrated or dilute. Strong nitric acid, with the assistance of heat, converts it into oxalic acid. (See *Oxalic Acid* in the Appendix.) The same acid, when weak, converts it into *saccharic acid*, confounded by Scheele with malic acid. Concentrated muriatic or sulphuric acid chars it. Treated, in fine powder, with a mixture of sixteen parts of sulphuric and eight of nitric acid, cooled to the temperature of 60°, it is converted, in a few seconds, into a pasty substance, which, after having been washed with cold water and dissolved in alcohol, furnishes, on the addition of an excess of carbonate of potassa to the alcoholic solution, a peculiar explosive and inflammable substance, resembling common rosin in its physical properties, and, like it, insoluble in water, but soluble in alcohol, ether, and the volatile oils. (*L. Thompson.*) Diluted muriatic acid, when boiled with cane sugar, converts it into a solid, brown, gelatinous mass. Weak sulphuric acid, by a prolonged action at a high temperature, converts cane sugar, first into uncrystallizable sugar, afterwards into grape sugar, and finally into two substances, analogous to ulmin and ulmic acid, called *sacchulmin* and *sacchulmic acid.* Vegetable acids are supposed to act in a similar way. If the boiling be prolonged for several days in open vessels, oxygen is absorbed, and, besides these two substances, formic acid is generated. Soubeiran admits the change of the uncrystallizable into grape sugar, but attributes it to a molecular transformation of the sugar, independently of the action of the acid; as, according to his observation, the conversion takes place only after rest. In confirmation of his views, this chemist states that he found the same changes to be produced by boiling sugar with water alone.

Cane sugar unites with the alkalies and some of the alkaline earths, forming definite combinations which render the sugar less liable to change. It also unites with protoxide of lead. Boiled for a long time with aqueous solutions of

potassa, lime, or baryta, the liquid becomes brown, formic acid is produced, and two new acids are generated; one brown or black and insoluble in water, called *melassic acid*, the other colourless and very soluble, named *glucic acid*.

The account above given of the action of acids and alkalies on sugar explains the way in which lime acts in the manufacture and refining of sugar. The acids, naturally existing in the saccharine juice, have the effect of converting the cane sugar into uncrystallizable sugar, by which a loss of the former is sustained. The use of lime, by neutralizing these acids, prevents this result. An excess of lime, however, must be carefully avoided; as it injures the product of cane sugar both in quantity and quality. The change in the sugar which precedes fermentation points to the necessity of operating before that process sets in; and hence the advantage of grinding the canes immediately after they are cut, and boiling the juice with the least possible delay.

The following is a description of the several forms of officinal sugar.

Purified or *white sugar*, as obtained on a large scale, is in concrete, somewhat porous masses, called loaves, consisting of an aggregate of small crystalline grains. When carefully refined, it is brittle and pulverulent, perfectly white, inodorous, and possessed of the pure saccharine taste. Cane sugar is sometimes adulterated with starch sugar, which may be detected by adding to a concentrated solution of the suspected sugar, first a small portion of fused potassa, and afterwards, at the boiling temperature, a few drops of nitrate of cobalt. This test, if the sugar be pure, will produce a violet-blue precipitate, a reaction prevented by the presence of a small proportion of starch sugar. (*Dr. G. Reich.*)

Unpurified or *brown sugar* is in the form of a coarse powder, more or less moist and sticky, consisting of shining crystalline grains, intermixed with lumps, having an orange-yellow colour, more or less deep, a sweet, cloying taste, and heavy peculiar smell. It varies very much in quality. The best sort is nearly dry, in large sparkling grains of a clear yellow colour, and possesses much less smell than the inferior kinds. It consists of cane sugar, associated with variable quantities of gummy and colouring matter, and a small proportion of lime and tannic acid. By keeping, it becomes soft and gummy, and less sweet; a change attributed to the lime.

Molasses is of two kinds, the West India and sugar house. *West India molasses* is a black ropy liquid, of a peculiar odour, and sweet empyreumatic taste. When mixed with water and the skimmings of the vessels used in the manufacture of sugar, it forms a liquor, which, when fermented and distilled, yields rum. *Sugar house molasses* has the same general appearance as the West India. It is, however, thicker, and has a different flavour. Its sp. gr. is about 1·4, and it contains about 75 per cent. of solid matter. Both kinds of molasses consist of uncrystallizable sugar, more or less cane sugar which has escaped separation in the process of manufacture or refining, and gummy and colouring matter. When the molasses from cane sugar is treated with a boiling, concentrated solution of bichromate of potassa, and boiled, a violent reaction takes place, and the liquid becomes green; but if it be adulterated with only an eighth of starch sugar molasses, the reaction is prevented, and the colour is not changed. (*Dr. G. Reich.*)

Composition. The following formulas express the composition of the different varieties of sugar, so far as known. Cane sugar, $C_{12}H_{11}O_{11}$. Cane sugar, as it exists in combination with two eqs. of protoxide of lead (caramel? anhydrous sugar?), $C_{12}H_9O_9$. Grape sugar, $C_{12}H_{14}O_{14}$. Grape sugar and uncrystallizable sugar, dried at 212°, $C_{12}H_{12}O_{12}$. Sorbin, $C_{12}H_{12}O_{12}$. (*Pelouze.*) The theory of the conversion of sugar, during the vinous fermentation, into alcohol and carbonic acid, will be explained under *absolute alcohol*. (See *Alcohol*, Ed., Dub., in the second part of this work.)

Med. and Pharm. Uses, &c. The uses of sugar as an aliment and condiment

are numerous. It is nutritious, but not capable of supporting life when taken exclusively as aliment, on account of the absence of nitrogen in its composition. It is a powerful antiseptic, and is beginning to be used for preserving meat and fish; for which purpose it possesses the advantage of acting in a much less quantity than is requisite of common salt, and of not altering the taste, nor impairing the nutritious qualities of the aliment. Prof. Marchand has ascertained that a solution of sugar has no action on the teeth out of the body. It may hence be inferred that the popular notion that sugar is injurious to the teeth is unfounded.

The medical properties of *sugar* are those of a demulcent, and as such it is much used in catarrhal affections, in the form of candy, syrup, &c. According to M. Provençal, it acts as a powerful antaphrodisiac, given in the quantity of a pound or more daily, dissolved in a quart of cold water. In pharmacy it is employed to render oils miscible with water, to cover the taste of medicines, to give them consistency, to preserve them from change, and to protect from oxidation certain ferruginous preparations. Accordingly it enters into the composition of several infusions and mixtures, of nearly all the syrups and confections, and of all the troches. It is directed by the Edinburgh College for purifying the commercial sulphuric acid from nitrous acid. *Molasses* is used to give the proper consistence to pills, in ten London formulæ, six Dublin, and one Edinburgh. It is well fitted for forming pills, preserving them soft and free from mouldiness, on account of its retentiveness of moisture and antiseptic qualities.

Off. Prep. of Saccharum. Syrupus.

Off. Prep. of Saccharum Commune. Confectio Sennæ; Infusum Sennæ Compositum.

Off. Prep. of Sacchari Fæx. Syrupus Sennæ. B.

SACCHARUM LACTIS. *Dub.*

Sugar of Milk.

Lactose; Sucre de lait, *Fr.;* Milchzucker, *Germ.*

Sugar of milk, or *lactin*, is found only in milk, of which it forms about five per cent. (*Boussingault.*) It is manufactured largely in Switzerland as an article of food. In preparing it, milk is first coagulated by the addition of a little dilute sulphuric acid, and the resulting *whey* is evaporated to a syrupy consistence, and set aside for several weeks, in a cool place, to crystallize. The crystals, which constitute the sugar of milk, are then decolorized by animal charcoal, and repeated crystallizations.

Sugar of milk is a hard, somewhat gritty, white substance, crystallized in four-sided prisms, and possessing a slightly sweet taste. In commerce it sometimes occurs in cylindrical masses, in the axis of which is a cord, around which the crystals have been deposited. It dissolves slowly in six parts of cold and three of boiling water, without forming a syrup. It is insoluble in ether, and but slightly soluble in alcohol. Its sp. gr. is 1·54. It is not susceptible of the vinous fermentation by the direct influence of yeast, but, after the action of dilute acids, which first convert it into grape sugar, it is capable of furnishing a spirituous liquor. It is well known that both mares' and cows' milk, after becoming sour, is capable of forming an intoxicating drink by fermentation. By the action of nitric acid, sugar of milk is converted into mucic (saclactic) acid. When anhydrous it consists of $C_{24}H_{19}O_{19}$; when crystallized, of $C_{24}H_{19}O_{19}+5HO$.

Sugar of milk has been proposed by Dr. Turnbull, of England, as a non-nitrogenous article of diet, in consumption and other pulmonary diseases. Dr. Ruschenberger used it with good effect as nourishment in a case of extreme irritability of stomach, following profuse loss of blood from menorrhagia. (*Trans. of the Phil. Col. of Phys.*, ii. 48.) B.

SAGAPENUM. *Lond.*

Sagapenum.

An uncertain plant. The gum resin. *Lond.*

Sagapenum, *Fr.;* Sagapen, *Germ.;* Sagapeno, *Ital., Span.;* Sugbeenuj, *Arab.*

All that is known in relation to the source of this gum-resin is, that it is the concrete juice of a plant, probably umbelliferous, growing in Persia. The plant is conjectured to be a species of Ferula, and Willdenow supposed it to be *F. Persica*, but without sufficient evidence. The drug is brought from Alexandria, Smyrna, and other ports of the Levant.

It is in irregular masses, composed of agglutinated fragments, slightly translucent, of a brownish-yellow, olive, or reddish-yellow colour externally, paler internally, brittle, of a consistence somewhat resembling that of wax, and often mixed with impurities, especially with seeds more or less entire. An inferior variety is soft, tough, and of uniform consistence. It has an alliaceous odour, less disagreeable than that of assafetida, and a hot, nauseous, bitterish taste. It softens and becomes tenacious by the heat of the hand. The effect of time and exposure is to harden and render it darker. It is inflammable, burning with a white flame and much smoke, and leaving a light spongy charcoal. Pure alcohol and water dissolve it partially, diluted alcohol almost entirely. Distilled with water it affords a small quantity of volatile oil; and the water is strongly impregnated with its flavour. According to Pelletier, it contains, in 100 parts, 54·26 of resin, 31·94 of gum, 1·0 of bassorin, 0·60 of a peculiar substance, 0·40 of acidulous malate of lime, and 11·80 of volatile oil including loss. Brandes found 3·73 per cent. of volatile oil. This is pale-yellow, very fluid, lighter than water, and of a disagreeable alliaceous odour.

Medical Properties and Uses. Sagapenum is a moderate stimulant, resembling assafetida, but much inferior, and usually considered as intermediate between that gum-resin and galbanum. It has been given as an emmenagogue and antispasmodic in amenorrhœa, hysteria, chlorosis, &c., but is now seldom used. It was known to the ancients; and Dioscorides speaks of it as being derived from Media. The dose is from ten to thirty grains, and may be given in pill or emulsion. Sagapenum is also considered discutient, and has been occasionally applied externally, in the form of plaster, to indolent tumours.

Off. Prep. Sagapenum Præparatum. W.

SAGO. *U.S., Lond., Ed., Dub.*

Sago.

The prepared fecula of the pith of Sagus Rumphii. *U. S.* Sagus lævis, S. Rumphii, and other species of palms. The fecula of the stem. *Lond.* Farina from the interior of the trunk of various Palmaceæ and species of Cycas. *Ed.* Cycas circinalis and other species of Cycas, and various Palmaceæ. The farina from the interior of the trunk. *Dub.*

Sagou, *Fr.;* Sago, *Germ., Ital.;* Sagu, *Span.*

Numerous trees, inhabiting the islands and coasts of the Indian Ocean, contain a farinaceous pith, which is applied to the purposes of nutriment by the natives. Such are *Sagus Rumphii*, *Sagus lævis*, *Sagus Ruffia*, *Saguerus Rumphii*, and *Phœnix farinifera*, belonging to the family of *palms;* and *Cycas circinalis*, *Cycas revoluta*, and *Zamia lanuginosa*, belonging to the *Cycadaceæ*. Of these *Sagus Rumphii*, *Sagus lævis*, and *Saguerus Rumphii* probably contribute

to furnish the sago of commerce. Crawford, in his History of the Indian Archipelago, states that it is derived exclusively from *Metroxylon Sagu*, identical with *Sagus Rumphii;* but Roxburgh ascribes the granulated sago to *S. lævis*, and one of the finest kinds is said by Dr. Hamilton to be produced by the *Saguerus Rumphii* of Roxburgh. The farinaceous product of the different species of Cycas, sometimes called *Japan sago*, does not enter into general commerce.

SAGUS. *Sex. Syst.* Monœcia Hexandria.—*Nat. Ord.* Palmaceæ.

Gen. Ch. Common spathe one-valved. *Spadix* branched. MALE. *Calyx* three-leaved. *Corolla* none. *Filaments* dilated. FEMALE. *Calyx* three-leaved, with two of the leaflets bifid. *Corolla* none. *Style* very short. *Stigma* simple. *Nut* tessellated-imbricated, one-seeded. *Willd.*

Sagus Rumphii. Willd. *Sp. Plant.* iv. 404; Carson, *Illust. of Med. Bot.* ii. 44, pl. 88. The *sago palm* is one of the smallest trees of the family to which it belongs. Its extreme height seldom exceeds thirty feet. The trunk is proportionably very thick, quite erect, cylindrical, covered with the remains of the old leafstalks, and surrounded by a beautiful crown of foliage, consisting of numerous very large, pinnate leaves, extending in every direction from the summit, and curving gracefully downwards. From the basis of the leaves proceed long, divided and subdivided flower and fruit-bearing spadices, the branches of which are smooth. The fruit is a roundish nut, covered with a checkered imbricated coat, and containing a single seed.

The tree is a native of the East India islands, growing in the Peninsula of Malacca, Sumatra, Borneo, Celebes, the Moluccas, and a part of New Guinea. It flourishes best in low and moist situations. Before attaining maturity, the stem consists of a shell usually about two inches thick, filled with an enormous volume of spongy medullary matter like that of elder. This is gradually absorbed after the appearance of fruit, and the stem ultimately becomes hollow. The greatest age of the tree is not more than thirty years. At the proper period of its growth, when the medullary matter is fully developed, and has not yet begun to diminish, the tree is felled, and the trunk cut into billets six or seven feet long, which are split in order to facilitate the extraction of the pith. This is obtained in the state of a coarse powder, which is mixed with water in a trough, having a sieve at the end. The water, loaded with farina, passes through the sieve, and is received in convenient vessels, where it is allowed to stand till the insoluble matter has subsided. It is then strained off; and the farina which is left may be dried into a kind of meal, or moulded into whatever shape may be desired. For the consumption of the natives it is usually formed into cakes of various sizes, which are dried, and extensively sold in the islands. The commercial sago is prepared by forming the meal into a paste with water, and rubbing it into grains. It is produced in the greatest abundance in the Moluccas, but of the finest quality on the eastern coast of Sumatra. The Chinese of Malacca refine it so as to give the grains a fine pearly lustre. Malcolm states that it is also refined in large quantities at Singapore. In this state it is called *pearl sago*, and is in great repute. It is said that not less than five or six hundred pounds of sago are procured from a single tree. (*Crawford.*)

Pearl sago is that which is now generally used. It is in small grains, about the size of a pin's head, hard, whitish, of a light-brown colour, in some instances translucent, inodorous, and with little taste. It may be rendered perfectly white by a solution of chloride of lime. *Common sago* is in larger and browner grains, of more unequal size, of a duller aspect, and frequently mixed with more or less of a dirty-looking powder.

Sago meal is imported into England from the East Indies; but we have met with none in the markets of this country. It is in the form of a fine amylaceous powder, of a whitish colour, with a yellowish or reddish tint, and of a faint but somewhat musty odour.

Common sago is insoluble in cold water, but by long boiling unites with that liquid, becoming at first soft and transparent, and ultimately forming a gelatinous solution. Pearl sago is partially dissolved by cold water, probably owing to heat used in its preparation. Chemically considered, it has the characters of starch. Under the microscope the granules of sago meal appear oval or ovate, and often truncated so as to be more or less mullar-shaped. Many of them are broken, and in most the surface is irregular or tuberculated. They exhibit upon their surface concentric rings, which, however, are much less distinct than in potato starch. The hilum is circular when perfect, and cracks either with a single slit, or a cross, or in a stellate manner. The granules of pearl sago are of the same form, but are all ruptured, and exhibit only indistinct traces of the annular lines, having been altered in the process employed in preparing them. Those of the common sago are very similar to the particles of sago meal, except that they are perhaps rather less regular and more broken. (*Pereira.*)

Potato starch is sometimes prepared in Europe so as to resemble bleached pearl sago, for which it is sold. But, when examined under the microscope, it exhibits larger granules, which are also more regularly oval or ovate, smoother, less broken, and more distinctly marked with the annular rugæ than those of sago; and the hilum often cracks with two slightly diverging slits.

Sago is used exclusively as an article of diet. Being nutritive, easily digestible, and wholly destitute of irritating properties, it is frequently employed in febrile cases, and in convalescence from acute disorders, in the place of richer and less innocent food. It is given in the liquid state, and in its preparation care should be taken to boil it long in water, and stir it diligently, in order that the grains may be thoroughly dissolved. Should any portion remain undissolved, it should be separated by straining; as it might offend a delicate stomach. A tablespoonful to the pint of water is sufficient for ordinary purposes. The solution may be seasoned with sugar and nutmeg or other spice, and with wine, where these are not contra-indicated. W.

SALIX. *U. S. Secondary.*

Willow.

The bark of Salix alba. *U. S.*

Off. Syn. SALICIS CORTEX. Bark of Salix Caprea. *Ed.*

Ecorce de saule, *Fr.;* Weidenrinde, *Germ.;* Corteccia di salcio, *Ital.;* Corteza de sauce, *Span.*

SALIX. *Sex. Syst.* Diœcia Diandria.—*Nat. Ord.* Salicaceæ.

Gen. Ch. MALE. *Amentum* cylindrical. *Calyx* a scale. *Corolla* none. *Glands* of the base nectariferous. FEMALE. *Amentum* cylindrical. *Calyx* a scale. *Corolla* none. *Style* two-cleft. *Capsule* one-celled, two-valved. *Seeds* downy. *Willd.*

This is a very extensive genus, comprising, according to Nuttall, not less than one hundred and thirty species, which, with very few exceptions, are natives of Europe, and of the northern and temperate parts of North America. Though most of them are probably possessed of similar medical properties, only two are now recognised as officinal in the Pharmacopœias of the U. States and Great Britain; viz., *S. alba* and *S. caprea;* of which *Salix alba* only has been introduced into this country. *S. Russelliana*, which has been introduced from Europe, is said by Sir James Smith to be the most valuable species. *S. purpurea*, which is a European species, is said by Lindley to be the most bitter, and *S. pentandra* is preferred by Nees von Esenbeck. Many native species are in all probability equally active with the foreign; but they have not been sufficiently tried in regular practice to admit of a positive decision. The younger Michaux

speaks of *S. nigra* or *black willow* as affording in its root a strong bitter, used in the country as a preventive and cure of intermittents. In consequence of the pliability of the young branches or twigs, the willow is well adapted for the manufacture of baskets and other kinds of wicker-work; and several species, native and introduced, are employed for this purpose in the United States. *S. Babylonica* or weeping willow is a favourite ornamental tree. The degree of bitterness in the bark is probably the best criterion of the value of the different species.

Salix alba. Willd. *Sp. Plant.* iv. 710; Smith, *Flor. Brit.* 1071. The common European or white willow is twenty-five or thirty feet in height, with numerous round spreading branches, the younger of which are silky. The bark of the trunk is cracked and brown, that of the smaller branches smooth and greenish. The leaves are alternate, upon short petioles, lanceolate, pointed, acutely serrate with the lower serratures glandular, pubescent on both sides, and silky beneath. There are no stipules. The flowers appear at the same time with the leaves. The *amenta* are terminal, cylindrical, and elongated, with elliptical-lanceolate, brown, pubescent scales. The stamens are two in number, yellow, and somewhat longer than the scales; the style is short; the stigmas two-parted and thick. The capsule is nearly sessile, ovate, and smooth. The white willow has been introduced into this country from Europe, and is now very common. It flowers in April and May; and the bark is easily separable throughout the summer.

That obtained from the branches rolls up when dried into the form of a quill, has a brown epidermis, is flexible, fibrous, and of difficult pulverization. Willow bark has a feebly aromatic odour, and a peculiar bitter astringent taste. It yields its active properties to water, with which it forms a reddish-brown decoction. Pelletier and Caventou found among its ingredients tannin, resin, a bitter yellow colouring matter, a green fatty matter, gum, wax, lignin, and an organic acid combined with magnesia. The proportion of tannin is so considerable that the bark has been used for tanning leather. A crystalline principle has also been obtained from it, which, having the medical virtues of the willow, has received the name of *salicin*. When pure, it is in white, shining, slender crystals, inodorous, but very bitter, with the peculiar flavour of the bark. It is soluble in cold water, much more so in boiling water, soluble in alcohol, and insoluble in ether and the oil of turpentine. It neutralizes neither acids nor salifiable bases; and is not precipitated by any reagent. Concentrated sulphuric acid decomposes it, receiving from it an intense and permanent bright-red colour, and producing a new compound called *rutulin*. Muriatic and dilute sulphuric acids convert it into grape-sugar, and a white, tasteless, insoluble powder named *saliretin*. Distilled with bichromate of potassa and sulphuric acid, it yields, among other products, a volatile oleaginous fluid, identical with one of the components of oil of spiræa, and, from its acid properties, denominated *salicylous acid*. This is considered by Dumas as consisting of a peculiar compound radical called *salicyle* and hydrogen. The formula of salicin is $C_{42}H_{29}O_{22}$. (*Turner's Chemistry.*) The honour of its discovery is claimed by Buchner, of Germany, and Fontana and Rigatelli, of Italy; but M. Leroux, of France, deserves the credit of having first accurately investigated its properties. Braconnot procured it by adding subacetate of lead to a decoction of the bark, precipitating the excess of lead by sulphuric acid, evaporating the colourless liquid which remains, adding near the end of the process a little animal charcoal previously washed, and filtering the liquor while hot. Upon cooling it deposits the salicin in a crystalline form. (*Journ. de Chimie Médicale*, Jan. 1831.) The following is the process of Merck. A boiling concentrated decoction of the bark is treated with litharge until it becomes nearly colourless. Gum, tannin, and extractive matter, which would impede the crystallization of the salicin, are thus removed from the liquid;

while a portion of the oxide is dissolved in union probably with the salicin. To separate this portion of oxide, sulphuric acid is first added and then sulphuret of barium, and the liquor is filtered and evaporated. Salicin is deposited, and may be purified by repeated solution and crystallization. (*Turner's Chemistry.*) Erdmann has given another process. Sixteen ounces of the bark are macerated for twenty-four hours in four quarts of water mixed with two ounces of lime, and the whole is then boiled for half an hour. The process is repeated with the residue. The decoctions having been mixed, and allowed to become clear by subsidence, the liquor is poured off, concentrated to a quart, then digested with eight ounces of ivory-black, filtered, and evaporated to dryness. The extract is exhausted by spirit containing 28 per cent. of alcohol, and the tincture evaporated so that the salicin may crystallize. This is purified by again dissolving, treating with ivory-black, and crystallizing. (*Christison's Dispensatory.*) Merck obtained 251 grains from 16 ounces of the bark and young twigs of *Salix helix*, and Erdmann 300 grains from the same quantity of the bark of *Salix pentandra*. It may probably be obtained from any of the willow barks having a bitter taste. Braconnot procured it from various species of Populus, particularly *P. tremula* or European aspen.

Medical Properties and Uses. The bark of the willow is tonic and astringent, and has been employed as a substitute for Peruvian bark, particularly in intermittent fever. It has attracted much attention from the asserted efficacy of salicin in the cure of this complaint. There seems to be no room to doubt, from the testimony of numerous practitioners in France, Italy, and Germany, that this principle has the property of arresting intermittents; though the ascription to it of equal efficacy with the sulphate of quinia was certainly premature. The bark may be employed in substance or decoction, in the same doses and with the same mode of preparation as cinchona. The dose of salicin is from two to eight grains, to be so repeated, that from twenty to forty grains may be taken daily, or in the interval between the paroxysms of an intermittent. Magendie has seen fevers cut short in one day by three doses of six grains each. The decoction of willow has been found beneficial as an external application to foul and indolent ulcers. W.

SALVIA. *U. S. Secondary.*

Sage.

The leaves of Salvia officinalis. *U. S.*

Sauge, *Fr.;* Salbey, *Germ.;* Salvia, *Ital., Span.*

SALVIA. *Sex. Syst.* Diandria Monogynia.—*Nat. Ord.* Lamiaceæ or Labiatæ. *Gen. Ch. Corolla* unequal. *Filaments* affixed transversely to a pedicel. *Willd.*

Salvia officinalis. Willd. *Sp. Plant.* i. 129; Woodv. *Med. Bot.* p. 352, t. 127. Common garden sage is a perennial plant, about two feet high, with a quadrangular, pubescent, branching, shrubby stem, furnished with opposite, petiolate, ovate-lanceolate, crenulate, wrinkled leaves, of a grayish-green colour, sometimes tinged with red or purple. The flowers are blue, variegated with white and purple; and are disposed on long terminal spikes, in distant whorls, each composed of few flowers, and accompanied with ovate, acute, deciduous bractes. The calyx is tubular and striated, with two lips, of which the upper has three acute teeth, the under two. The corolla is tubular, bilabiate, ringent, with the upper lip concave, the lower divided into three rounded lobes, of which the middle is the largest. The filaments are supported upon short pedicels, to which they are affixed transversely at the middle.

Sage grows spontaneously in the South of Europe, and is cultivated abundantly in our gardens. There are several varieties, differing in the size and colour

of their flowers, but all possessed of the same medical properties. The flowering period is in June, at which time the plant should be cut and dried in a shady place. The leaves are the officinal portion.

Both these and the flowering summits have a strong fragrant odour, and a warm, bitterish, aromatic, somewhat astringent taste. They abound in a volatile oil, which may be obtained separate by distillation with water, and contains a considerable proportion of camphor. Sulphate of iron strikes a black colour with their infusion.

Medical Properties and Uses. Sage unites a slight degree of tonic power and astringency with aromatic properties. By the ancients it was highly esteemed; but it is at present little used internally, except as a condiment. In the state of infusion it may be given in debility of the stomach with flatulence, and is said to have been useful in checking the sweats of hectic fever. But its most useful application is as a gargle in inflammation of the throat, and relaxation of the uvula. For this purpose it is usually employed in infusion, with honey and alum, or vinegar. The dose of the powdered leaves is from twenty to thirty grains. The infusion is prepared by macerating an ounce of the leaves in a pint of boiling water, of which two fluidounces may be administered at once. When intended merely as a pleasant drink in febrile complaints, or to allay nausea, the maceration should continue but a very short time, so that all the bitterness of the leaves may not be extracted.

Two other species of salvia—*S. pratensis* and *S. Sclarea*—are ranked among officinal plants in Europe. The latter, which is commonly called *clarry*, has been introduced into our gardens. Their medical properties are essentially the same as those of the common sage; but they are less agreeable, and are not much used. In Europe, the leaves of *S. Sclarea* are said to be introduced into wine in order to impart to it a muscadel taste. W.

SAMBUCUS. *U. S. Secondary, Lond., Ed.*

Elder Flowers.

The flowers of Sambucus Canadensis. *U. S.* Sambucus nigra. The recent flowers. *Lond.* Flowers of Sambucus nigra. *Ed.*

Sureau, *Fr.;* Hollunder, *Germ.;* Sambuco, *Ital.;* Sauco, *Span.*

SAMBUCUS. *Sex. Syst.* Pentandria Trigynia.—*Nat. Ord.* Caprifoliaceæ.

Gen. Ch. Calyx five-parted. *Corolla* five-cleft *Berry* three-seeded. *Willd.*

Sambucus Canadensis. Willd. *Sp. Plant.* i. 1494. Our indigenous *common elder* is a shrub from six to ten feet high, with a branching stem, which is covered with a rough gray bark, and contains a large spongy pith. The small branches and the leafstalks are very smooth. The leaves are opposite, pinnate, sometimes bipinnate, and composed usually of three or four pairs of oblong-oval, acuminate, smooth, shining, deep-green leaflets, the midribs of which are somewhat pubescent. The flowers are small, white, and disposed in loose cymes, having about five divisions. The berries are small, globular, and deep-purple when ripe.

The shrub grows in low moist grounds, along fences, and on the borders of small streams, in all parts of the United States, from Canada to Carolina. It flowers from May to July, and ripens its berries early in autumn. The flowers, which are the officinal portion, have a somewhat aromatic, though rather heavy odour. The berries as well as other parts of the plant are employed in domestic practice, and answer the same purposes as the corresponding parts of the European elder, to which this species bears a close affinity.

Sambucus nigra. Willd. *Sp. Plant.* i. 1495; Woodv. *Med. Bot.* p. 596, t. 211. The common elder of Europe differs from the American most obviously in its size, which approaches to that of a small tree. The stem is much branched to-

wards the top, and has a rough whitish bark. The leaves are pinnate, consisting usually of five oval, pointed, serrate leaflets, four of which are in opposite pairs, and the fifth terminal. The flowers are small, whitish, and in five-parted cymes. The berries are globular, and of a blackish-purple colour when ripe.

The *flowers* have a peculiar sweetish odour, which is strong in their recent state, but becomes feeble by drying. Their taste is bitterish. They yield their active properties to water by infusion, and when distilled give over a small proportion of volatile oil, which on cooling assumes a butyraceous consistence. Water distilled from them contains an appreciable portion of ammonia. The *berries* are nearly inodorous, but have a sweetish, acidulous taste, dependent on the saccharine matter and malic acid which they contain. Their expressed juice is susceptible of fermentation, and forms a vinous liquid used in the North of Europe. It is coloured violet by alkalies, and bright red by acids; and the colouring matter is precipitated blue by acetate of lead. The *inner bark* is without smell. Its taste is at first sweetish, afterwards slightly bitter, acrid, and nauseous. Both water and alcohol extract its virtues, which are said to reside especially in the green layer between the liber and epidermis. According to Simon, the active principle of the inner bark of the root is a soft resin, which may be obtained by exhausting the powdered bark with alcohol, filtering the tincture, evaporating to the consistence of syrup, then adding ether, which dissolves the active matter, and finally evaporating to the consistence of a thick extract. Of this, twenty grains produce brisk vomiting and purging. (*Annal. der Pharm.*, xxxi. 262.) The bark, analyzed by Kramer, yielded an acid called by him *viburnic acid*, but which has proved to be the *valerianic*, traces of volatile oil, albumen, resin, an acid sulphurous fat, wax, chlorophylle, tannic acid, grape-sugar, gum, extractive, starch, pectin, and various alkaline and earthy salts. (*Chem. Gaz.*, May, 1846, from *Archiv. der Pharm.*)

Medical Properties and Uses. The flowers are gently excitant and sudorific, but are seldom used except externally, as a discutient in the form of poultice, fomentation, or ointment. The berries are diaphoretic and aperient; and their inspissated juice has enjoyed some reputation as a remedy in rheumatic, gouty, eruptive, and syphilitic affections. Its dose as an alterative diaphoretic is one or two drachms, as a laxative half an ounce or more. The inner bark is a hydragogue cathartic, acting also as an emetic in large doses. It has been employed in dropsy, and as an alterative in various chronic diseases. An ounce may be boiled with two pints of water to a pint, and four fluidounces of the decoction given for a dose. It is also sometimes used in vinous infusion. The leaves are not without activity, and the young leaf-buds are said to be a violent and even unsafe purgative. The juice of the root has been highly recommended in dropsy as a hydragogue cathartic, sometimes acting as an emetic, in the dose of a tablespoonful, repeated every day, or less frequently if it act with violence.

Off. Prep. Aqua Sambuci; Unguentum Sambuci. W.

SANGUINARIA. *U. S.*

Bloodroot.

The rhizoma of Sanguinaria Canadensis. *U. S.*

SANGUINARIA. *Sex. Syst.* Polyandria Monogynia.—*Nat. Ord.* Papaveraceæ. *Gen. Ch. Calyx* two-leaved. *Petals* eight. *Stigma* sessile, two-grooved. *Capsule* superior, oblong, one-celled, two-valved, apex attenuated. *Receptacles* two, filiform, marginal. *Nuttall.*

Sanguinaria Canadensis. Willd. *Sp. Plant.* ii. 1140; Bigelow, *Am. Med. Bot.* i. 75; Barton, *Med. Bot.* i. 31. The *bloodroot*, or, as it is sometimes called, *puccoon*, is an herbaceous perennial plant. The root (rhizoma) is horizontal, abrupt,

often contorted, about as thick as the finger, two or three inches long, fleshy, of a reddish-brown colour on the outside, and brighter red within. It is furnished with numerous slender radicles, and makes offsets from the sides, which succeed the old plant. From the end of the root arise the scape and leafstalks, surrounded by the large sheaths of the bud. These spring up together, the folded leaf enveloping the flower-bud, and rolling back as the latter expands. The leaf, which stands upon a long channeled petiole, is reniform, somewhat heart-shaped, deeply lobed, smooth, yellowish-green on the upper surface, paler or glaucous on the under, and strongly marked by orange-coloured veins. The scape is erect, round, and smooth, rising from a few inches to a foot in height, and terminating in a single flower. The calyx is two-leaved and deciduous. The petals, varying from seven to fourteen, but usually about eight in number, are spreading, ovate, obtuse, concave, mostly white, but sometimes slightly tinged with rose or purple. The stamens are numerous, with yellow filaments shorter than the corolla, and orange oblong anthers. The germ is oblong and compressed, and supports a sessile, persistent stigma. The capsule is oblong, acute at both ends, two-valved, and contains numerous oval, reddish-brown seeds. The whole plant is pervaded by an orange-coloured sap, which flows from every part when broken, but is of the deepest colour in the root.

The bloodroot is one of the earliest and most beautiful spring flowers of North America. It grows abundantly throughout the whole United States, delighting in loose rich soils, and shady situations, and flowering in March and April. After the fall of the flower, the leaves continue to grow, and, by the middle of summer, have become so large as to give the plant an entirely different aspect. All parts of the plant are active, but the root only is officinal.

This, when dried, is in pieces from one to three inches long, from a quarter to half an inch or more in thickness, flattened, much wrinkled and twisted, often furnished with abrupt offsets and numerous short fibres, of a reddish-brown colour externally, with a spongy uneven fracture, the surface of which is at first bright-orange, but becomes of a dull-brown by long exposure. The colour of the powder is a brownish orange-red. Sanguinaria has a faint narcotic odour, and a bitterish very acrid taste, the pungency of which remains long in the mouth and fauces. It yields its virtues to water and alcohol. The late Dr. Dana, of New York, obtained from it a peculiar alkaline principle, denominated by him *sanguinarina*, upon which the acrimony, and perhaps the medical virtues of the root depend. It may be procured, according to Dana, by infusing the finely powdered root in hot water or diluted muriatic or acetic acid, precipitating with water of ammonia, collecting the precipitated matter, boiling it in water with pure animal charcoal, filtering off the water, exposing the residue left upon the filter to the action of alcohol, and finally evaporating the alcoholic solution. (*Ann. Lyc. of Nat. Hist., New York*, ii. 250.) It may also be conveniently procured by a process similar to that employed by Probst for obtaining chelerythrin from celandine. This consists in forming a strong ethereal tincture of the root; passing through this muriatic acid gas, drying the precipitated muriate which is insoluble in ether, dissolving it in hot water, filtering, precipitating by ammonia, drying the precipitate, dissolving it in ether, decolorizing by animal charcoal, again precipitating by means of muriatic acid gas, and decomposing the muriate as before. (*Chem. Gaz.*, i. 145.) Sanguinarina, thus obtained, is a white pearly substance, of an acrid taste, very sparingly soluble in water, soluble in ether, and very soluble in alcohol. With the acids it forms salts soluble in water, all of which have some shade of red, crimson, or scarlet, and form beautiful red solutions. They are acrid and pungent to the taste, particularly the muriate and acetate. From these facts it would appear that the red colour and acrid properties of the bloodroot may be owing to the presence of some native salt of sanguinarina, which is de-

composed by ammonia in the separation of the organic alkali. The formula of sanguinarina is $NC_{37}H_{16}O_8$. A principle has been extracted from bloodroot by Riegel analogous to the porphyroxin found by Merck in opium. (*Chem. Gaz.*, iv. 198.) The virtues of the root are said to be rapidly deteriorated by time.

Medical Properties and Uses. Sanguinaria is an acrid emetic, with stimulant and narcotic powers. In small doses it excites the stomach, and accelerates the circulation; more largely given, produces nausea and consequent depression of the pulse; and in the full dose occasions active vomiting. The effects of an overdose are violent emesis, a burning sensation in the stomach, tormenting thirst, faintness, vertigo, dimness of vision, and alarming prostration. Four persons lost their lives at Bellevue Hospital, New York, in consequence of drinking largely of tincture of bloodroot, which they mistook for ardent spirit. (*Am. Journ. of Med. Sci.*, N. S., ii. 506.) Snuffed up the nostrils, bloodroot excites much irritation, attended with sneezing. Upon fungous surfaces it acts as an escharotic. It has been given in typhoid pneumonia, catarrh, pertussis, croup, phthisis pulmonalis, scarlatina, rheumatism, jaundice, dyspepsia, hydrothorax, and some other affections, either as an emetic, nauseant, or alterative; and its virtues are highly praised by many judicious practitioners. Dr. Mothershead, of Indianapolis, speaks in the strongest terms of its efficacy as an excitant to the liver, given in alterative doses. (See *Wood's Quart. Retrosp.*, ii. 80.)

The dose with a view to its emetic operation is from ten to twenty grains, given in powder or pill. The latter form is preferable, in consequence of the great irritation of throat produced by the powder when swallowed. For other purposes the dose is from one to five grains, repeated more or less frequently according to the effect desired. The medicine is sometimes given in infusion or decoction, in the proportion of half an ounce to the pint. The emetic dose of this preparation is from half a fluidounce to a fluidounce. The tincture is officinal. An infusion in vinegar has been employed advantageously, as a local application, in obstinate cutaneous affections; and Dr. R. G. Jennings has found it more efficient as a gargle in the sorethroat of scarlatina than any other that he has employed. (*Stethoscope*, ii. 182.) Dr. Stevens, of Ceres, New York, has found the powder useful as an errhine, in coryza, combined with cloves and camphor. (*N. Y. Journ. of Med.*, N. S., iv. 358.)

Off. Prep. Tinctura Sanguinariæ. W.

SANTALUM. *U. S.*

Red Saunders.

The wood of Pterocarpus santalinus. *U. S.*

Off. Syn. PTEROCARPUS. Pterocarpus santalinus. The wood. *Lond.*, *Ed.* Santal rouge, *Fr.*; Santelholz, *Germ.*

PTEROCARPUS. *Sex. Syst.* Diadelphia Decandria.—*Nat. Ord.* Fabaceæ or Leguminosæ.

Gen. Ch. Calyx five-toothed. *Legume* falcated, leafy, varicose, girted by a wing, not gaping. *Seeds* solitary. *Willd.*

Pterocarpus santalinus. Willd. *Sp. Plant.* iii. 906; Woodv. *Med. Bot.* p. 430, t. 156. This is a large tree with alternate branches, and petiolate ternate leaves, each simple leaf being ovate, blunt, somewhat notched at the apex, entire, veined, smooth on the upper surface, and hoary beneath. The flowers are yellow, in axillary spikes, and have a papilionaceous corolla, of which the *vexillum* is obcordate, erect, somewhat reflexed at the sides, toothed and waved, the *alæ* spreading with their edges apparently toothed, and the *carina* oblong, short, and somewhat inflated. The tree is a native of India, attaining the highest perfection

in mountainous districts, and inhabiting especially the mountains of Coromandel and Ceylon. Its wood is the true officinal *red saunders*, though there is reason to believe that the product of other trees is sold by the same name.

The wood comes in roundish or angular billets, internally of a blood-red colour, externally brown from exposure, compact, heavy, and fibrous. It is kept in the shops in the state of small chips, raspings, or coarse powder.

Red saunders has little smell or taste. It imparts a red colour to alcohol, ether, and alkaline solutions, but not to water; and a test is thus afforded by which it may be distinguished from some other colouring woods. The alcoholic tincture produces a deep-violet precipitate with the sulphate of iron, a scarlet with the bichloride of mercury, and a violet with the soluble salts of lead. The colouring principle, which was separated by Pelletier, and called by him *santalin*, is of a resinous character, scarcely soluble in cold water, more so in boiling water, very soluble in alcohol, ether, acetic acid, and alkaline solutions, but slightly in the fixed and volatile oils, with the exception of those of lavender and rosemary, which readily dissolve it. It is precipitated when acids are added to the infusion of the wood prepared with an alkaline solution. Weyermann and Hœfferly have found it to be possessed of acid properties. The wood has no medical virtues, and is employed solely for the purpose of imparting colour.

Off. Prep. Spiritus Lavandulæ Compositus; Tinctura Cinchonæ Composita; Tinctura Rhei et Sennæ. W.

SAPO. *U. S., Lond.*

Soap.

Soap made with soda and olive oil. *U. S., Lond.*

Off. Syn. SAPO DURUS, *Ed., Dub. Spanish* or *Castile soap*, made with olive oil and soda. *Ed.*

Savon blanc, *Fr.;* Oel-sodaseife, *Germ.;* Sapone duro, *Ital.;* Xabon, *Span.*

SAPO VULGARIS. *U. S.*

Common Soap.

Soap made with soda and animal oil. *U. S.*

Savon de suif, Savon de graisse, *Fr.;* Talgseife, *Germ.*

SAPO MOLLIS. *Lond., Ed.*

Soft Soap.

Soap made with olive oil and potash. *Lond., Ed.*

Savon mou, Savon vert, Savon à base de potasse, *Fr.;* Schmierseife, Kaliseife, *Germ.*

Soaps, in the most extended signification of the term, embrace all those compounds which result from the reaction of salifiable bases with fats and oils. Fats and oils, as has been explained under the titles *Adeps* and *Olea*, consist of three principles, two solid, differing in fusibility, called *stearin* and *margarin*, and one liquid, called *olein*, of which there are two varieties. Stearin characterizes the fats which are firm and solid, as tallow; margarin, those that are soft like lard; and olein the oils. When the fats and oils undergo *saponification* by reaction with a salifiable base, these three principles are decomposed into oily acids peculiar to each, discovered by Chevreul, and called stearic, margaric, and oleic acids, which unite with the base to form the soap, and into a sweet principle not

saponifiable, called glycerin, which is set free. Hence it is inferred that stearin is a stearate, margarin a margarate, and olein an oleate of glycerin, and that the fats and oils are mixtures of these three oily salts. Hence, also, it is obvious that soaps are mixed stearates, margarates, and oleates of various bases. *Stearic acid* is a firm white solid, fusible at 167°, greasy to the touch, pulverizable, soluble in alcohol, very soluble in ether, but insoluble in water. In the impure state it is used as a substitute for wax, for making candles. *Margaric acid* has the appearance of fat, and is fusible at 140°. *Oleic acid* is an oily liquid, insoluble in water, soluble in alcohol and ether, lighter than water, crystallizable in needles a little below 32°, and having a slight smell and pungent taste. *Glycerin* will be described under a separate head. (See *Glycerina.*)

Soaps are divided into the soluble and insoluble. The soluble soaps are combinations of the oily acids with soda, potassa, and ammonia; the insoluble consist of the same acids united with earths and metallic oxides. It is the soluble soaps only that are detergent, and to which the name *soap* is generally applied. Several of the insoluble soaps are employed in pharmacy; as, for example, the soap of the protoxide of lead, or lead plaster, and the soap of lime, or lime liniment. (See *Emplastrum Plumbi* and *Linimentum Calcis.*)

The consistency of the fixed alkaline soaps depends partly on the nature of the oil or fat, and partly on the alkali present. Soaps are harder the more stearate and margarate they contain, and softer when the oleate predominates; and, as it respects the alkali present, they are harder when formed with soda, and softer when containing potassa. Hence it is that of pure soaps, considered as salts, stearate of soda is the hardest and least soluble, and oleate of potassa the softest and most soluble.

The officinal soaps, here described, embrace three varieties; namely, two soda soaps, one made with olive oil (Castile soap), the other with animal oil (common soap); and one potassa soap (soft soap). The soap of ammonia is noticed under another head. (See *Linimentum Ammoniæ.*)

Preparation. The following is an outline of the process for making soap. The oil or fat is boiled with a solution of caustic alkali, until the whole forms a thick mass, which can be drawn out into long clear threads. After the soap is completely formed, the next step is to separate it from the excess of alkali, the glycerin, and redundant water. This is effected by adding common salt, or a very strong alkaline lye, in either of which the soap is insoluble. The same end may be attained by boiling down the solution, until the excess of alkali forms a strong alkaline solution, which acts the same part in separating the soap as the addition of a similar solution. As soon as the soap is completely separated, it rises to the surface, and, when it has ceased to froth in boiling, is ladled out into wooden frames to congeal, after which it is cut into bars by means of a wire. The soap, as first separated, is called *grain soap.* It may be purified by dissolving it in an alkaline lye, and separating it by common salt. During this process the impurities subside, and the soap combines with more water; and hence it becomes weaker, although purer and whiter. If the grain soap be not purified it forms *marbled soap,* the coloured streaks arising principally from an insoluble soap of oxidized iron. Sometimes the marbled appearance is produced by adding to the soap, as soon as it is completely separated, a fresh portion of lye, and immediately afterwards a solution of sulphate of iron. The black oxide of iron is precipitated, and gives rise to dark-coloured streaks, which, by exposure to the air, become red, in consequence of the conversion of the black into the sesquioxide of iron.

The officinal *soap* (Sapo) of the U.S. and London Pharmacopœias is an olive oil soda soap, made on the same general plan as that just explained. It is the *Sapo Durus* of the Edinburgh and Dublin Colleges.

Common Soap (Sapo Vulgaris) is also a soda soap; but instead of olive it contains concrete animal oil. This soap corresponds with the white soap of Northern European countries and of the United States, and is formed usually from barilla and tallow. In Scotland it is manufactured from kelp and tallow. It was introduced into the list of the U. S. Pharmacopœia as the only proper soap for making opodeldoc. (See *Linimentum Saponis Camphoratum.*)

Soft Soap (Sapo Mollis) is prepared on the same general principles as hard soap; potash being employed as the alkali, and a fatty matter, rich in olëin, as the oil. The French soft soap is made with the seed oils, such as rape seed, hemp seed, &c.; the Scotch and Irish, with fish oil and some tallow; and our own with refuse fat and grease. A lye of wood-ashes is the form of potash usually employed. In forming this soap it is necessary that it should continue dissolved in the alkaline solution, instead of being separated from it. Hence soft soap is a soap of potassa, completely dissolved in the solution of its alkali, which is consequently present in excess. A soap of potassa is sometimes made with a view to its conversion into a soda soap. This conversion is effected by the addition of common salt, which, by double decomposition, generates a soap of soda, and chloride of potassium in solution. After this change is effected, the addition of a further portion of salt separates the soda soap formed.

Besides the officinal soaps of the United States and British Pharmacopœias, there are many other varieties, more or less used for medicinal or economical purposes. The officinal soap of the French Codex, called *amygdaline soap* (*almond oil soap*), is formed of caustic soda and almond oil, and is directed to be kept for two months exposed to the air, before being used. *Starkey's soap*, also officinal in the Codex, is prepared by uniting, by trituration, equal parts of carbonate of potassa, oil of turpentine, and Venice turpentine. *Beef's marrow soap* is a fine animal oil soap, also included in the French standard of pharmacy. *Windsor soap* is a scented soda soap, made of one part of olive oil and nine parts of tallow. *Eau de luce* (*aqua luciæ*) is a kind of liquid soap, formed by mixing a tincture of oil of amber and balsam of Gilead with water of ammonia. *Transparent soap* is prepared by saponifying kidney fat with soda free from foreign salts, drying the resulting soap, dissolving it in alcohol, filtering and evaporating the solution, and running it into moulds when sufficiently concentrated. The soap is yellow or yellowish-brown, and preserves its transparency after desiccation. *Palm soap* is prepared from soda and palm oil, to which tallow is added to increase its firmness. If it be wanted white, the palm oil must be bleached by sulphuric acid, by chlorine, or by exposure to the sun. This soap has a yellowish colour, and the agreeable odour of violets, derived from the oil. *Soap balls* are prepared by dissolving soap in a small quantity of water, and then forming it with starch into a mass of the proper consistence. *Common yellow soap* (*rosin soap*) derives its peculiarities from an admixture of rosin and a little palm oil with the tallow employed; the oil being added to improve its colour. Large quantities of lard oil (nearly pure olein) are manufactured into soap.

All the varieties of soap, except a few of the fancy sort and the olive oil soaps, are manufactured in the United States. The latter, which are chiefly used for medicinal purposes, are imported from France.

Properties. Soap, whatever may be its variety, has the same general properties. Its aspect and consistence are familiar to every one. Its smell is peculiar, and taste slightly alkaline. It is somewhat heavier than water, and therefore sinks in that liquid. Exposed to heat it quickly fuses, swells up, and is decomposed. It is soluble in water, and more readily in hot than in cold. Potassa soaps and those containing oleic acid are far more soluble than the soda soaps, especially those in which the stearates and margarates predominate. Acids, added to an aqueous solution of soap, combine with the alkali, and set free the

oily acids, which, being diffused through the water, give it a milky appearance. Its decomposition is also produced by metallic salts, which invariably give rise to insoluble soaps. Soap is soluble in cold, and abundantly in boiling alcohol. This solution constitutes the *tincture of soap*, and forms a very convenient test for discovering lime in natural waters. The efficacy of soap as a detergent depends upon its power of rendering grease and other soiling substances soluble in water, and, therefore, capable of being removed by washing. Various adulterations in soap are lime, gypsum, heavy spar, steatite, and pipe-clay, in which case it will not be entirely soluble in alcohol. According to Dr. Riegel, glue is an occasional adulteration in Spanish soap, discoverable also by its insolubility in alcohol. The same impurity is found in other soaps.

Olive oil soda soap (Sapo), otherwise called *Castile* or *Spanish soap*, is a hard soap, and is presented under two principal varieties, the white and the marbled. *White Castile soap*, when good, is of a pale grayish-white colour, incapable of giving an oily stain to paper, devoid of rancid odour or strong alkaline qualities, and entirely soluble both in water and alcohol. It should not feel greasy, nor grow moist, but, on the contrary, should become dry by exposure to the air, without exhibiting any saline efflorescence. This variety of soap contains about twenty-one per cent. of water. Sometimes it contains a larger proportion of water, with which the soap is made to combine by the manufacturer, with the fraudulent intention of increasing its weight. Soap, thus adulterated, is known by its unusual whiteness, and by its suffering a great loss of weight in a dry air. The proportion of water may be ascertained by introducing the soap into a saturated solution of chloride of sodium and boiling; when the soap, nearly free from water, concretes into a solid mass. *Marbled Castile soap* is harder, more alkaline, and more constant in its composition than the other variety. It contains about fourteen per cent. of water. Containing less water than the white Castile, it is a stronger and more economical soap; but at the same time less pure. The impurity arises from the veins of marbling, which consist of ferruginous matter, as already explained.

Animal oil soda soap (Sapo Vulgaris) is a hard soap, of a white colour, inclining to yellow. It is made from tallow and caustic soda. This soap possesses the same general properties as the olive oil soda soap.

Soft soap (Sapo Mollis), as made in this country, is semi-fluid, slippery, capable of being poured from one vessel to another, and of a dirty brownish-yellow colour. This soap always contains an excess of alkali, which causes it to act more powerfully as a detergent than hard soap. It also contains the glycerin of the fatty matters, which is always separated from hard soap. The London and Edinburgh Colleges direct it to be made from olive oil and potash; but Dr. Pereira states that he has not been able to meet with it in England. That which is made in France has a greenish colour and the consistence of soft ointment, and is composed of hemp seed oil and potash. It is called in the French Codex, *savon vert*. Sometimes it is manufactured from the dregs of olive oil.

Incompatibles. Soap is decomposed by all the acids, earths, and earthy and metallic salts. Acids combine with the alkali, and set free the oily acids of the soap; the earths unite with the oily acids and separate the alkali; while the earthy and metallic salts give rise, by double decomposition, to an insoluble soap of their base, and a saline combination between their acid and the alkali of the soap. Hard waters, in consequence of their containing salts of lime, decompose and curdle soap. They may be rendered soft and fit for washing, by adding sufficient carbonate of soda, or of potassa, to precipitate all the lime.

Composition. It has been already explained that soap consists of certain oily acids, united with an alkali. As olive oil is a compound of margarin and olëin, so the officinal "soap" is a mixed margarate and oleate of soda. The officinal

"common soap" is principally a stearate of soda, and "soft soap," as defined by the London and Edinburgh Colleges, is a mixed margarate and oleate of potassa. The most important soaps have the following composition in the hundred parts. *Marseilles white soap*,—soda 10·24, margaric acid 9·20, oleic acid 59·20, water 21·36. (*Braconnot.*) *Castile soap*, very dry,—soda, 9·0, oily acids 76·5, water 14·5. (*Ure.*) *Glasgow soft soap*,—potassa 9·0, oily acids 43·7, water 47·3. (*Ure.*) *French soft soap*,—potassa 9·5, oily acids 44, water 46·5. (*Thenard.*) Most soaps, it is perceived, contain a large proportion of water.

Medical Properties. Soap possesses the properties of a laxative, antacid, and antilithic. It is seldom given alone, but frequently in combination with rhubarb, the astringency of which it has a tendency to correct. Thus combined, it is frequently administered in dyspepsia, attended with constipation and torpor of the liver. As it is readily decomposed by the weakest acids, which combine with the alkali, it has proved useful in acidity of the stomach, and has been recommended as a remedy in the uric acid diathesis; but it possesses no power to dissolve calculi, as was once supposed. Externally, soap is a stimulating discutient, and as such has been used, by friction, in sprains and bruises. The late Dr. A. T. Thomson found much benefit to result from rubbing the tumid abdomen of children in mesenteric fever, morning and evening, with a strong lather of soap. In constipation of the bowels, particularly when arising from hardened feces in the rectum, a strong solution of soap, especially of soft soap, forms a useful enema. When the latter is used, two tablespoonfuls may be dissolved in a pint of warm water. In pharmacy, soap is frequently employed for the purpose of giving a proper consistence to pills; but care must be taken not to associate it with a substance which may be decomposed by it. It is also an ingredient in some liniments and plasters. In toxicology it is used as a counterpoison for the mineral acids, and should always be resorted to in poisoning by these agents without a moment's delay, and its use continued until magnesia, chalk, or the bicarbonate of soda or of potassa can be obtained. The mode of administration, in these cases, is to give a teacupful of a solution of soap, made by dissolving it in four times its weight of water, every three or four minutes, until the patient has taken as much as he can swallow. The dose of soap is from five grains to half a drachm, given in the form of pill.

Off. Prep. of Soap. Ceratum Saponis; Emplastrum Resinæ; Emplastrum Saponis; Extractum Colocynthidis Compositum; Linimentum Opii; Pilulæ Aloës; Pil. Aloës et Assafœtidæ; Pil. Assafœtidæ; Pil. Cambogiæ; Pil. Colocynthidis Comp.; Pil. Opii; Pil. Rhei; Pil. Rhei Comp.; Pil. Saponis Comp.; Pil. Scillæ Comp.; Tinctura Saponis Camphorata.

Off. Prep. of Common Soap. Linimentum Saponis Camphoratum.

Off. Prep. of Soft Soap. Enema Colocynthidis; Linimentum Terebinthinæ; Pilula Aloës cum Myrrhâ; Pil. Aloës cum Sapone; Pil. Cambogiæ Composita; Pil. Colocynthidis Comp.; Pil. Galbani Comp.; Pil. Rhei Comp.; Pil. Saponis Comp.; Pil. Scillæ Comp.; Unguentum Sulphuris Compositum. B.

SARSAPARILLA. *U. S., Dub.*

Sarsaparilla.

The root of Smilax officinalis and of other species of Smilax. *U. S.* Smilax officinalis. Jamaica Sarsaparilla. The root. *Dub.*

Off. Syn. SARSA. Smilax officinalis. The root. *Lond.;* SARZA. Root of Smilax officinalis, and probably other species. *Ed.*

Salsepareille, *Fr.;* Sarsaparille, *Germ.;* Salsapariglia, *Ital.:* Zarzaparrilla, *Span.*

SMILAX. *Sex. Syst.* Diœcia Hexandria.—*Nat. Ord.* Smilaceæ.

Gen. Ch. MALE. *Calyx* six-leaved. *Corolla* none. FEMALE. *Calyx* six-leaved. *Corolla* none. *Styles* three. *Berry* three-celled. *Seeds* two. *Willd.*

Formerly, *Smilax Sarsaparilla* was admitted by most of the standard authorities as the source of this drug; but it is doubtful whether any of the sarsaparilla of the shops was ever obtained from that species. *S. Sarsaparilla* is a native of the United States; and the medicine has never, within our knowledge, been collected in this country. It is not among the eleven species of *Smilax* described by Humboldt, Bonpland, and Kunth, who indicate *S. officinalis*, *S. syphilitica*, and *S. Cumanensis*, especially the first, as the probable sources of the drug exported from Mexico and the Spanish Main. In the present state of our knowledge, it is impossible to decide with certainty from what species the several commercial varieties of the drug are respectively derived. This much is certain, that they do not proceed from the same plant. Of the many species belonging to this genus, few possess any medicinal power; and Hancock states that of the six or eight which he found growing in the woods of Guiana, only one presented in any degree the sensible properties of the genuine sarsaparilla, the rest being insipid and inert. The root (rhizoma) of *Smilax China*, a native of China and Japan, has been employed under the name of *China root* for similar purposes with the officinal sarsaparilla. As it occurs in commerce, it is in pieces from three to eight inches long and an inch or two thick, usually somewhat flattened, more or less knotty, often branched, of a brownish or grayish-brown colour externally, whitish or of a light flesh-colour internally, without odour, and of a taste flat at first, but afterwards very slightly bitterish and somewhat acrid, like that of sarsaparilla. The root of *Smilax aspera* is said to be employed in the South of Europe as a substitute for sarsaparilla; but it has little reputation. The East India sarsaparilla, which was at one time referred to this species of Smilax, is now known to be the product of *Hemidesmus Indicus*. (See *Hemidesmus*.) We shall briefly describe S. Sarsaparilla, on account of its former officinal rank, and afterwards such other species as are believed to yield any portion of the drug. All of these species are climbing or trailing plants, with prickly stems; a character expressed in the name of the medicine, which is derived from two Spanish words (*zarza* and *parilla*), signifying a small thorny vine.

Smilax Sarsaparilla. Willd. *Sp. Plant.* iv. 776; Woodv. *Med. Bot.* p. 161, t. 62. The stem of this plant is long, slender, shrubby, angular, and beset with prickles. The leaves are unarmed, ovate-lanceolate with about five nerves, somewhat glaucous beneath, and supported alternately upon footstalks, at the bases of which are long tendrils. The flowers usually stand three or four together, upon a common peduncle, which is longer than the leafstalk. This species is indigenous, growing in swamps and hedges in the Middle and Southern States.

S. officinalis. Humb. and Bonpl. *Plant. Æquinoct.* i. 271. In this species the stem is twining, angular, smooth, and prickly; the young shoots are unarmed; the leaves ovate-oblong, acute, cordiform, five or seven-nerved, coriaceous, smooth, twelve inches long and four or five broad, with footstalks an inch long, smooth, and furnished with tendrils. The young leaves are lanceolate-oblong, acuminate, and three-nerved. According to Humboldt, the plant abounds on the river Magdalena, in New Granada, where it is called *zarzaparilla* by the natives. Large quantities of the root are sent down the river to Mompox and Carthagena.

S. Syphilitica. Willd. *Sp. Plant.* iv. 780. The stem is round and smooth; armed at the joints with from two to four thick, straight prickles; and furnished with oblong-lanceolate, acuminate, three-nerved, coriaceous, shining leaves, which are a foot in length, and terminate by a long point. The plant was seen by Humboldt and Bonpland in New Granada, upon the banks of the river Cassiquiare, and by Martius in Brazil, at Yupura and near the Rio Negro. It has been supposed to yield the Brazilian sarsaparilla.

S. Papyracea. Poiret, *Encyc. Méth.* iv. 467. This is an under-shrub with a compressed stem, angular below, and furnished with spines at the angles. Its leaves are elliptical, acuminate, and three-nerved. It inhabits Cayenne and Brazil, chiefly upon the banks of the Amazon and its tributaries, and is thought to yield the variety of sarsaparilla denominated Brazilian. (*Am. Journ. of Pharm.*, xv. 277.) A particular description of a specimen of Smilax, supposed to belong to this species, is given by Professor Bentley in the *London Pharm. Journ. and Trans.* (x. 470). It was obtained from Guatemala, and was the source of a variety of commercial sarsaparilla, recently introduced into the market, which Professor Bentley proposes to name Guatemala sarsaparilla.

S. medica. Schlechtendahl, *in Linnæa*, vi. 47; Carson, *Illust. of Med. Bot.* ii. 51, pl. 95. This species has an angular stem, armed with straight prickles at the joints, and a few hooked ones in the intervals. The leaves are smooth, bright-green on both sides, shortly acuminate, five-nerved, with the veins prominent beneath. They vary much in form, the lower being cordate, auriculate-hastate; the upper cordate-ovate. In the old leaves, the petiole and midrib are armed with straight subulate prickles. The inflorescence is an umbel of from eight to twelve flowers, with a smooth axillary peduncle, and pedicels about three lines long. Schiede found this plant on the eastern declivity of the Mexican Andes, where the root is collected to be taken to Vera Cruz.

The medicinal species of Smilax grow in Mexico, Guatemala, and the warm latitudes of South America. The roots are very long and slender, and originate in great numbers from a common head or rhizoma, from which the stems of the plant rise. The whole root with the rhizoma is usually dug up, and as brought into market exhibits not unfrequently portions of the stems attached, sometimes several inches in length. The sarsaparilla of commerce comes from different sources, and is divided into varieties according to the place of collection or shipment.

Honduras Sarsaparilla is the variety most used in this country. It is brought from the bay of *Honduras*, and comes in bundles two or three feet long, composed of several roots folded lengthwise, and secured in a compact form by a few circular turns. These are packed in bales imperfectly covered with skins, each bale containing one hundred pounds or more. The roots are usually connected at one extremity in large numbers in a common head, to which portions of the stems are also attached. In some bundles are many small fibres either lying loose, or still adhering to the roots. The colour of the roots externally is a dirty grayish or reddish-brown; and the cortical portion beneath the epidermis often appears amylaceous when broken.

The *Jamaica* or *red sarsaparilla* of foreign writers is little known by that name in the United States. The island of Jamaica is merely its channel of exportation to Europe, and it is probably derived originally from Central America. It does not materially differ in properties from Honduras sarsaparilla; its chief peculiarity being the reddish colour of the epidermis, which is also sometimes found in that variety. It is said also to yield a larger proportion of extract, and to contain less starch. As found in commerce, it is in bundles twelve or eighteen inches long, by four or five in thickness, consisting of long slender roots folded up, with numerous radical fibres attached.

Considerable quantities of the drug are imported from the Mexican ports of Vera Cruz and Tampico. The *Vera Cruz sarsaparilla* comes in large, rather loose bales, weighing about two hundred pounds, bound with cords or leather thongs, and usually containing the roots folded upon themselves, and separately packed. These, as in the Honduras sarsaparilla, consist of a head or caudex with numerous long radicles, which, however, are somewhat smaller than in that variety, and have a thinner bark. They are often also much soiled with earth. This variety is not highly esteemed; but from the acrid taste which it possesses,

it is probably not inferior in real virtues to the other kinds. It is probably derived from the Smilax medica.

Another variety is the *Caracas sarsaparilla*, brought in large quantities from La Guayra. It is in oblong packages, of about one hundred pounds, surrounded with broad strips of hide, which are connected laterally with thongs of the same material, and leave much of the root exposed. The roots, as in the last variety, are separately packed, but more closely and with greater care. The radicles are often very amylaceous internally, in this respect resembling the following.

The *Brazilian*, or, as it is sometimes called in Europe, the *Lisbon sarsaparilla*, is less used in the United States than in Europe, where it has commanded a higher price. Within a few years, however, it has been imported in considerable quantities. It comes from the ports of Para and Maranham, in cylindrical bundles of from three to five feet in length, by about a foot in thickness, bound about by close circular turns of a very flexible stem, and consisting of unfolded roots, destitute of caudex (rhizoma) and stems, and having few radical fibres. It is the variety of which Hancock speaks as celebrated throughout South America by the name of *sarsa of the Rio Negro*, and is considered as the most valuable variety of the drug. It is distinguished by the amylaceous character of its interior structure, and has considerable acrimony. It was said by Martius to be derived from Smilax syphilitica; but Dr. Hancock considers that portion of it which comes from the Rio Negro, and is shipped at Para, as the product of an undescribed species, certainly not S. syphilitca. According to Richard, it has been ascertained to be the product of the S. papyracea of Poiret. (See *Am. Journ. of Pharm.*, xv. 277.)

The variety described by Professor Bentley under the name of *Guatemala sarsaparilla* was collected in the province of Sacatepeques, about ninety miles from the sea. It is in cylindrical bundles about two feet eight inches long by four inches in diameter, composed of separate roots, arranged in parallel order, without rootstalk, and bound together by a few turns of the flexible stem of a monocotyledonous plant. The bundles resemble the Brazilian in arrangement, but are much less compact. It is amylaceous, has considerable acrimony, and is probably one of the most efficient varieties. Professor Bentley ascribes it to S. papyracea. For a particular description of the root, the reader is referred to the *Pharm. Journ. and Trans.* (xii. 472).

Much sarsaparilla has been imported into England from Lima, Valparaiso, and other places on the Pacific coast of South America. It is described by Pereira as bearing a close resemblance to Jamaica sarsaparilla, but yielding a smaller proportion of extract. It is in bundles of about three feet long and nine inches thick, consisting of the roots folded with their heads or rhizoma attached. The epidermis is brown or grayish-brown. Sometimes roots of a light clay colour are found in the bundles.

Properties. The dried sarsaparilla roots are several feet in length, about the thickness of a goose-quill, cylindrical, more or less wrinkled longitudinally, flexible, and composed of a thick exterior cortical portion, covered with a thin easily separable epidermis, of an inner layer of ligneous fibre, and of a central pith. The epidermis is of various colours, generally ash-coloured, grayish-brown, or reddish-brown, and sometimes very dark. The cortical portion is in some specimens whitish, in others brown, and not unfrequently of a pink or rosy hue. It is occasionally white, brittle, and almost powdery like starch. The woody part is usually very thin, and composed of longitudinal fibres, which allow the root to be split with facility through its whole length. The central medulla often abounds in starch.

Sarsaparilla in its ordinary state is nearly or quite inodorous, but in decoction acquires a decided and peculiar smell. To the taste it is mucilaginous and

very slightly bitter, and, when chewed for some time, produces a disagreeable acrid impression, which remains long in the mouth and fauces. The root is efficient in proportion as it possesses this acrimony, which is said by some authors to be confined to the cortical portion, while the ligneous fibre and medullary matter are insipid and inert. Hancock avers that all parts are equally acrid and efficacious. The truth is probably between the two extremes; and, as in most medicinal roots, it must be admitted that the bark is more powerful than the interior portions, while these are not wholly inactive. The virtues of the root are communicated to water cold or hot, but are impaired by long boiling. (See *Decoctum Sarsaparillæ.*) They are extracted also by diluted alcohol. According to Hancock, the whole of the active principle is not extracted by water. He observes in his paper upon sarsaparilla, published in the *London Medico-Botanical Transactions*, when speaking of the sarsaparilla from Para and the Rio Negro, "after exhausting half a pound of this sort by two digestions, boiling, and pressure, I added to the dregs half a pint of proof spirit, and digested this with a gentle heat for a few hours in a close vessel, then affusing hot water to the amount of that taken off from the first boiling, and pressing again, I procured by the last operation about four pints of an infusion which possessed the acrid properties of the sarsa in a much higher degree even than that obtained by the first decoction with simple water." It appears that in South America it is the custom to prepare sarsaparilla by digestion in wine or spirit, or by infusion in water with additions which may produce the vinous fermentation, and thus add alcohol to the menstruum. The same result, as to the superior efficacy of alcohol as a solvent of the acrid principle of sarsaparilla, has been obtained by the French experimentalists. (Soubeiran, *Journ. de Pharm.*, xvi. 38.)

According to M. Thubeuf, sarsaparilla contains, 1. a peculiar crystalline substance, which is probably the active principle of the root, 2. a colouring substance, 3. resin, 4. starch, 5. lignin, 6. a thick, aromatic, fixed oil, 7. a waxy substance, and 8. chloride of potassium and nitrate of potassa. It is said also to contain a minute proportion of volatile oil, and Batka found gum, bassorin, albumen, gluten and gliadine, lactic and acetic acids, and various salts. The proportion of starch is large. Chatin found iodine in Honduras sarsaparilla; but Dr. Winckler, not having succeeded in detecting this principle in any one root, thinks it probable that the specimen examined by Chatin had been exposed to sea-water. (*Pharm. Cent. Blatt*, May 7, 1852.)

Sarsaparillin. (*Smilacin. Pariglin. Salseparine. Parillinic acid.*) The crystalline principle in which the virtues of sarsaparilla reside should be called *sarsaparillin.* It was first discovered by Dr. Palotta, who described it in 1824 under the name of *pariglin.* Subsequently, M. Folchi supposed that he had found another principle which he called *smilacin.* In 1831, M. Thubeuf announced the discovery of a new substance in sarsaparilla which he named *salseparine*, from the French name of the root. Finally, Batka, a German chemist, towards the end of 1833, published an account of a principle which he had discovered in the root, and which, under the impression that it possessed acid properties, he called *parillinic acid.* M. Poggiale, however, has shown that these substances are identical, though procured by different processes. The following is the process of M. Thubeuf. The root is treated with hot alcohol till deprived of taste. The tincture is submitted to distillation, and seven-eighths of the alcohol drawn off. The remainder is treated with animal charcoal, and filtered at the end of twenty-four or forty-eight hours. The sarsaparillin is deposited in the form of a granular powder. This is dissolved in a fresh portion of alcohol and crystallized. The alcoholic mother liquors may be deprived of that portion of the principle which they retain by evaporating to dryness, dissolving the product in water, filtering, again evaporating to dryness, redissolving in alcohol,

and crystallizing. *Sarsaparillin* is white, inodorous, almost tasteless in the solid state, but of a bitter, acrid, nauseous taste, when dissolved in alcohol or water. It is very slightly soluble in cold water, but more readily in boiling water, which deposits it on cooling. It is very soluble in alcohol, especially at a boiling temperature. Ether and the volatile oils also dissolve it. Its aqueous solution has the property of frothing very much by agitation. M. Beral states that he has procured it pure by distilling, by means of a salt-water bath, a tincture of sarsaparilla prepared with very dilute alcohol. In that case it must be volatile, and we can understand why sarsaparilla suffers in decoction. (*Am. Journ. of Pharm.*, xii. 245, from *Journ. de Chim. Méd.*) The solutions of sarsaparillin are without acid or alkaline reaction. Batka erred in considering it an acid. M. Poggiale found it both in the cortical and medullary part of the root, but most largely in the former. Pallotta gave it internally in doses varying from two to thirteen grains, and found it to produce nausea, and to diminish the force of the circulation. It is probably the principle upon which sarsaparilla depends chiefly, if not exclusively, for its remedial powers. (*Journ. de Pharm.*, xx. 553 and 679.)

The sarsaparilla of the shops is apt to be nearly if not quite inert, either from age, or from having been obtained from inferior species of Smilax. This inequality of the medicine, with the improper modes of preparing it long in vogue, has probably contributed to its variable reputation. The only criterion of good sarsaparilla to be relied on is the taste. If it leave a decidedly acrid impression in the mouth after having been chewed for a short time, it may be considered efficient; if otherwise, it is probably inert.

Medical Properties and Uses. Few medicines have undergone greater changes of reputation. About the middle of the sixteenth century it was introduced into Europe as a remedy for the venereal complaint, in which it had been found very useful in the recent Spanish settlements in the West Indies. After a time it fell into disrepute, and was little employed till about a century ago, when it was again brought into notice by Sir William Fordyce and others, as a useful adjuvant and corrigent of mercury in lues venerea. Since that period very different opinions have been entertained of its efficacy. Some, among whom was Dr. Cullen, considered it wholly inert; others, on the contrary, have had the most unbounded confidence in its powers. The probable cause of much of this discrepancy has been already mentioned. Experience, both among regular practitioners and empirics, would seem to have placed its efficacy beyond reasonable doubt. Its most extensive and useful application is to the treatment of secondary syphilis and syphiloid diseases, and that shattered state of the system which sometimes follows the imprudent use of mercury in these affections. It is also employed, though with less obvious benefit, in chronic rheumatism, scrofulous affections, certain cutaneous diseases, and other depraved conditions of health. Its mode of action is less evident than its ultimate effects. It is said to increase the perspiration and urine; but, allowing it to possess this power, the amount of effect is too trifling to explain its remedial influence; and the diaphoretic and diuretic action which it appears to evince may perhaps be as justly ascribed to the medicines with which it is generally associated, or the liquid in which it is exhibited. In this ignorance of its precise *modus operandi* we call it an alterative, as those medicines are named which change existing morbid actions, without obvious influence over any of the functions.

Sarsaparilla may be given in powder, in the dose of half a drachm three or four times a day. The medicine, however, is more conveniently administered in the form of infusion, decoction, syrup, or extract. (*See the several officinal preparations* in Part II.) A beer, made by fermenting an infusion of the drug

with molasses, is said to be a popular remedy in South America.* The smoke of sarsaparilla has been highly recommended in asthma. (*Journ. de Pharm. et de Chim.*, xviii. 221.)

Off. Prep. Decoctum Sarsaparillæ; Decoctum Sarsaparillæ Compositum; Extractum Sarsaparillæ; Extractum Sarsaparillæ Fluidum; Infusum Sarsaparillæ; Infusum Sarsaparillæ Comp.; Syrupus Sarsæ; Syrupus Sarsaparillæ Comp. W.

SASSAFRAS MEDULLA. *U. S.*

Sassafras Pith.

The pith of the stems of Sassafras officinale. *U. S.*

SASSAFRAS RADICIS CORTEX. *U. S.*

Bark of Sassafras Root.

The bark of the root of Sassafras officinale. *U. S.*

Off. Syn. SASSAFRAS. Sassafras officinale. The root. *Lond., Ed.* SASSAFRAS ROOT. Sassafras officinale. The root. *Dub.*

Sassafras, *Fr., Germ.;* Sassafras, Sassafrasso, *Ital.;* Sasafras, *Span.*

In the new distribution of the species composing the genus Laurus of Linnæus, the sassafras tree has been made the type of a distinct genus, denominated *Sassafras*, which has been admitted into the last edition of our Pharmacopœia.

Sassafras. *Sex. Syst.* Enneandria Monogynia. — *Nat. Ord.* Lauraceæ.

Gen. Ch. Diœcious. *Calyx* six-parted, membranous; segments equal, permanent at the base. Males. *Fertile stamens* nine, in three rows, the three inner with double stalked distinct glands at the base. *Anthers* linear, four-celled, all looking inwards. Females, with as many sterile stamens as the males or fewer; the inner often confluent. *Fruit* succulent, placed on the thick fleshy apex of the peduncle, and seated in the torn unchanged calyx. (*Lindley.*)

Sassafras officinale. Nees, *Laurin.* 488.—*Laurus Sassafras.* Willd. *Sp. Plant.* ii. 485; Bigelow, *Am. Med. Bot.* ii. 142; Michaux, *N. Am. Sylv.* ii. 144. This is an indigenous tree of middling size, rising in favourable situations from thirty to fifty feet in height, with a trunk about a foot in diameter. In the Southern States it is sometimes larger, and in the northern parts of New England is little more than a shrub. The bark which covers the stem and large branches is rough, deeply furrowed, and grayish; that of the extreme branches or twigs is smooth and beautifully green. The leaves, which are alternate, petiolate, and downy when young, vary much in their form and size even upon the same tree. Some are oval and entire, others have a lobe on one side; but the greater number are three lobed. Their mean length is four or five inches. The flowers, which are frequently diœcious, and appear before the leaves, are small, of a pale greenish-yellow colour, and disposed in racemes which spring from the branches below the leaves, and have linear bractes at their base. The corolla is divided into six oblong segments. The male flowers have nine stamens; the hermaphrodite,

* The following is a formula recommended by Hancock. "Take of Rio Negro sarsa, bruised, 2lb.; bark of guaiac, powdered, 8oz.; raspings of guaiac wood, anise seeds, and liquorice root, each 4oz.; mezereon, *bark of the root*, 2oz.; treacle [molasses] 2lb.; and a dozen bruised cloves; pour upon these ingredients about four gallons of boiling water, and shake the vessel thrice a day. When fermentation has well begun, it is fit for use, and may be taken in the dose of a small tumblerful twice or thrice a day." This formula is worthy of attention; but the bark of guaiacum, which is not kept in the shops, might be omitted, or replaced by the wood.

which are on a different plant, have only six, with a simple style. The fruit is an oval drupe, about as large as a pea, of a deep-blue colour when ripe, and supported on a red pedicel, which enlarges at the extremity into a cup for its reception.

The sassafras is common throughout the United States, and extends into Mexico. It is said also to grow in Brazil and Cochin China; but the plants observed in these places are probably not of the same species. In this country the sassafras is found both in woods and open places, and is apt to spring up in the neighbourhood of cultivation, and in neglected or abandoned fields. In Pennsylvania and New York, it blooms in the beginning of May; but much earlier at the South. The fresh flowers have a slightly fragrant odour, and almost all parts of the plant are more or less aromatic. The root is directed by the British Pharmacopœias; the bark of the root, and the pith of the twigs or extreme branches, by that of the United States. The root is exported, and is the part chiefly used in British pharmacy. It consists of a brownish-white wood, covered with a spongy bark divisible into layers. The latter portion is by far the most active, and is usually kept separate in our shops.

1. *Sassafras Pith.* This is in slender cylindrical pieces, very light and spongy, with a mucilaginous taste, and in a slight degree the characteristic flavour of the sassafras. It abounds in a gummy matter, which it readily imparts to water, forming a limpid mucilage, which, though ropy and viscid, has much less tenacity than that of gum Arabic, and will not answer as a substitute in the suspension of insoluble substances. It differs also from solutions of ordinary gum, in remaining limpid when added to alcohol. This mucilage is much employed as a mild and soothing application in inflammation of the eyes; and forms an agreeable and useful drink in dysenteric, catarrhal, and nephritic diseases. It may be prepared by adding a drachm of the pith to a pint of boiling water.

2. *Bark of Sassafras Root.* As found in the shops, this is usually in small irregular fragments, sometimes invested with a brownish epidermis, sometimes partially or wholly freed from it, of a reddish or rusty cinnamon hue, very brittle, and presenting when freshly broken a lighter colour than that of the exposed surfaces. Its odour is highly fragrant, its taste sweetish and gratefully aromatic. These properties are extracted by water and alcohol. They reside in a volatile oil, which is obtained by distillation with water. (See *Oleum Sassafras.*) According to Dr. Reinsch, the bark contains a heavy and light volatile oil, camphorous matter, fatty matter, resin, wax, a peculiar principle resembling tannic acid called *sassafrid*, tannic acid, gum, albumen, starch, red colouring matter, lignin, and salts. (See *Am. Journ. of Pharm.*, xviii. 159.)

Medical Properties and Uses. The bark of sassafras root is stimulant, and perhaps diaphoretic; though its possession of any peculiar tendency to the skin, independently of its mere excitant property, is quite doubtful. It is used almost exclusively as an adjuvant to other more efficient medicines, the flavour of which it improves, while it renders them more cordial to the stomach. The complaints for which it has been particularly recommended are chronic rheumatism, cutaneous eruptions, and scorbutic and syphiloid affections. As a remedy in lues venerea, in which it formerly had a high reputation, it is now universally considered as in itself wholly inefficient. It is most conveniently administered in the form of infusion. The oil may also be given.

Off. Prep. of the Pith. Infusum Sassafras Medullæ.

Off. Prep. of the Bark of the Root, or of the Root. Decoctum Guaiaci; Decoctum Sarsaparillæ Compositum; Extractum Sarsaparillæ Fluidum; Oleum Sassafras. W.

SCAMMONIUM. *U. S., Lond., Ed., Dub.*

Scammony.

The concrete juice of the root of Convolvulus Scammonia. *U. S.* The gum-resin emitted from the root cut off. *Lond.* Gummy-resinous exudation from incisions into the root. *Ed., Dub.*

Scammonée, *Fr.;* Scammonium, *Germ.;* Scamonea, *Ital.;* Escamonea, *Span.*

CONVOLVULUS. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Convolvulaceæ.

Gen. Ch. Corolla campanulate. *Style* one. *Stigmas* two, linear-cylindrical, often revolute. *Ovary* two-celled, four-seeded. *Capsule* two-celled. (*Lindley.*)

Convolvolus Scammonia. Willd. *Sp. Plant.* i. 845; Woodv. *Med. Bot.* p. 243, t. 86; Carson, *Illust. of Med. Bot.* ii. 14, pl. 62. This species of Convolvulus has a perennial, tapering root, from three to four feet long, from nine to twelve inches in circumference, branching towards its lower extremity, covered with a light-gray bark, and containing a milky juice. The stems are numerous, slender, and twining, extending sometimes fifteen or twenty feet upon the ground, or on neighbouring plants, and furnished with smooth, bright-green, arrow-shaped leaves, which stand alternately upon long footstalks. The flowers are placed in pairs, or three together upon the peduncles, which are round, axillary, solitary, and of nearly twice the length of the leaf.

The plant is a native of Syria, Anatolia, and certain islands of the Archipelago. No part is medicinal except the root, which, when dried, was found by Dr. Russel to be a mild cathartic. Scammony is the concrete juice of the fresh root, and is collected, according to Russel, in the following manner. In the month of June, the earth is cleared away from about the root, the top of which is cut off obliquely about two inches from the origin of the stems. The milky juice which exudes is collected in shells, or other convenient receptacle, placed at the most depending part of the cut surface. A few drachms only are collected from each root. The juice from several plants is put into any convenient vessel, and concretes by time. In this state it constitutes genuine scammony, but is very seldom exported. It is generally prepared for the market by admixture, while it is yet soft, with the expressed juice of the stalks and leaves, with wheat flour, ashes, fine sand, &c.; and it has been supposed that scammony sometimes consists wholly or in great part of the expressed juice of the root, evaporated to dryness by exposure to the sun, or by artificial heat. The drug is exported chiefly from Smyrna, though small quantities are said to be sent out of the country at Alexandretta, the seaport of Aleppo. Dr. Pereira was informed by a merchant who had resided in Smyrna, that it is brought upon camels in a soft state into that city, and afterwards adulterated by a set of individuals called scammony makers. The adulteration appears to be conducted in conformity with a certain understood scale, more or less foreign matter being added according to the price. The materials employed are chiefly chalk and some kind of flour or meal. Very little comparatively is exported perfectly pure. We obtain scammony either directly from Smyrna, or indirectly through some of the Mediterranean ports.*

* An interesting account of the collection and preparation of scammony in Anatolia, in the vicinity of Smyrna, has been communicated by Mr. S. H. Maltass to the *London Pharmaceutical Journ. and Trans.* (xiii. 264). The juice is collected in the same manner as described by Russel in reference to Syria. The product, however, of each plant is somewhat less. In some districts, according to Maltass, ten plants produce only a drachm of scammony; in others the average from each root is a drachm; and in a good soil a plant four years old will yield two drachms. The juice received in the shells is mixed with another portion scraped from the cut surface of the root; and this mixture is the pure or *lachryma scammony.* Only a small quantity of this is taken to Smyrna; the greater part being adulterated

The name of *Aleppo scammony* was formerly given to the better kinds of the drug, and of *Smyrna scammony* to those of inferior quality; the distinction having probably originated in some difference in the character of the scammony obtained at these two places. But no such difference now exists; as scammony is brought from Smyrna of every degree of purity. It has been customary in this country to designate the genuine drug of whatever quality as Aleppo scammony; while the name of Smyrna scammony has been given to a spurious article manufactured in the South of France, and to other factitious substitutes. It is quite time that these terms should be altogether abandoned. We shall treat of the drug under the heads of genuine and factitious scammony.

Genuine Scammony. This is sent into commerce in drums or boxes, and is either in irregular lumps, in large solid masses of the shape of the containing vessel into which it appears to have been introduced while yet soft, or in circular, flattish or plano-convex cakes. It seldom reaches us in an unmixed state. Formerly small portions of pure scammony were occasionally to be met with in Europe, contained in the shells in which the juice was collected and dried. This variety, denominated *scammony in shells*, is now scarcely to be found. The pure drug, as at present known in the shops of London, and occasionally brought to this country, is called *virgin scammony*. It is in irregular pieces, often covered with a whitish-gray powder, friable and easily broken into small fragments between the fingers, with a shining grayish-green fracture soon passing into greenish-black, and exhibiting under the microscope minute air-cells, and numerous gray semi-transparent splinters.* It is easily pulverized, affording a pale ash-gray powder. When rubbed with water it readily forms a milky emulsion. It has a rather strong, peculiar odour, which has been compared to that of old cheese. The taste is feeble at first, and afterwards somewhat acrid, but without bitterness. It gives no evidence, when the requisite tests are applied, of the presence of starch or carbonate of lime, leaves but a slight residue when burned, and yields about 80 per cent. of its weight to ether.

The form of scammony chiefly found in our markets is that in circular cakes. These are sometimes flattish on both sides, but generally somewhat convex on one side and flat on the other, as if dried in a saucer, or other shallow vessel. They are from four to six inches in diameter, and from half an inch to an inch and a half, or even two inches thick in the centre. As found in the retail shops, they are often in fragments. They are hard and heavy, with a faintly shining roughish fracture; and when broken exhibit in general a structure very finely

by the peasants before it reaches the market. Sometimes the juice is worked up with a decoction of the roots, in which case it is black, heavier than the preceding, and not so easily broken. Sometimes they add a calcareous earth, in a proportion varying from 10 to 150 per cent. The kind thus prepared is usually kept for some time in Smyrna, and is apt to ferment, so as to become porous and lose its gloss. It is in irregular lumps, and is the kind usually sold in London as *lachryma scammony*. Another kind sold in London in rough lumps, and probably under the same name, is prepared in the interior of the country by mixing the juice with wheat starch, ashes, earthy matters, gum arabic or tragacanth, and sometimes wax, yolk of egg, pounded scammony roots and leaves, flour, or resin. A kind much used in Great Britain is prepared by the Jews in Smyrna, and is in the form of cakes as described in the text. It is of two qualities. The *first quality* is prepared by mixing *skilip* (which is an inferior kind of scammony prepared at Anjora, and consists of 30 to 40 per cent. of juice and 60 to 70 of starch) with 60 per cent. of inferior scammony from the neighbourhood of Smyrna; the *second quality* by mixing *skilip* with about 30 per cent. of the latter kind, and adding about 10 per cent. of gum arabic and black-lead. The *first quality* contains usually about 50 per cent. of resin, the *second* about 30 per cent. For an account of several specimens of scammony sent by Mr. Maltass from Smyrna, see a paper by Mr. Daniel Hanbury in the *Pharm. Journ. and Trans.*, xiii. 268.—*Note to the tenth edition.*

* According to Maltass, the purest scammony has a reddish-black fracture, unless it has been mixed with water in its preparation, in which case it is black and very glossy. (*Pharm. Journ. and Trans.*, xiii. 266.)

porous, sometimes almost compact, and in a very few instances cavernous. Their colour externally is a dark ash or dark olive, or slate colour approaching to black; internally somewhat lighter and grayish, with an occasional tinge of green or yellow, but deepening by exposure. The small fragments are sometimes slightly translucent at the edges. The mass, though hard, is pulverizable without great difficulty, and affords a light-gray powder. It imparts to water with which it is triturated a greenish milky appearance. The smell is rather disagreeable, and similar to that of the pure drug. The taste, very slight at first, becomes feebly bitterish and acrid. This kind of scammony is never quite pure, and much of it is considerably adulterated. In some of the cakes carbonate of lime is the chief impurity; in others the adulterating substance is probably meal, as evidences of the presence of starch and lignin are afforded; and in others again both these substances are found. Christison discovered in the chalky specimens a proportion of carbonate of lime varying from 15 to 38 per cent.; in the amylaceous, from 13 to 42 per cent. of impurity. It was probably to the flat, dark-coloured, compact, difficultly pulverizable, and more impure cakes that the name of *Smyrna scammony* was formerly given. These have been erroneously ascribed by some to the *Periploca Secamone*, a plant growing in Egypt.*

Scammony is ranked among the gum-resins. It is partially dissolved by water, much more largely by alcohol and ether, and almost entirely, when pure, by boiling diluted alcohol. Its active ingredient is resin, which constitutes from

* Dr. Pereira, in his work on Materia Medica, describes the varieties of scammony as they exist in the London market. As these have interest for the druggist, we introduce a notice of them.

1. *Virgin Scammony. Pure Scammony. Lachryma Scammony.* The description of this corresponds with that of pure scammony given in the text. In addition, the following particulars may be mentioned. The whitish powder often found upon the surface effervesces with muriatic acid, and consists of chalk, in which the lumps have probably been rolled. The sp. gr. of the masses is 1·210. In the same pieces it sometimes happens that certain portions are shining and black, while others are dull-grayish. Virgin scammony readily takes fire, and burns with a yellowish flame. This variety is now much more abundant in the shops of London than formerly.

2. *Scammony of second quality.* This is called *seconds* in commerce. It is in two forms. 1. In *irregular pieces.* This, in external appearance, brittleness, odour, and taste, resembles virgin scammony; but is distinguished by its greater sp. gr., which is 1·463, by its dull, very slightly shining fracture, and its grayish colour. The freshly broken surface effervesces with muriatic acid, but the cold decoction does not give a blue colour with iodine. It therefore contains chalk, but not fecula. 2. In *large regular masses.* This has the form of the drum or box in which it was imported, and into which it was probably introduced while soft. It has a dull grayish fracture, and the sp. gr. 1·359. It exhibits, with the appropriate tests, evidence of the presence both of chalk and fecula. It is sometimes found of a soft or cheesy consistence.

3. *Scammony of third quality.* This is called *thirds* in commerce. It is in circular flat cakes, about five inches in diameter and one inch thick. The cakes are dense, heavy, and more difficult to break than the preceding varieties. The fracture is sometimes resinous and shining, sometimes dull, and exhibits air cavities, and numerous white specks, which consist of chalk. The colour is grayish or grayish-black. The sp. gr. varies from 1·276 to 1·543. Both chalk and flour are detected by tests. In five different cakes, the quantity of chalk employed in the adulteration was stated by the importer to be, in 100 parts of the cakes respectively, 13·07, 23·1, 25·0, 31·05, and 37·54, numbers which correspond very closely, in the two extremes, with the results obtained by Christison. This is the variety of scammony referred to in the text as the one chiefly used in the United States.

A valuable paper by Dr. Carson, on the varieties of scammony imported into this country, was published in the *Am. Journ. of Pharm.* (xx. i.), to which the reader is referred. Besides the kinds described in the text, namely the virgin scammony, and those which are adulterated with chalk or meal or both, Dr. Carson describes two, under the names of *gummy* and *black gummy* scammony, in which the chief adulteration appears to be tragacanth, or some analogous substance, which is associated in the dark variety with bone-black. They afforded from 6 to 13 per cent. of resin. They are in circular cakes, hard, compact, of difficult pulverization, and viscid when moistened.—*Note to the eighth edition.*

80 to 90 per cent. of pure dry scammony. The gum-resin has been analyzed by various chemists, but the results are somewhat uncertain; as the character of the specimens examined is insufficiently determined by the terms Aleppo and Smyrna scammony, employed to designate them. Thus, Bouillon-Lagrange and Vogel obtained, from 100 parts of Aleppo scammony, 60 of resin, 3 of gum, 2 of extractive, and 35 of insoluble matter; from the same quantity of Smyrna scammony, 29 parts of resin, 8 of gum, 5 of extractive, and 58 of vegetable remains and earthy substances. It is obvious that both the specimens upon which they operated were very impure. Marquart found in pure scammony (*scammony in shells*) 81·25 per cent. of resin, 3·00 of gum with salts, 0·75 of wax, 4·50 of extractive, 1·75 of starchy envelopes, bassorin, and gluten, 1·50 of albumen and lignin, 3·75 of ferruginous alumina, chalk, and carbonate of magnesia, and 3·50 of sand. Christison found different specimens of pure scammony to contain, in 100 parts, from 77 to 83 parts of resin, from 6 to 8 of gum, from 3·2 to 5 of lignin and sand, and from 7·2 to 12·6 of water, with occasionally a little starch, probably derived accidentally from the root, and not in sufficient quantity to cause a cold decoction of the gum-resin to give a blue colour with iodine. Mr. Hanbury, of London, found in the purest scammony in shells 91·1 per cent. of resin; and Mr. B. W. Bull, of New York, 86·88 per cent. in a specimen in irregular lumps, received from Constantinople as Aleppo Scammony. (*N. Y. Journ. of Pharm.*, June, 1852.) For the character of the resin, see *Extractum* sive *Resina Scammonii*. As already stated, scammony is seldom or never quite pure as found in our shops. Much of it contains not more than 50 per cent. of the resin, some not more than 42 per cent., and the worst varieties as little as 10 per cent., or even less.* Sometimes the cakes are of good quality on the outside, and inferior within. (Bull, *N. Y. Journ. of Pharm.*, i. 7.) It has been suggested, in this uncertainty as to the strength of the scammony of the shops, whether it might not be best to abandon its internal use altogether, and to substitute its resin, which is of uniform strength.

The Edinburgh College gives the following signs of pure scammony, "Fracture glistening, almost resinous, if the specimen be old and dry; muriatic acid does not cause effervescence on its surface; the decoction of its powder, filtered and cooled, is not rendered blue by tincture of iodine. Sulphuric ether separates at least eighty per cent. of resin dried at 280°." Effervescence with muriatic acid indicates the presence of chalk, a blue colour with iodine that of starch in the form of flour.

Factitious Scammony. Montpellier Scammony. Much spurious scammony is manufactured in the South of France, said to be made from the expressed juice of *Cynanchum Monspeliacum*, incorporated with various resins, and other purgative substances.† It has been occasionally imported into the United States, and sold as Smyrna scammony. It is usually in flat semicircular cakes, four or five inches in diameter, and six or eight lines thick, blackish both externally and

* The following table is given by Dr. Christison as the result of his examination of different specimens of impure commercial scammony.

	Calcareous.			Amylaceous.		Calcareo-amylaceous.
Resin,	64·6	56·6	43·3	37·0	62·0	42·4
Gum,	6·8	5·0	8·2	9·0	7·2	7·8
Chalk,	17·6	25·0	31·6	—	—	18·6
Fecula,	—	1·4	4·0	20·0	10·4	13·2
Lignin and sand,	5·2	7·1	7·8	22·2	13·4	9·4
Water,	6·4	5·2	6·4	12·0	7·5	10·4
	100·6	100·3	101·3	100·2	100·5	101·8

† This statement as to the employment of Cynanchum Monspeliacum is made on the authority of Guibourt. M. Thorel, a pharmaceutist of Avallon, denies that this plant is employed in its preparation. (*Journ. de Pharm.*, xx. 107.)

within, very hard, compact, rather heavy, of a somewhat shining and resinous fracture, a feeble balsamic odour wholly different from that of genuine scammony, and a very bitter nauseous taste. When rubbed with the moistened finger it becomes dark-gray, unctuous, and tenacious. We have seen another substance sold as Smyrna scammony, which was obviously spurious, consisting of blackish, circular, flat cakes, or fragments of such cakes, rather more than half an inch thick, very light, penetrated with small holes as if worm eaten, and when broken exhibiting an irregular, cellular, spongy texture. Dr. Pereira describes a factitious substance sold as *Smyrna scammony*, which is in circular flat cakes, about half an inch thick, blackish, and of a slaty aspect, breaking with difficulty, of a dull black fracture, and of the sp. gr. 1·412. Moistened and rubbed it has the smell of guaiac, which may also be detected by chemical tests.

Medical Properties and Uses. Scammony is an energetic cathartic, apt to occasion griping, and sometimes operating with harshness. It was known to the ancient Greek physicians, and was much employed by the Arabians, who not only gave it as a purgative, but also applied it externally for the cure of various cutaneous diseases. It may be used in all cases of torpid bowels, when a powerful impression is desired; but on account of its occasional violence is seldom administered, except in combination with other cathartics, the action of which it promotes, while its own harshness is mitigated. It should be given in emulsion with mucilage, sugar, almonds, liquorice, or other demulcent; and its disposition to gripe may be counteracted by the addition of an aromatic. The dose is from five to fifteen grains of pure scammony, from ten to thirty of that commonly found in the market.

Off. Prep. Confectio Scammonii; Extractum Colocynthidis Compositum; Extractum sive Resina Scammonii; Pilulæ Colocynthidis Comp.; Pulvis Scammonii Comp. W.

SCILLA. *U. S., Lond., Ed., Dub.*

Squill.

The bulb of Scilla maritima. *U. S.* Urginea Scilla. Recent bulb. *Lond.* The bulb. *Dub.* Bulb of Squilla maritima. *Ed.*

Scille, *Fr.;* Meerzwiebel, *Germ.;* Scilla, *Ital.;* Cebolla albarrana, *Span.*

Scilla. *Sex. Syst.* Hexandria Monogynia.—*Nat. Ord.* Liliaceæ.

Gen. Ch. Corolla six-petaled, spreading, deciduous. *Filaments* thread-like. *Willd.*

Scilla maritima. Willd. *Sp. Plant.* ii. 125; Woodv. *Med. Bot.* p. 745, t. 255. —*Squilla maritima.* Steinheil; Lindley, *Flor. Med.* p. 591; Carson, *Illust. of Med. Bot.* ii. 46, pl. 89. This is a perennial plant, with fibrous roots proceeding from the bottom of a large bulb, which sends forth several long, lanceolate, pointed, somewhat undulated, shining, deep-green leaves. From the midst of the leaves a round, smooth, succulent flower-stem rises, from one to three feet high, terminating in a long, close spike of whitish flowers. These are destitute of calyx, and stand on purplish peduncles, at the base of each of which is a linear, twisted, deciduous floral leaf.

The squill grows on the sea-coast of Spain, France, Italy, Greece, and the other countries bordering on the Mediterranean. The bulb is the officinal portion. It is generally dried for use; but is sometimes imported into this country in the recent state packed in sand.

Properties. The fresh bulb is pear-shaped, usually larger than a man's fist, sometimes as large as the head of a child, and consisting of fleshy scales attenuated at their edges, closely applied over each other, and invested by exterior scales so thin and dry as to appear to constitute a membranous coat. There are two

varieties, distinguished as the *red* and *white squill*. In the former, the exterior coating is of a deep reddish-brown colour, and the inner scales have a whitish rosy or very light pink epidermis, with a yellowish-white parenchyma; in the latter, the whole bulb is white. They do not differ in their medicinal virtues. The bulb abounds in a viscid, very acrid juice, which causes it to inflame and even excoriate the skin when much handled. By drying, this acrimony is very much diminished, with little loss of medicinal power. The bulb loses about four-fifths of its weight in the process. Vogel found 100 parts of fresh squill to be reduced to 18 by desiccation. The process is somewhat difficult, in consequence of the abundance and viscid character of the juice. The bulb is cut into thin transverse slices, and the pieces dried separately by artificial or solar heat. The outer and central scales are rejected, the former being dry and destitute of the active principle, the latter too fleshy and mucilaginous. The London College gives directions for the slicing and drying of the recent bulb.

Dried squill, as found in our shops, is in irregular oblong pieces, often more or less contorted, of a dull yellowish-white colour with a reddish or rosy tint, sometimes entirely white, slightly diaphanous, brittle and pulverizable when perfectly dry, but often flexible from the presence of moisture, for which they have a great affinity. Occasionally a parcel will be found consisting of vertical slices, some of which adhere together at the base. The odour is very feeble, the taste bitter, nauseous, and acrid.

The virtues of squill are extracted by water, alcohol, and vinegar. According to Vogel, it contains a bitter principle named by him *scillitin*, gum, tannin, citrate of lime and saccharine matter, lignin, and an acrid principle which he was unable to isolate. Water distilled from it had neither taste nor smell, and was drunk by Vogel to the amount of six ounces without effect. From the experiments of Duncan and Buchner, it appears that tannin, if it exists in squill, is in very small proportion. The *scillitin* of Vogel was soluble in water, alcohol, and vinegar; but was considered by M. Tilloy, of Dijon, to be a compound of the proper active principle of squill with gum and uncrystallizable sugar. The *scillitin*, obtained by the latter experimenter, was insoluble in water and dilute acids, soluble in alcohol, exceedingly acrid and bitter, and very powerful in its influence on the system. A single grain produced the death of a strong dog. The process of Tilloy may be seen in former editions of this work. The scillitin obtained by him was still impure. Labourdais believed that he had obtained it in an isolated state by means of animal charcoal. A decoction of squill was first treated with acetate of lead to separate the viscid matters, was then filtered and agitated in the cold with purified animal charcoal in fine powder, and afterwards allowed to rest. The charcoal gradually subsided, carrying with it the bitter and colouring principles. The liquid being decanted, the solid matter was dried, and treated with hot alcohol, which acquired an insupportable bitterness. The alcohol being distilled off, left a milky liquid, which was allowed to evaporate spontaneously. The scillitin thus procured was solid, uncrystallized, easily decomposable by heat, almost caustic to the taste, not deliquescent, neuter, but slightly soluble in water, to which, however, it imparted a very great bitterness, very soluble in alcohol, and dissolved, but at the same time decomposed by concentrated sulphuric and nitric acids, imparting to the former a purple colour, instantly becoming black. (*Ann. de Thérap.*, 1849, p. 145.) L. F. Bley succeeded in obtaining scillitin, by the process of Labourdais, in long flexible needle-shaped crystals, by simply allowing the last alcoholic solution to evaporate spontaneously. (*Arch. der Pharm.*, lxi. 141.) Landerer obtained a crystalline principle from fresh squill, by treating the bruised bulb with dilute sulphuric acid, concentrating the solution, neutralizing it with lime, drying the precipitate, exhausting this with alcohol, and evaporating the tincture, which, on cooling, deposited the substance in question in prismatic crystals. It was bitter, but not

acrid, insoluble in water or the volatile oils, slightly soluble in alcohol, and, according to Landerer, capable of neutralizing the acids. (*Christison's Dispensatory.*) Wittstein inferred from his experiments that the bitterness and acrimony of squill reside in distinct principles. (See *Pharm. Journ. and Trans.*, x. 359.) Tilloy has recently made a new analysis of squill, which he finds to contain, 1. a resinoid substance very acrid and poisonous, soluble in alcohol and not in ether, 2. a very bitter principle, yellow, and soluble in water and alcohol, 3. a fatty matter soluble in ether and not in alcohol, 4. citrate of lime, and 5. mucilage and sugar. The acrid principle, in the dose of about three quarters of a grain, killed a dog. The bitter principle is much less powerful. Both are contained in the matters extracted from squill by means of animal charcoal. The citrate of lime is in the form of minute, silky, acicular crystals, interspersed through the parenchyma of the bulb. (*Journ. de Pharm.*, 3e sér., xxiii. 410.)

When kept in a dry place, squill retains its virtues for a long time; but if exposed to moisture it soon becomes mouldy.

Medical Properties and Uses. Squill is expectorant, diuretic, and in large doses emetic and purgative. In over-doses it has been known to occasion hypercatharsis, strangury, bloody urine, and fatal inflammation of the stomach and bowels. The Greek physicians employed it as a medicine; and it has retained to the present period a deserved popularity. As an expectorant, it is used both in cases of deficient and of superabundant secretion from the bronchial mucous membrane; in the former case usually combined with tartar emetic or ipecacuanha, in the latter frequently with the stimulant expectorants. In both instances, it operates by stimulating the vessels of the lungs; and, where the inflammatory action in this organ is considerable, as in pneumonia and severe catarrh, the use of squill should be preceded by the lancet. In dropsical diseases it is very much employed, especially in connexion with calomel, which is supposed to excite the absorbents, while the squill increases the secretory action of the kidneys. It is thought to succeed best, in these complaints, in the absence of general inflammatory excitement. On account of its great uncertainty and occasional harshness, it is very seldom prescribed as an emetic, except in infantile croup or catarrh, in which it is usually given in the form of syrup or oxymel. When given in substance, it is most conveniently administered in the form of pill. The dose, as a diuretic or expectorant, is one or two grains repeated two or three times a day, and gradually increased till it produces slight nausea, or evinces its action upon the kidneys or lungs. From six to twelve grains will generally vomit. The vinegar and syrup of squill are officinal, and much used. An *acetic extract* has been prepared by Mr. F. D. Niblett, by digesting a pound of squill with three fluidounces of acetic acid and a pint of distilled water, with a gentle heat, for forty-eight hours, then expressing, and, without filtration, evaporating to a proper consistence. One grain is equal to about three of the powder. (*Pharm. Journ. and Trans.*, xii. 133.)

Off. Prep. Acetum Scillæ; Pilulæ Digitalis et Scillæ; Pil. Ipecacuanhæ cum Scillâ; Pil. Scillæ Comp.; Syrupus Scillæ Comp.; Tinctura Scillæ. W.

SCOPARIUS. *U. S. Secondary, Lond.*

Broom.

The fresh tops of Cytisus Scoparius. *U. S.* Cytisus Scoparius. Recent and dried top. *Lond.*

Off. Syn. SCOPARIUM. Tops of Cytisus Scoparius. *Ed., Dub.*

Genet à balais, *Fr.*; Gemeine Besenginster, *Germ.*; Scoparia, *Ital.*; Retama, *Span.*

Cytisus. *Sex. Syst.* Diadelphia Decandria.—*Nat. Ord.* Fabaceæ or Leguminosæ.

Gen. Ch. Calyx bilabiate, upper lip generally entire, lower somewhat three-toothed. *Vexillum* ovate, broad. *Carina* very obtuse, enclosing the stamens and pistils. *Stamens* monadelphous. *Legume* plano-compressed, many-seeded, not glandular. (*De Cand.*)

Cytisus Scoparius. De Cand. *Prodrom.* ii. 154. — *Spartium Scoparium.* Willd. *Sp. Plant.* iii. 933; Woodv. *Med. Bot.* p. 413, t. 150. This is a common European shrub, cultivated in our gardens, from three to eight feet high, with numerous straight, pentangular, bright-green, very flexible branches, and small, oblong, downy leaves, which are usually ternate, but on the upper part of the plant are sometimes simple. The flowers are numerous, papilionaceous, large, showy, of a golden-yellow colour, and supported solitarily upon short axillary peduncles. The seeds are contained in a compressed legume, which is hairy at the sutures.

The whole plant has a bitter nauseous taste, and, when bruised, a strong peculiar odour. The tops of the branches are the officinal portion; but the seeds are also used, and, while they possess similar virtues, have the advantage of keeping better. Water and alcohol extract their active properties. According to Cadet de Gassicourt, the flowers contain volatile oil, fatty matter, wax, chlorophylle, yellow colouring matter, tannin, a sweet substance, mucilage, osmazome, albumen and lignin. Dr. Stenhouse has separated from them two principles, one of which called *scoparin* he believes to be the diuretic principle, and the other, named *spartein*, to be narcotic. The former is in stellate crystals, easily dissolved by boiling water and alcohol, and is obtained by purifying a yellow gelatinous substance deposited upon the evaporation of the decoction. It may be given in the dose of four or five grains. The latter was obtained by distillation from the mother waters of the scoparin. It is a colourless liquid, having a peculiar bitter taste, and all the properties of a volatile organic base. It appears to have narcotic properties. But we need more definite information on the subject. (*Ann. de Thérap.*, A. D. 1853, p. 153.)

Medical Properties and Uses. Broom is diuretic and cathartic, and in large doses emetic, and has been employed with great advantage in dropsical complaints, in which it was recommended by Mead, Cullen, and others. Cullen prescribed it in the form of decoction, made by boiling half an ounce of the fresh tops in a pint of water down to half a pint, of which he gave a fluidounce every hour till it operated by stool or urine. It is a domestic remedy in Great Britain, but is seldom used in this country. The seeds may be given in powder, in the dose of ten or fifteen grains.

Off. Prep. Decoctum Scoparii; Decoctum Scoparii Compositum. W.

SENEGA. *U. S., Lond., Ed., Dub.*

Seneka.

The root of Polygala Senega. *U. S., Lond., Ed., Dub.*

Polygale de Virginie, *Fr.;* Klapperschlangenwurzel, *Germ.;* Poligala Virginiana, *Ital.*

POLYGALA. *Sex. Syst.* Diadelphia Octandria. — *Nat. Ord.* Polygalaceæ.

Gen. Ch. Calyx five-leaved, with two leaflets wing-shaped, and coloured. *Legume* obcordate, two-celled. *Willd.*

Besides *P. Senega*, two other species have attracted some attention in Europe—*P. amara* and *P. vulgaris*—as remedies in chronic pectoral affections; but as they are not natives of this country, and are never used by practitioners here, they do not merit particular notice.

Polygala Senega. Willd. *Sp. Plant.* iii. 894; Bigelow, *Am. Med. Bot.* ii. 97; Barton, *Med. Bot.* ii. 111. This unostentatious plant has a perennial branching root, from which several erect, simple, smooth, round, leafy stems annually rise, from nine inches to a foot in height. The stems are occasionally tinged

with red or purple below, but are green near the top. The leaves are alternate or scattered, lanceolate, pointed, smooth, bright-green on the upper surface, paler beneath, and sessile or supported on very short footstalks. The flowers are small and white, and form a close spike at the summit of the stem. The calyx is their most conspicuous part. It consists of five leaflets, two of which are wing-shaped, white, and larger than the others. The corolla is small and closed. The capsules are small, much compressed, obcordate, two-valved, and two-celled, with two oblong-ovate, blackish seeds, pointed at one end.

This species of Polygala, commonly called *Seneka snakeroot*, grows wild in all parts of the United States, but most abundantly in the southern and western sections, where the root is collected for sale. It is brought into market in bales weighing from fifty to four hundred pounds.

Properties. As the root occurs in commerce, it is of various sizes, from that of a straw to that of the little finger, presenting a thick knotty head, which exhibits traces of the numerous stems. It is tapering, branched, variously twisted, often marked with crowded annular protuberances, and with a projecting keel-like line, extending along its whole length. The epidermis is corrugated, transversely cracked, of a yellowish-brown colour in the young roots, and brownish gray in the old. In the smaller branches the colour is a lighter yellow. The bark is hard and resinous, and contains the active principles of the root. The central portion is ligneous, white, and quite inert, and should be rejected in the preparation of the powder. The colour of this is gray. The odour of seneka is peculiar, strong in the fresh root, but faint in the dried. The taste is at first sweetish and mucilaginous, but after chewing becomes somewhat pungent and acrid, leaving a peculiar irritating sensation in the fauces. These properties, as well as the medical virtues of the root, are extracted by boiling water, and by alcohol. Diluted alcohol is an excellent solvent. The root has been analyzed by Gehlen, Peschier of Geneva, Feneulle of Cambray, Dulong D'Astafort, Folchi, and Trommsdorff, and more recently by M. Quevenne. Gehlen was supposed to have found the active principle in the substance left behind, when the alcoholic extract is treated successively with ether and water; and the name of *senegin* was accordingly conferred upon it. But it does not seem to have any just claim to the rank assigned to it, though it probably contains the active principle among its constituents. From a comparison of the results obtained by the above-mentioned chemists, it would appear that seneka contains, 1. a peculiar acrid principle, which M. Quevenne considers to be an acid, and has named *polygalic acid;* 2. a yellow colouring matter, of a bitter taste, insoluble or nearly so in water, but soluble in ether and alcohol; 3. a volatile principle, considered by some as an essential oil, but thought by Quevenne to possess acid properties, and named by him *virgineic acid;* 4. pectic acid or pectin; 5. tannic acid of the variety which precipitates iron green; 6. gum; 7. albumen; 8. cerin; 9. fixed oil; 10. woody fibre; and 11. saline and earthy substances, as the carbonates, sulphates, and phosphates of lime and potassa, chloride of potassium, alumina, magnesia, silica, and iron. The virtues of seneka appear to reside chiefly, if not exclusively, in the acrid principle which M. Quevenne called polygalic acid, and which he considered closely analogous to saponin. He obtained it pure by the following process. Powdered seneka is exhausted by alcohol of 33°, and so much of the alcohol is distilled off as to bring the resulting tincture to the consistence of syrup. The residue is treated with ether, in order to remove the fatty matter. The liquid upon standing deposits a precipitate, which is separated by filtration, and is then mixed with water. To the turbid solution thus formed alcohol is added, which facilitates the production of a white precipitate, consisting chiefly of polygalic acid. The liquid is allowed to stand for several days, that the precipitate may be fully formed. The supernatant liquid being decanted, the pre-

cipitate is drained upon a filter, and, being removed while yet moist, is dissolved by the aid of heat in alcohol of 36°. The solution is boiled with purified animal charcoal, and filtered while hot. Upon cooling it deposits the principle in question in a state of purity. Thus obtained, polygalic acid is a white powder, inodorous, and of a taste at first slight, but soon becoming pungent and acrid, and producing a very painful sensation in the throat. It is fixed, unalterable in the air, inflammable, soluble in water slowly when cold and rapidly with the aid of heat, soluble in all proportions in boiling absolute alcohol, which deposits most of it on cooling, quite insoluble in ether and in the fixed and volatile oils, and possessed of the properties of reddening litmus and neutralizing the alkalies. Its constituents are carbon, hydrogen, and oxygen. M. Quevenne found it, when given to dogs, to occasion vomiting and much embarrassment in respiration, and in large quantities to destroy life. Dissection exhibited evidences of inflammation of the lungs, and frothy mucus was found in the stomach, œsophagus, and superior portion of the trachea, showing the tendency of this substance to increase the mucous secretion, and explaining in part the beneficial influence of seneka in croup. (*Journ. de Pharm.*, xxii. 449, and xxiii. 227.)

From the experiments of M. Quevenne it also appears that seneka yields its virtues to water, cold or hot, and to boiling alcohol; and that the extracts obtained by means of these liquids have the sensible properties of the root. But, under the influence of heat, a portion of the acrid principle unites with the colouring matter and coagulated albumen, and thus becomes insoluble in water; and the decoction, therefore, is not so strong as the infusion, if time is allowed, in the formation of the latter, for the full action of the menstruum. If it be desirable to obtain the virtues of the root in the form of an aqueous extract, the infusion should be prepared on the principle of displacement; as it is thus most concentrated, and consequently requires less heat in its evaporation. In forming an infusion of seneka, the temperature of the water, according to M. Quevenne, should not exceed 104° F. (*Ibid.*)

The roots of *Panax quinquefolium* or ginseng are frequently mixed with the seneka, but are easily distinguishable by their shape and taste. Another root has been occasionally observed in parcels of seneka, supposed to be that of Gillenia trifoliata. This would be readily distinguished by its colour and shape (see *Gillenia*), and by its bitter taste without acrimony. One of the most characteristic marks of seneka is the projecting line running the whole length of the root, and appearing as though a thread were placed beneath the bark, and, being attached at the upper end, were drawn at the lower, so as to give the root a contorted shape.

Medical Properties and Uses. Seneka is a stimulating expectorant and diuretic, and in large doses emetic and cathartic. It appears indeed to excite more or less all the secretions, proving occasionally diaphoretic and emmenagogue, and increasing the flow of saliva. Its action, however, is especially directed to the lungs; and its expectorant virtues are those for which it is chiefly employed. It was introduced into practice about a century ago by Dr. Tennant, of Virginia, who recommended it as a cure for the bite of the rattlesnake, and in various pectoral complaints. As an expectorant it is employed in cases not attended with acute inflammatory action, or in which the inflammation has been in great measure subdued. It is peculiarly useful in chronic catarrhal affections, the secondary stages of croup, and in peripneumonia notha after sufficient depletion. By Dr. Archer, of Maryland, it was recommended in the early stages of croup; but under these circumstances it is now seldom given, unless in combination with squill and an antimonial, as in the *Syrupus Scillæ Compositus*. Employed so as to purge and vomit, it has proved useful in rheumatism; and some cases of dropsy are said to have been cured by it. It has also been recommended in amenorrhœa.

The dose of powdered seneka is from ten to twenty grains; but the medicine is more frequently administered in decoction. (See *Decoctum Senegæ.*) There is an officinal syrup. An extract is prepared by macerating sixteen ounces of coarsely powdered senega, for two days, in three pints of a liquid consisting of one measure of alcohol and two of water; then putting the mixture into a percolator, and pouring upon it a similar fluid until six pints of filtered liquor are obtained; and, lastly, evaporating by means of a water-bath to the consistence of an extract. The dose is from one to three grains. (*Am. Journ. of Pharm.*, xiv. 287.) A tincture may also be prepared, but is not much employed. Polygalic acid may be employed in the dose of from the fourth to the half of a grain, dissolved in hot water, with the addition of gum and sugar.

Off. Prep. Decoctum Senegæ; Electuarium Opii; Infusum Senegæ; Syrupus Scillæ Compositus; Syrupus Senegæ. W.

SENNA. *U. S., Dub.*

Senna.

The leaflets of Cassia acutifolia (*Delile*), Cassia obovata (*De Candolle*), and Cassia elongata (*Lemaire*). *U. S.* Cassia acutifolia. Alexandrian Senna. The leaves. Cassia elongata. Tinnevelly senna. The leaves. *Dub.*

Off. Syn. SENNA ALEXANDRINA. *Lond., Ed.* Cassia acutifolia and C. obovata. The leaf. *Lond.* Leaves of various species of Cassia, probably of C. lanceolata, C. acutifolia, and C. obovata. *Ed.* SENNA INDICA. *Lond., Ed.* Cassia acutifolia? The leaf. *Lond.* Leaves of Cassia elongata. *Ed.*

Séné, *Fr.;* Sennesblatter, *Germ.;* Senna, *Ital., Port.;* Sen, *Span.*

Cassia. See CASSIA FISTULA.

The plants which yield senna belong to the genus Cassia, of which several species contribute to furnish the drug. These were confounded together by Linnæus in a single species, which he named Cassia Senna. Since his time the subject has been more thoroughly investigated, especially by Delile, who accompanied the French expedition to Egypt, and had an opportunity of examining the plant in its native country. Botanists at present distinguish at least three species, C. acutifolia, C. obovata, and C. elongata, as the sources of commercial senna; and it is probable that two others, *C. lanceolata* of Forskhal and *C. Æthiopica* of Guibourt, contribute towards it. The first three are recognised by the U. S. Pharmacopœia.

1. *Cassia acutifolia.* Delile, *Flore d'Egypte*, lxxv. tab. 27, f. 1—*C. lanceolata.* De Candolle; Carson, *Illust. of Med. Bot.* i. 34, pl. 27. This is described as a small undershrub, two or three feet high, with a straight, woody, branching, whitish stem; but, according to Landerer, the senna plant attains the height of eight or ten feet in the African deserts, and affords the natives shelter from the sun. (See *Am. Journ. of Pharm.*, xviii. 174.) The leaves are alternate and pinnate, with glandless footstalks, and two small narrow pointed stipules at the base. The leaflets, of which from four to six pairs belong to each leaf, are almost sessile, oval-lanceolate, acute, oblique at their base, nerved, from half an inch to an inch long, and of a yellowish-green colour. The flowers are yellow, and in axillary spikes. The fruit is a flat, elliptical, obtuse, membranous, smooth, grayish-brown, bivalvular legume, about an inch long and half an inch broad, scarcely if at all curved, and divided into six or seven cells, each containing a hard, heart-shaped, ash-coloured seed. C. acutifolia grows wild in great abundance in Upper Egypt near Sienne, in Nubia, Sennaar, and probably in other parts of Africa having similar qualities of soil and climate. This species furnishes the greater part of that variety of senna, known in commerce by the title of Alexandria senna.

2. *Cassia obovata.* Colladon, *Monographie des Casses;* De Cand. *Prodrom.* ii. 492; Carson, *Illust. of Med. Bot.* i. 35, pl. 28. The stem of this species is rather shorter than that of C. acutifolia, rising to the height of only a foot and a half. The leaves have from five to seven pairs of leaflets, which are obovate, very obtuse, sometimes mucronate, in other respects similar to those of the preceding species. The flowers are in axillary spikes, of which the peduncles are longer than the leaves of the plant. The legumes are very much compressed, curved almost into the kidney form, of a greenish-brown colour, and covered with a very short down, which is perceptible only by the aid of a magnifying glass. They contain from eight to ten seeds. The *C. obtusata* of Hayne, with obovate, truncated, emarginate leaflets, is probably a mere variety of this species. The plant, which according to Merat is annual, grows wild in Syria, Egypt, and Senegambia; and is said to have been cultivated successfully in Italy, Spain, and the West Indies. It yields the variety of senna called in Europe Aleppo senna, and contributes to the packages of the Alexandrian.

3. *Cassia elongata.* Lemaire, *Journ. de Pharm.* vii. 345; Fée, *Journ. de Chim. Méd.* vi. 232; Carson, *Illust. of Med. Bot.* i. 36, pl. 29. This name was conferred by M. Lemaire upon the plant from which the India senna of commerce is derived. The botanical description was completed by M. Fée, from dried specimens of the leaves and fruit found by him in unassorted parcels of this variety of senna. Dr. Wallich has subsequently succeeded in raising the plant from seeds found in a parcel of senna taken to Calcutta from Arabia; and it has been described by Dr. Royle, Wight & Arnott, and Dr. Lindley. As usually grown, it is annual; but with care it may be made to live through the year, and then assumes the character of an undershrub. It has an erect, smooth stem, and pinnate leaves, with from four to eight pairs of leaflets. These are nearly sessile, lanceolate, obscurely mucronate, oblique at the base, smooth above and somewhat downy beneath, with the veins turned inwards so as to form a wavy line immediately within the edge of the leaflet. The most striking character of the leaflet is its length, which varies from an inch to twenty lines. The petioles are without glands; the stipules minute, spreading, and semi-hastate. The flowers are bright yellow, and arranged in axillary and terminal racemes, rather longer than the leaves. The legume is oblong, membranous, tapering abruptly at the base, rounded at the apex, and an inch and a half long by somewhat more than half an inch broad. This plant is a native of the southern parts of Arabia. It has been said also to grow in the interior of India, and is at present cultivated at Tinnevelly for medical use.

Besides the three officinal species above described, the *C. lanceolata* of Forskhal, found by that author growing in the deserts of Arabia, is admitted by Lindley and others as a distinct species. Some difference, however, of opinion exists upon this point. De Candolle considered it only a variety of the C. acutifolia of Delile, from the ordinary form of which it differs chiefly in having leaflets with glandular petioles; and, as Forskhal's description was prior to that of Delile, he designated the species by the name of C. lanceolata. Forskhal's plant has been supposed by some to be the source of the India and Mocha senna; but the leaflets in this variety are much longer than those of C. lanceolata, from which the plant differs also in having no gland on the petiole. Niebuhr informs us that he found the Alexandria senna growing in the Arabian territory of *Abuarish*, whence it is taken by the Arabs to Mecca and Jedda. This is probably the C. lanceolata of Forskhal. It is highly probable that this species is the source of a variety of senna which has been brought to this market under the name of Mecca senna.

The *Cassia Æthiopica* of Guibourt (*C. ovata* of Merat), formerly confounded with C. acutifolia, is considered by Dr. Lindley as undoubtedly a distinct species. It grows in Nubia, Fezzan to the south of Tripoli, and probably, according to

Guibourt, throughout Ethiopia. It is from this plant that the *Tripoli senna* of commerce is derived.*

Commercial History. Several varieties of this valuable drug are known in commerce. Of these, four have been received in America, the Alexandria, the Tripoli, the India, and the Mecca senna.

1. *Alexandria Senna.* Though the name of this variety is derived from the Egyptian port at which it is shipped, it is in fact gathered very far in the interior. The Alexandria senna does not consist exclusively of the product of one species of Cassia. The history of its preparation is not destitute of interest. The senna plants of Upper Egypt yield two crops annually, one in spring and the other in autumn. They are gathered chiefly in the country beyond Sienne. The natives cut the plants, and, having dried them in the sun, strip off the leaves and pods, which they pack in bales, and send to Boulac, in the vicinity of Cairo, the great entrepot for this article of Egyptian commerce. This senna from Upper Egypt, consisting chiefly though not exclusively of the product of C. acutifolia, was here formerly mixed with the leaflets of C. obovata, brought from other parts of Egypt, and even from Syria, with the leaves of *Cynanchum oleæfolium* (*C. Argel* of Delile), known commonly by the name of *argel* or *arguel*, and sometimes with those of the *Tephrosia Apollinea* of De Candolle, a leguminous plant growing in Egypt and Nubia. According to M. Royer, the proportions in which the three chief constituents of this mixture were added together, were five parts of C. acutifolia, three of C. obovata, and two of Cynanchum. Thus prepared, the senna was again packed in bales, and transmitted to Alexandria. But at present there is no such uniformity in the constitution of Alexandria senna; and, though the three chief ingredients may still sometimes be found in it, they are not in the same fixed proportions; and not unfrequently the Cynanchum leaves are wholly wanting. This commercial variety of senna is often called in the French pharmaceutic works *séné de la palthe*, a name derived from an impost formerly laid upon it by the Ottoman Porte.

A parcel of Alexandria senna, as it was formerly brought to market, consisted of the following ingredients:—1. The leaflets of C. acutifolia, characterized by their acute form, and their length almost always less than an inch; 2. the leaflets of C. obovata, known by their rounded very obtuse summit, which is sometimes furnished with a small projecting point, and by their gradual diminution in breadth towards their base; 3. the pods, broken leafstalks, flowers, and fine fragments of other parts of one or both of these species; 4. the leaves of Cynanchum oleæfolium, which are distinguishable by their length, almost always more than an inch, their greater thickness and firmness, the absence of any visible lateral nerves on their under surface, their somewhat lighter colour, and the regularity of their base. In this last character they strikingly differ from the genuine senna leaflets, which, from whatever species derived, are always marked by obliquity at their base, one side being inserted in the petiole at a point somewhat lower than

* The following is the botanical description of the two species last mentioned, not hitherto officinally recognised.

1. *C. lanceolata.* Forskhal; Lindley, *Flor. Med.* p. 259. "Leaflets in four or five pairs, never more; oblong, and either acute or obtuse, not at all ovate or lanceolate, and perfectly free from downiness even when young; the petioles have constantly a small round brown gland a little above the base. The pods are erect, oblong, tapering to the base, obtuse, turgid, mucronate, rather falcate, especially when young, at which time they are sparingly covered with coarse scattered hairs." (*Lindley.*)

2. *C. Æthiopica.* Guibourt, *Hist. Ab. des Drogues, &c.* ii. 219; Lindley, *Flor. Med.* p. 259. The plant is about eighteen inches high. The footstalks have a gland at the base, and another between each pair of leaflets. There are from three to five pairs of leaflets, which are pubescent, oval-lanceolate, from seven to nine lines in length, and three or four in breadth, rather shorter and less acute than those of C. acutifolia. The legume is flat, smooth, not reniform, rounded, from eleven to fifteen lines long, with from three to five seeds.

the other, and at a different angle. The discrimination between this and the other ingredients is a matter of some consequence, as the cynanchum must be considered an adulteration. It is said by the French writers to occasion hypercatharsis and much irritation of the bowels; but was found by Christison and Mayer to occasion a griping, and severe protracted nausea, with little purgation. The flowers and fruit of the Cynanchum were also often present, the former of a white colour, and in small corymbs, the latter an ovoid follicle rather larger than an orange seed. Besides the above constituents of Alexandria senna, it occasionally contained leaflets of genuine senna, much longer than those of the acutifolia or obovata, equalling in this respect the cynanchum, which they also somewhat resembled in form. They were distinguishable, however, by their greater thinness, the distinctness of their lateral nerves, and the irregularity of their base. The leaflets and fruit of *Tephrosia Apollinea*, which have been an occasional impurity in this variety of senna, may be distinguished, the former by their downy surface, their obovate-oblong, emarginate shape, their parallel unbranched lateral nerves, and by being usually folded longitudinally; the latter, by its dimensions, being from an inch to an inch and a half long, and only two lines broad. As now imported, the Alexandria senna is often quite free from the leaves of the Cynanchum, and may have few or none of the leaflets of the obovate senna. It is probably brought directly to Alexandria from Upper Egypt, without having undergone any intermixture at Boulac or other intervening place. In Europe, this senna is said to have been sometimes adulterated with the leaflets of *Collutea arborescens* or bladder senna, and the leaves of *Coriaria myrtifolia*, a plant of Southern Europe, said to be astringent and even poisonous. An account of the former of these plants is given in the Appendix. The leaflets of the Coriaria are ovate-lanceolate, grayish-green with a bluish tint, and are readily known, when not too much broken up, by their strongly marked midrib, and two lateral nerves running from the base nearly to the summit. They are chemically distinguished by giving a whitish precipitate with solution of gelatin, and a bluish-black one with the salts of sesquioxide of iron, proving the presence of tannin. Their poisonous properties are denied by Peschier. According to Bouchardat, they are closely analogous to strychnia in their effect. (*Ann. de Thérap.*, 1843, p. 55.)

2. *Tripoli Senna.* Genuine Tripoli senna consists in general exclusively of the leaflets of one species of Cassia, which was formerly considered as a variety of *C. acutifolia*, but is now admitted to be distinct, and named *C. Æthiopica*. The leaflets, however, are much broken up; and it is probably on this account that the variety is usually less esteemed than the Alexandrian. The aspect given to it by this state of comminution, and by the uniformity of its constitution, enables the eye at once to distinguish it from the other varieties of senna. The leaflets, moreover, are shorter, less acute, thinner, and more fragile than those of the C. acutifolia in Alexandria senna; and their nerves are much less distinct. The general opinion at one time was, that it was brought from Sennaar and Nubia to Tripoli in caravans; but it is reasonably asked by M. Fée, how it could be afforded at a cheaper price than the Alexandrian, if thus brought on the backs of camels a distance of eight hundred leagues through the desert. It is probably collected in Fezzan, immediately south of Tripoli, and brought to that town for exportation.

3. *India Senna.* This variety is in Europe sometimes called *Mocha senna*, probably because obtained originally from that port. It derives its name of India senna from the route by which it reaches us. Though produced in Arabia, it is brought to this country and Europe from Calcutta, Bombay, and possibly other ports of Hindostan. It consists of the leaflets of Cassia elongata, with some of the leafstalks and pods intermixed. The eye is at once struck by the great

length and comparative narrowness of the leaflets, so that no difficulty can be experienced in distinguishing this variety. The pike-like shape of the leaflet has given rise to the name of *séné de la pique*, by which it is known in French pharmacy. Many of the leaflets have a yellowish, dark-brown, or blackish colour, probably from exposure after collection; and this variety has in mass a dull tawny hue which is not found in the others. It is generally considered inferior in purgative power.

A variety of India senna has recently reached this country, which is the produce of Hindostan, being cultivated at Tinnevelly, and probably other places in the South of the Peninsula. The plant was originally raised from seeds obtained from the Red Sea, and is the same as that from which the common India senna is derived. The drug is exported from Madras to England, where it is known by the name of *Tinnevelly senna*. It is a very fine unmixed variety, consisting of unbroken leaflets, from one to two or more inches in length, and sometimes half an inch in their greatest breadth, thin, flexible, and of a fine green colour.

4. *Mecca Senna.* Since the publication of the fifth edition of this Dispensatory, a variety of senna has been imported under the name of *Mecca senna*, consisting of the leaflets, pods, broken stems, and petioles of a single species of Cassia. The leaflets are oblong-lanceolate, on the average longer and narrower than those of C. acutifolia, and shorter than those of C. elongata. The variety in mass has a yellowish or tawny hue, more like that of India than that of Alexandria senna. May it not be the product of the C. lanceolata of Forskhal? Landerer, however, speaks of a valuable variety of senna, characterized by the large size of the leaflets, and sold under the name of Mecca senna, which he says comes from the interior of Africa.

Commercial senna is prepared for use by picking out the leaflets, and rejecting the leafstalks, the small fragments, and the leaves of other plants. The pods are also rejected by some apothecaries; but they possess considerable cathartic power, though said to be milder than the leaves.

Properties. The odour of senna is faint and sickly; the taste slightly bitter, sweetish, and nauseous. Water and diluted alcohol extract its active principles. Pure alcohol extracts them but imperfectly. (Bley and Diesel, *Pharm. Central Blatt.*, Feb. 1849, p. 126.) The leaves are said to yield about one-third of their weight to boiling water. The infusion is of a deep reddish-brown colour, and has the odour and taste of the leaves. When exposed to the air for a short time, it deposits a yellowish insoluble precipitate, supposed to result from the union of extractive matter with oxygen. The nature of this precipitate, however, is not well understood. Decoction also produces some change in the principles of senna, by which its medicinal virtues have been supposed to be impaired; but some experiments of B. Heerlein would seem to show that this opinion is incorrect. An extract prepared by boiling down an infusion, redissolving the residue, and again boiling down to a solid consistence, was found to operate actively in a dose equivalent to a drachm of the leaves. (*Pharm. Cent. Blatt*, A. D. 1851, p. 909.) To diluted alcohol it imparts the same reddish-brown colour as to water; but rectified alcohol and ether digested upon the powdered leaves become of a deep olive-green. The analysis of senna by MM. Lassaigne and Feneulle furnished the following results. The leaves contain—1. a peculiar principle called cathartin; 2. chlorophylle or the green colouring matter of leaves; 3. a fixed oil; 4. a small quantity of volatile oil; 5. albumen; 6. a yellow colouring matter; 7. mucilage; 8. salts of the vegetable acids, viz., malate and tartrate of lime and acetate of potassa; and 9. mineral salts. The pods are composed of the same principles, with the exception of the chlorophylle, the place of which is supplied by a peculiar colouring matter. (*Journ. de Pharm.*,

vii. 548, and ix. 58.) *Cathartin* was at one time believed to be the active principle of senna; but upon trial it has proved to possess little power of affecting the system; and it is now believed to be a complex body, consisting, according to Bley and Diesel, of a mixture of resinous and extractive matter. It is an uncrystallizable substance, having a peculiar smell, a bitter, nauseous taste, and a reddish-yellow colour; is soluble in every proportion in water and alcohol, but insoluble in ether; and in its dry state attracts moisture from the air. It is prepared in the following manner. To a filtered decoction of senna the solution of acetate of lead is added; and the precipitate which forms is separated. A stream of hydrosulphuric acid (sulphuretted hydrogen) is then made to pass through the liquor in order to precipitate the lead, and the sulphuret produced is removed by filtration. The liquid is now evaporated to the consistence of an extract; the product is treated with rectified alcohol; and the alcoholic solution is evaporated. To the extract thus obtained sulphuric acid diluted with alcohol is added, in order to decompose the acetate of potassa which it contains; the sulphate of potassa is separated by filtration; the excess of sulphuric acid by acetate of lead; the excess of acetate of lead by hydrosulphuric acid; and the sulphuret of lead by another filtration. The liquid being now evaporated yields cathartin. Bley and Diesel found in senna a peculiar yellow resin which they name *chrysoretin*, a brown resin and brown extractive which they could not fully separate, pectin, gummy extractive, chlorophylle, fatty matter, and various salts. (*Pharm. Cent. Blatt*, Feb. 1849, p. 126.)

Incompatibles. Many substances produce precipitates with the infusion of senna; but it does not follow that they are all medicinally incompatible; as they may remove ingredients which have no therapeutical effect, and leave the active principles untouched. Cathartin is precipitated by the infusion of galls and the solution of subacetate of lead. Acetate of lead and tartarized antimony, which disturb the infusion, have no effect upon the solution of this principle.

Medical Properties and Uses. Senna was first used as a medicine by the Arabians. It was noticed in their writings so early as the ninth century; and the name itself is Arabic. It is a prompt, efficient, and very safe purgative, well calculated for fevers and febrile complaints, and other cases in which a decided but not violent impression is desired. An objection sometimes urged against it is that it is apt to produce severe griping. This effect, however, may be obviated by combining with the senna some aromatic, and some one of the alkaline salts, especially bitartrate of potassa, tartrate of potassa, or sulphate of magnesia. The explanation which attributes the griping property to the oxidized extractive, and its prevention by the saline substances to their influence in promoting the solubility of that principle, is not entirely satisfactory. The purgative effect of senna is considerably increased by combination with bitters; a fact which was noticed by Cullen, and has been abundantly confirmed by the experience of others. The decoction of guaiac is said to exert a similar influence. The dose of senna in powder is from half a drachm to two drachms; but its bulk renders it of inconvenient administration; and it is not often prescribed in this state. Besides, the powder is said to undergo decomposition, and to become mouldy on exposure to a damp air. The form of infusion is almost universally preferred. (See *Infusum Sennæ.*) The medicine is also used in the forms of confection, fluid extract, syrup, and tincture, all of which are officinal.

Senna taken by nurses is said to purge sucking infants, and an infusion injected into the veins operates as a cathartic.

Off. Prep. Confectio Sennæ; Enema Catharticum; Extractum Sennæ Fluidum; Extract. Spigeliæ et Sennæ Fluidum; Infusum Sennæ; Infusum Sennæ Compositum; Syrupus Sarsaparillæ Comp.; Syrupus Sennæ; Tinctura Rhei et Sennæ; Tinctura Sennæ Comp.; Tinctura Sennæ et Jalapæ. W.

SERPENTARIA. *U. S., Lond., Ed., Dub.*

Virginia Snakeroot.

The root of Aristolochia Serpentaria, A. reticulata, and other species of Aristolochia. *U. S.* Aristolochia Serpentaria. The root. *Lond., Ed., Dub.*

Serpentaire de Virginie, *Fr.;* Virginianische Schlangenwurzel, *Germ.;* Serpentaria Virginiana, *Ital., Span.*

ARISTOLOCHIA. *Sex. Syst.* Gynandria Hexandria.—*Nat. Ord.* Aristolochiaceæ.

Gen. Ch. Calyx none. *Corolla* one-petaled, ligulate, ventricose at the base. *Capsule* six-celled, many-seeded, inferior. *Willd.*

Numerous species of Aristolochia have been employed in medicine. The roots of all of them are tonic and stimulant, and, from their supposed possession of emmenagogue properties, have given origin to the name of the genus. *A. Clematitis*, *A. longa*, *A. rotunda*, and *A. Pistolochia* are still retained in many officinal catalogues of the continent of Europe, where they are indigenous. The root of *A. Clematitis* is very long, cylindrical, as thick as a goosequill or thicker, variously contorted, beset with the remains of the stems and radicles, of a grayish-brown colour, a strong peculiar odour, and an acrid bitter taste; that of *A. longa* is spindle-shaped, from a few inches to a foot in length, of the thickness of the thumb or more, fleshy, very brittle, grayish externally, brownish-yellow within, bitter, and of a strong disagreeable odour when fresh; that of *A. rotunda* is tuberous, roundish, heavy, fleshy, brownish on the exterior, grayish-yellow internally, and similar to the preceding in odour and taste; that of *A. Pistolochia* consists of numerous slender yellowish or brownish fibres, attached to a common head, and possessed of an agreeable aromatic odour, with a taste bitter and somewhat acrid. Many species of Aristolochia growing in the West Indies, Mexico, and South America, have attracted attention for their medicinal properties, and some, like our own snakeroot, have acquired the reputation of antidotes for the bites of serpents. In the East Indies, *A. Indica* is employed for similar purposes with the European and American species; and the Arabians are said by Forskhal to use the leaves of *A. sempervirens* as a counter-poison. We have in the United States six species, of which four—*A. Serpentaria*, *A. hirsuta*, *A. hastata*, and *A. reticulata*—contribute to furnish the snakeroot of the shops.

Aristolochia Serpentaria. Willd. *Sp. Plant.* iv. 159; Bigelow, *Am. Med. Bot.* iii. 82; Barton, *Med. Bot.* ii. 41. This species of Aristolochia is an herbaceous plant with a perennial root, which consists of numerous slender fibres proceeding from a short horizontal caudex. Several stems often rise from the same root. They are about eight or ten inches in height, slender, round, flexuose, jointed at irregular distances, and frequently of a reddish or purple colour at the base. The leaves are oblong-cordate, acuminate, entire, of a pale yellowish-green colour, and supported on short petioles at the joints of the stem. The flowers proceed from the joints near the root, and stand singly on long, slender, round, jointed peduncles, which are sometimes furnished with one or two small scales, and bend downwards so as nearly to bury the flower in the earth or decayed leaves. There is no calyx. The corolla is purple, monopetalous, tubular, swelling at the base, contracted and curved in the middle, and terminating in a labiate border with lanceolate lips. The anthers—six or twelve in number—are sessile, attached to the under part of the stigma, which is roundish, divided into six parts, and supported by a short fleshy style upon an oblong, angular, hairy, inferior germ. The fruit is a hexangular, six-celled capsule, containing several small flat seeds.

The plant grows in rich, shady woods, throughout the Middle, Southern, and

Western States, abounding in the valley of the Ohio, and in the mountainous regions of our interior. It flowers in May and June. The root is collected in Western Pennsylvania and Virginia, in Ohio, Indiana, and Kentucky, and is brought eastward chiefly by the routes of Wheeling and Pittsburg. As it reaches Philadelphia, it is usually in bales containing about one hundred pounds, and is often mixed with the leaves and stems of the plant, and with dirt from which it has not been properly cleansed at the time of collection.

A. hirsuta. Muhlenberg, *Catalogue*, p. 81; Bridges, *Am. Journ. of Pharm.*, xiv. 121. In Muhlenberg's Catalogue this species was named without being described; and botanists, supposing from the name that it was identical with *A. tomentosa*, have generally confounded the two plants. But they are entirely distinct. A description of *A. hirsuta* in the handwriting of Muhlenberg, and a labelled specimen of the plant, in the possession of the Academy of Natural Sciences of this city, have been found to correspond with a dried specimen received by one of the authors of this work from Virginia. *A. tomentosa* is a climbing plant, growing in Louisiana on the banks of the Mississippi, ascending to the summit of the highest trees. A plant in the garden of the author has a thick creeping root, entirely different in shape from that of the officinal species, though possessed of an analogous odour. *A. hirsuta* has a root like that of *A. Serpentaria*, consisting of a knotty caudex, sending out numerous slender simple fibres, sometimes as much as six inches in length. From this arise several jointed, flexuose, pubescent stems, less than a foot high, with one or two pubescent bractes, and several large roundish-cordate leaves, of which the lower are obtuse, the upper abruptly acuminate, and all pubescent on both sides and at the margin. From the joints near the root originate from one to three solitary peduncles, each bearing three or four leafy bractes and one flower. The peduncles, bractes, and corolla are all hairy. This species grows in Virginia, and probably other parts of the Western and Southern States. There is reason to believe that it contributes to afford the serpentaria of commerce, as its leaves, at one time mistaken for those of *A. tomentosa*, have been found in bales of the drug.

A. hastata. Nuttall, *Gen. of N. Am. Plants*, p. 200.—*A. sagittata.* Muhl. *Catal.* This species, if indeed it can be considered a distinct species, differs from A. Serpentaria in having hastate, acute, somewhat cordate leaves, and the lip of the corolla ovate. It flourishes on the banks of the Mississippi, in the Carolinas, and elsewhere. Its root scarcely differs from that of the officinal plant, and is frequently mixed with it, as proved by the presence of the characteristic leaves of *A. hastata* in the parcels brought into market.

A. reticulata. Nuttall; Bridges, *Am. Journ. of Pharm.* xvi. 118; Carson, *Illust. of Med. Bot.* ii. 32, pl. 77. This plant was probably first observed by Mr. Nuttall; as a specimen labelled "*A. reticulata*, Red river," in the handwriting of that botanist, is contained in the Herbarium of the Academy of Natural Sciences of Philadelphia. From this specimen, as well as from others found in parcels of the drug brought into market, a description was drawn up by Dr. Robert Bridges, and published in the *Amer. Journ. of Pharmacy*. From a root, similar to that of *A. serpentaria*, numerous short, slender, round, flexuose, jointed stems arise, usually simple, but sometimes branched near the root. The older stems are slightly villous, the young densely pubescent. The leaves, which stand on very short villous petioles, are round or oblong-cordate, obtuse, reticulate, very prominently veined, and villous on both sides, especially upon the veins. From the lower joints of the stem four or five hairy, jointed peduncles proceed, which bear small leafy villous bractes at the joints, and several flowers on short pedicels. The flowers are small, purplish, and densely pubescent, especially at the base and on the germ. The hexangular capsule is deeply

sulcate. This species grows in Louisiana, Arkansas, and probably in the Indian Territory west of that State; but its geographical range has not been ascertained.

Bales of a new variety of serpentaria have within a few years been brought to Philadelphia, which is certainly the product of this species; as specimens of all parts of the plant have been found in the bales, and the roots, which differ somewhat from those before known, are homogeneous in character. One of these bales was brought from New Orleans, and was said to have come down the Red river, and to have been collected by the Indians. The chief difference between this and ordinary Virginia snakeroot is in the size of the radicles, which are much thicker and less interlaced in the new variety. Each root has usually a considerable portion of one or more stems attached to the caudex. The colour is yellowish. The odour and taste are scarcely, if at all distinguishable from those of common serpentaria; and there is no doubt that the root is equally effectual as a medicine. From a chemical examination by Mr. Thomas S. Wiegand, it appears to have the same constituents, and to differ only in containing a somewhat larger proportion of gum, extractive, and volatile oil. (*Am. Journ. of Pharm.*, xvi. 16.)

Properties. Virginia snakeroot, as found in the shops, is in tufts of long, slender, frequently interlaced, and brittle fibres, attached to a short, contorted, knotty head or caudex. The colour, which in the recent root is yellowish, becomes brown by time. That of the powder is grayish. The smell is strong, aromatic, and camphorous; the taste warm, very bitter, and also camphorous. The root yields all its virtues to water and alcohol, producing with the former a yellowish-brown infusion, with the latter a bright greenish tincture, which is rendered turbid by the addition of water. Chevallier found in the root volatile oil, a yellow bitter principle soluble in water and alcohol, resin, gum, starch, albumen, lignin, and various salts. Buchholz obtained from 1000 parts, 5 of a green, fragrant volatile oil, 28.5 of a yellowish-green resin, 17 of extractive matter, 181 of gummy extract, 624 of lignin, and 144·5 of water. The active ingredients are probably the volatile oil, and the yellow bitter principle of Chevallier, which that chemist considers analogous to the bitter principle of quassia. The volatile oil passes over with water in distillation, rendering the liquid milky, and impregnating it with the peculiar odour of the root. Dr. Bigelow states that the liquid on standing deposits around the edges of its surface small crystals of camphor.

The roots of *Spigelia Marilandica* are sometimes found associated with serpentaria. They may be distinguished by the absence of the bitter taste, and, when the stem and foliage are attached, by the peculiar character of these parts of the plant. (See *Spigelia.*) We have occasionally seen the young roots of *Polygala Senega* mixed with serpentaria. Independently of their difference in odour and taste, they may be readily distinguished by being single, and by the projecting line running from one end to the other of the root.

Medical Properties and Uses. Serpentaria is a stimulant tonic, acting also as a diaphoretic or diuretic, according to the mode of its application. Too largely taken, it occasions nausea, griping pains in the bowels, sometimes vomiting and dysenteric tenesmus. It is admirably adapted to the treatment of typhoid fevers, whether idiopathic or symptomatic, when the system begins to feel the necessity for support, but is unable to bear active stimulation. In exanthematous diseases in which the eruption is tardy or has receded, and the grade of action is low, it is thought to be useful by promoting the cutaneous affection. It has also been highly recommended in intermittent fevers; and though itself generally inadequate to the cure of the complaint, often proves serviceable as an adjunct to Peruvian bark or sulphate of quinia. With the same remedies it is frequently associated in the treatment of typhous diseases. It is sometimes given in dyspepsia, and is employed as a gargle in malignant sorethroat.

The dose of the powdered root is from ten to thirty grains; but the infusion is almost always preferred. (See *Infusum Serpentariæ.*) The decoction or extract would be an improper form; as the volatile oil, upon which the virtues of the medicine partly depend, is dissipated by boiling.*

Off. Prep. Infusum Serpentariæ; Tinctura Cinchonæ Composita; Tinctura Serpentariæ. W.

SESAMI FOLIA. *U. S. Secondary.*

Benne Leaves.

The leaves of Sesamum Indicum, and of Sesamum orientale. *U. S.*

OLEUM SESAMI. *U. S. Secondary.*

Benne Oil.

The oil of the seeds of Sesamum Indicum, and of Sesamum Orientale. *U. S.* Sesame, *Fr.;* Sesam, *Germ.;* Sesamo, *Ital.;* Anjonjoli, *Span.*

SESAMUM. *Sex. Syst.* Didynamia Angiospermia.—*Nat. Ord.* Bignoniæ, *Juss.;* Pedaliaceæ, *R. Brown, Lindley.*

Gen. Ch. Calyx five-parted. *Corolla* bell-shaped, five-cleft, with the lower lobe largest. *Stamens* five, the fifth a rudiment. *Stigma* lanceolate. *Capsule* four-celled. *Willd.*

Sesamum orientale. Willd. *Sp. Plant.* iii. 358;. Rheed. *Hort. Malab.* ix. 54. "Leaves ovate, oblong, entire."

Sesamum Indicum. Willd. *Sp. Plant.* iii. 359; Curtis, *Bot. Mag.* vol. xli. t. 1688. "Leaves ovate-lanceolate, the inferior three-lobed, the superior undivided. Stem erect." There is reason to believe that this species is the one chiefly cultivated in our Southern States. At least we have found plants, raised in Philadelphia from seeds obtained from Georgia, to have its specific character, as given by Willdenow.

The benne plant of our Southern States is annual, with a branching stem four or five feet high, and bearing opposite, petiolate leaves, varying considerably in their shape. Those on the upper part of the plant are ovate-lanceolate, irregularly serrate, and pointed; those near the base three-lobed and sometimes ternate; and lobed leaves are not uncommon at all distances from the ground. The flowers are of a reddish-white colour, and stand solitarily upon short peduncles in the axils of the leaves. The fruit is an oblong capsule, containing small, oval, yellowish seeds.

These two species of Sesamum are natives of the East Indies, and have been cultivated from time immemorial in various parts of Asia and Africa. From the latter continent it is supposed that seeds were brought by the Negroes to the United States, where, as well as in the West Indies, one or both species are now cultivated to a considerable extent. It has been found that the plant above described will grow vigorously in the gardens so far north as Philadelphia, though it does not usually ripen its seeds in this vicinity.

* Mr. J. B. Savery proposes a *fluid extract of serpentaria*, made in the following manner. Eight ounces of the powdered root are macerated for a day or two in a pint of alcohol; and the mixture is then submitted to percolation, diluted alcohol being poured upon it until four pints have passed. The tincture thus obtained is evaporated by a gentle heat, with constant agitation, to twelve fluidounces, in which eight ounces of powdered sugar are dissolved, and the whole strained through flannel. A fluidounce contains the virtues of half an ounce of the root. From half a fluidrachm to a fluidrachm may be given for a dose. (*Am. Journ. of Pharm.*, xxiii. 120.)

The seeds are employed as food by the negroes, who parch them over the fire, boil them in broths, make them into puddings, and prepare them in various other modes. By expression they yield a fixed oil, which, as well as the leaves of the plant, has been introduced into the secondary catalogue of our national Pharmacopœia.

1. *Benne Leaves.* These abound in a gummy matter, which they readily impart to water, forming a rich, bland mucilage, much used in the Southern States as a drink in various complaints to which demulcents are applicable, as in cholera infantum, diarrhœa, dysentery, catarrh, and affections of the urinary passages. The remedy has attracted attention also in the North, and has been employed with favourable results in Philadelphia. One or two fresh leaves of full size, stirred about in half a pint of cool water, will soon render it sufficiently viscid. In their dried state they should be introduced into hot water. The leaves also serve for the preparation of emollient cataplasms.

2. *Benne Oil.* This is inodorous, of a bland, sweetish taste, and will keep long without becoming rancid. It bears some resemblance to olive oil in its properties, and may be used for similar purposes. It was known to the ancient Persians and Egyptians, and is highly esteemed by the modern Arabs and other people of the East, both as food and as an external application to promote softness of the skin. Like olive oil, it is laxative in large doses. W.

SEVUM. *U. S., Lond., Ed.*

Suet.

The prepared suet of Ovis Aries. *U. S., Lond., Ed.*

Suif, Graisse de mouton, *Fr.;* Hammelstalg, *Germ.;* Grasse duro, *Ital.;* Sebo, *Span.*

Suet is the fat of the sheep, taken chiefly from about the kidneys. It is prepared by cutting the fat into pieces, melting it with a moderate heat, and straining it through linen or flannel. In order to avoid too great a heat, the crude suet is sometimes purified by boiling it in a little water.

Mutton suet is of a firmer consistence, and requires a higher temperature for its fusion than any other animal fat. It is very white, sometimes brittle, inodorous, of a bland taste, insoluble in water, and nearly so in alcohol. Boiling alcohol, however, dissolves it, and deposits it upon cooling. It consists, according to Chevreul, of stearin, olein, and a small proportion of hircin. For an account of the two first-mentioned principles, the reader is referred to the article *Adeps. Hircin* is a liquid like olein, from which it differs in being much more soluble in alcohol, and in yielding *hircic acid* by saponification.

Suet acquires by time an unpleasant smell, and becomes unfit for pharmaceutic purposes. It is employed to give a proper consistence to ointments, cerates, and plasters, and sometimes as a dressing to blisters. W.

SILEX CONTRITUS. *Lond.*

Pulverized Silex.

Powdered flint, Silica, Silicic acid; Silice, *Fr.;* Kieselerde, *Germ.*

In operations of pharmacy, substances are sometimes employed whose action is exclusively mechanical. Thus, in the U. S. Pharmacopœia, sand is used in preparing oil of amber and the fluid extract of rhubarb, and carbonate of magnesia in forming several of the medicated waters. The use of the same carbonate was also directed in the London Pharmacopœia of 1836, in alternative processes for preparing several of these waters. Mr. R. Warington has objected to the

use of this carbonate, as being dissolved to an injurious extent, and proposed to substitute porcelain clay, or pulverized silica, glass, or pumice stone. (*Chem. Gaz.*, March 1, 1845.) The London College, probably influenced by this objection, has, in its Pharmacopœia of 1851, abandoned the use of carbonate of magnesia, and substituted finely pulverized silex, under the name of *Silex Contritus.*

This powder may be conveniently obtained from *colourless* quartz or rock-crystal. In order to render it more easily pulverizable, it is advantageous to heat it to redness, and quench it in water. It may then be reduced to fine powder in a porphyry or agate mortar.

Pulverized silex is a harsh, white, tasteless powder, insoluble in water and most other solvents. Its sp. gr. is 2·66. In composition it is generally considered to be a *teroxide of silicon*, consisting of one eq. of silicon 21·3, and three of oxygen 24=45·3.

The London College directs the use of pulverized silex in preparing all the medicated waters, except two, from the volatile oils of the plants, in addition to the method of distillation with water from the plants themselves. In the excepted cases (rose and elder water), distillation is alone allowed. The oil is rubbed up first with the silex and then with the water, and the whole is filtered. The silex acts as a mechanical agent in minutely dividing the oil and diffusing it through the water, and, by the subsequent filtration, is entirely removed.

B.

SIMARUBA. *U. S. Secondary, Lond., Ed.*

Simaruba.

The bark of the root of Simaruba officinalis. *U. S.* Root-bark of Simaruba amara. *Ed., Dub.*

Ecorce de simarouba, *Fr.;* Simarubarinde, *Germ.;* Corteccia di simaruba, *Ital.;* Corteza de simaruba, *Span.*

QUASSIA. See QUASSIA.

Quassia Simaruba. Willd. *Sp. Plant.* ii. 568; Woodv. *Med. Bot.* p. 569, t. 203. —*Simaruba officinalis.* De Cand. *Prodrom.* i. 733.—*S. amara.* Aublet; Lindley, *Flor. Med.* p. 207. As this plant is unisexual, it belongs to the genus Simaruba of De Candolle and Lindley, those only being placed by these botanists in the genus Quassia which are hermaphrodite. But as the Linnæan arrangement was adhered to in the case of Quassia excelsa, we continue to adhere to it in relation to this plant. (See *Quassia.*) It is a tree of considerable height and thickness, having alternate branches, with a bark which in the old tree is black and somewhat furrowed, in the young is smooth, gray, and marked here and there with broad yellow spots. The leaves are alternate and abruptly pinnate, with a naked petiole, to which the leaflets are alternately attached by short footstalks. The leaflets are nearly elliptical, on the upper surface smooth and of a deep-green colour, on the under whitish. The flowers are yellow, and disposed in long axillary panicles. In some descriptions they are stated to be monœcious, in others diœcious. According to Dr. Wright, the female flowers are never found in Jamaica on the same tree with the male. The number of stamens is ten.

The tree is found in the West Indies and Guyana. In Jamaica it is called the *mountain damson.* The *Simaruba amara* of Aublet, which grows in Guyana, and has generally been considered identical with *Q. simaruba*, is believed by Hayne to be a distinct species; the Jamaica plant having diœcious, while this has monœcious flowers. The bark of the root is the part employed; the wood itself being nearly tasteless and inert.

Simaruba bark is in long pieces, some inches in breadth, folded lengthwise,

light, flexible, tenacious, very fibrous, externally of a light brownish-yellow colour, rough, warty, and marked with transverse ridges, internally of a pale yellow. It is without smell, and of a bitter taste. It readily imparts its virtues, at ordinary temperatures, to water and alcohol. The infusion is at least equally bitter with the decoction, which becomes turbid as it cools. Its constituents, according to M. Morin, are a bitter principle identical with *quassin*, a resinous matter, a volatile oil having the odour of benzoin, malic acid, gallic acid in very minute proportion, an ammoniacal salt, malate and oxalate of lime, some mineral salts, oxide of iron, silica, ulmin, and lignin.

Medical Properties and Uses. Simaruba possesses the same tonic properties as other simple bitters, and may be employed for the same purposes. In large doses it is said to purge and vomit. It was introduced into France in the year 1713 from Guyana, where it had previously been used as a remedy for dysentery. In the treatment of this disease and of obstinate diarrhœa it afterwards obtained much credit in Europe; but Cullen was right in denying to it any specific control over these complaints. It operates simply as a tonic; and, though it may be occasionally beneficial in relaxed and debilitated states of the alimentary canal, it would do much harm if indiscriminately prescribed in dysenteric cases. On account of its difficult pulverization, it is seldom given in substance. The best mode of administration is by infusion. The dose is from a scruple to a drachm.

Off. Prep. Infusum Simarubæ. W.

SINAPIS. *U. S., Lond.*

Mustard.

The seeds of Sinapis nigra and Sinapis alba. *U. S., Lond.*

Off. Syn. SINAPI. Flour of the seeds of Sinapis nigra, generally mixed with those of Sinapis alba, and deprived of fixed oil by expression. *Ed.* SINAPIS ALBA and SINAPIS NIGRA. The flour of the seeds. *Dub.*

Moutarde, *Fr.;* Senfsamen, *Germ.;* Senapa, *Ital.;* Mostaza, *Span.*

SINAPIS. *Sex. Syst.* Tetradynamia Siliquosa. — *Nat. Ord.* Brasicaceæ or Cruciferæ.

Gen. Ch. Calyx spreading. *Corolla* with straight claws. *Glands* between the shorter stamens and pistil, and between the longer stamens and calyx. *Willd.*

Sinapis nigra. Willd. *Sp. Plant.* iii. 555; Woodv. *Med. Bot.* p. 403, t. 146. Common or black mustard is an annual plant, with a stem three or four feet in height, divided and subdivided into numerous spreading branches. The leaves are petiolate and variously shaped. Those near the root are large, rough, lyrate-pinnate, and unequally toothed; those higher on the stem are smooth and less lobed; and the uppermost are entire, narrow, smooth, and dependent. The flowers are small, yellow, with a coloured calyx, and stand closely together upon peduncles at the upper part of the branches. The pods are smooth, erect, nearly parallel with the branches, quadrangular, furnished with a short beak, and occupied by numerous seeds.

Sinapis alba. Willd. *Sp. Plant.* iii. 555; Smith, *Flor. Brit.* 721. The white mustard is also annual. It is rather smaller than the preceding species. The lower leaves are deeply pinnatifid, the upper sublyrate, and all irregularly toothed, rugged, with stiff hairs on both sides, and pale-green. The flowers are in racemes, with yellow petals, and linear, green, calycine leaflets. The pods are spreading, bristly, rugged, roundish, swelling in the position of the seeds, ribbed, and provided with a very long ensiform beak.

Both plants are natives of Europe and cultivated in our gardens; and *S. nigra* has become naturalized in some parts of this country. Their flowers appear in

June. The seeds are kept in the shops both whole and in the state of very fine powder, as prepared by the manufacturers for the table.

Black mustard seeds are small, globular, of a deep-brown colour, slightly rugose on the surface, and internally yellow. In the entire state they are inodorous, but have a distinct smell in powder, and when rubbed with water or vinegar exhale a strong pungent odour, sufficient in some instances to excite a flow of tears. Their taste is bitterish, hot, and pungent, but not permanent. *White mustard seeds* are much larger, of a yellowish colour, and less pungent taste. Both afford a yellow powder, which has a somewhat unctuous appearance, and cakes when compressed. This is commonly called *flour of mustard*, or simply *mustard*, and is prepared by crushing and pounding the seeds, and then sifting them; the purest flour being obtained by a second sifting. Both the black and the white seeds are used in its preparation. It is often adulterated with wheat flour coloured by turmeric, to which red pepper is added to render the mixture sufficiently hot. The skin of white mustard seeds contains a mucilaginous substance, which is extracted by boiling water. When bruised or powdered, both kinds impart their active properties wholly to water, but in a very slight degree to alcohol. They yield upon pressure a fixed oil, called *oil of mustard*, of a greenish-yellow colour, little smell, and a mild not unpleasant taste; and the portion which remains is even more pungent than the unpressed seeds. The fixed oil of mustard yields, upon saponification, a peculiar acid, for which the name of *erucic acid* has been proposed. (Darby, *Chem. Gaz.*, vii. 163, from *Liebig's Annalen.*)

It has been long known that black mustard seeds yield by distillation with water a very pungent volatile oil, containing sulphur. Guibourt conjectured, and Robiquet and Boutron proved, that this oil does not pre-exist in the seeds, but is produced by the action of water. Hence the absence or very slight degree of odour in the seeds when bruised in a dry state, and their great pungency when water is added. It seemed reasonable to suppose that the reaction in this case was similar to that exercised by water upon bitter almonds (see *Amygdala Amara*); and this has been proved to be the fact by the experiments of Simon, Bussy, Boutron, and Frémy. According to M. Bussy, there are two peculiar principles in black mustard seeds, one named by him *myronic acid*, which exists in the seeds in the state of *myronate of potassa;* the other *myrosyne*, closely analogous in character to the albuminous constituent of almonds called *emulsin*. When water is added to black mustard seed, the myrosyne, acting the part of a ferment, determines a reaction between the water and myronate of potassa, which results in the production of the volatile oil. The same thing happens when any one of the myronates is brought into contact with water and myrosyne. The presence of the last-mentioned principle is essential. Like emulsin, it becomes inoperative when coagulated by heat, alcohol, or the acids; and, if black mustard seeds be subjected to either of these agencies previously to the addition of water, they will yield no volatile oil. The myrosyne, however, sometimes partially recovers its power by continued contact with water. This substance is found also in white mustard seeds, but without the myronate of potassa. If, therefore, white mustard seeds be added to the black in which the myrosyne has been coagulated, the volatile oil will be generated on the application of water. Though closely analogous to emulsin, myrosyne is yet a distinct principle, as its place cannot be supplied by emulsin with the same effect. (*Journ. de Pharm.*, xxvi. 39.) Simon obtained results somewhat different from those of M. Bussy. The former chemist succeeded in procuring a peculiar crystalline principle from the seeds which he called *sinapisin*, and which, upon contact with water and the albuminous principle of the seeds, emitted the odour of the oil of mustard. The whole subject requires further investigation.

The *volatile oil of mustard* is usually obtained from seeds which have been deprived of their fixed oil by pressure. It is a colourless or pale-yellow liquid,

rather heavier than water, of an exceedingly pungent odour, and an acrid burning taste. It boils at about 298°; is slightly soluble in water, and readily so in alcohol and ether; with alkaline solutions yields sulphocyanurets; and consists, according to M. Löwig and Dr. Will, of nitrogen, carbon, hydrogen, and sulphur; its formula being $NC_8H_5S_2$. Dr. Will considers it a sulphocyanuret of *allyle* (C_6H_5), the compound radical of oil of garlic, which is considered a sulphuret of allyle. (*Chem. Gaz.*, No. 62 and 64.) It is the principle upon which black mustard seeds depend for their activity.

White mustard seeds do not yield volatile oil when treated with water; but an acrid fixed principle is developed, which renders these seeds applicable to the same purposes as the other variety. MM. Robiquet and Boutron, who ascertained this fact, concluded that the acrid principle resulted from the reaction of water upon *sulpho-sinapisin*, discovered in the seeds by MM. Henry, Jun., and Garot. Their reason for this belief was that mustard, which had been deprived of this ingredient, was incapable of developing the acrid principle. The myrosyne or emulsin is equally essential to the change here, as to that which occurs in black mustard; and the reaction equally fails, if this principle be previously rendered inert by heat, alcohol, or the acids. MM. Boutron and Frémy state that not only the acrid principle of white mustard, but hydrosulphocyanic acid also results from the reaction above explained; and this observation renders still closer the analogy between the changes that take place, upon contact with water, in mustard seeds and bitter almonds. (*Journ. de Pharm.*, xxvi. 50.)*

* As some may desire to push these investigations further, we give the properties of these peculiar principles, and the modes of procuring them.

Myronic acid is a fixed inodorous substance, of a bitter and sour taste, and acid reaction. When obtained separate from its bases, it forms a colourless solution, which by evaporation becomes of a thick consistence like molasses, without crystallizing. It is soluble in water and alcohol, but not in ether; and forms soluble salts with the alkalies, baryta, lime, and the oxides of lead and silver, all of which yield volatile oil of mustard, when mixed with an aqueous solution of myrosyne. It contains sulphur, besides nitrogen, carbon, hydrogen, and oxygen. It is obtained from the myronate of potassa by adding to 100 parts of that salt 38 parts of crystallized tartaric acid, concentrating the solution by evaporation, and then adding weak alcohol, which precipitates the bitartrate of potassa and retains the myronic acid in solution. To obtain *myronate of potassa* from black mustard seeds, the powder, having been dried at 212°, and deprived of its fixed oil by pressure, is treated with strong alcohol in a displacement apparatus, and, when thus nearly exhausted of everything soluble in that liquid, is pressed and treated with water. The aqueous solution is evaporated, and, before it is too much concentrated, weak alcohol is added, which precipitates a glutinous matter. The solution, being then carefully evaporated, deposits crystals of myronate of potassa, which may be obtained very pure and white by washing the mass with diluted alcohol. This salt is easily crystallizable in fine large, transparent crystals, is unalterable in the air, very soluble in water, insoluble in pure alcohol, and of a bitter taste.

Myrosyne, when dry, has the character of an albuminous substance. It is soluble in water, forming a viscid solution which froths when agitated, and is coagulated by heat, alcohol, and the acids. It is obtained by treating white mustard seed with cold water, filtering the solution, evaporating it by a heat not exceeding 100°, and, when it is of the consistence of syrup, carefully adding alcohol, which causes a precipitate easily separable by decantation. If this be dissolved in water, and the solution evaporated as before, myrosyne is obtained, though not entirely pure. (*Journ. de Pharm.*, xxvi. 39.)

The *sinapisin* of Simon is in brilliant, white, scaly crystals, sublimable by heat, soluble in alcohol, ether, and the fixed and volatile oils, but insoluble in acids and alkalies. To obtain it he exhausted black mustard seed with strong alcohol, distilled off the greater part of the alcohol, treated the residue several times with four or five times its weight of ether, from the ethereal solutions distilled off all the ether, treated the extract again with a smaller quantity of ether so as to leave behind insoluble substances, and repeated this process until the extract formed a perfectly clear solution without residue. The extract was then dissolved in cold strong alcohol, and the solution, having been decolorized with animal charcoal, was allowed to evaporate in the air. Simon obtained from 55 pounds of the seeds only 80 grains of crystallized sinapisin. (*Annal. der Pharm.*, xxviii. 291.)

Sulpho-sinapisin, the peculiar ingredient of white mustard seed, is white, crystallizable,

From the above account of the chemical relations of mustard, it is obvious that admixture with alcohol or the acids, or the application of a boiling heat, can only have the effect of impairing its medical virtues, and that the best vehicle, whether for external or internal use, is water at common temperatures.

Medical Properties and Uses. Mustard seeds swallowed whole operate as a laxative, and have acquired some reputation as a remedy in dyspepsia, and in other complaints attended with torpid bowels and deficient excitement. The white seeds are preferred, and are taken in the dose of a tablespoonful once or twice a day, mixed with molasses, or previously softened and rendered mucilaginous by immersion in hot water. They probably act in some measure by mechanically stimulating the bowels. The bruised seeds or powder, in the quantity of a large teaspoonful, operate as an emetic. Mustard in this state is applicable to cases of great torpor of stomach, especially that resulting from narcotic poisons. It rouses the gastric susceptibility, and facilitates the action of other emetics. In smaller quantities it is useful as a safe stimulant of the digestive organs; and, as it is frequently determined to the kidneys, has been beneficially employed in dropsy. Whey, made by boiling half an ounce of the bruised seeds or powder in a pint of milk and straining, is a convenient form for administration. It may be given in the dose of a wineglassful repeated several times a day. But mustard is most valuable as a rubefacient. Mixed with water in the form of a cataplasm, and applied to the skin, it very soon produces redness with a burning pain, which in less than an hour usually becomes insupportable. When a speedy impression is not desired, especially when the sinapism is applied to the extremities, the powder should be diluted with an equal portion of rye meal or wheat flour. Care should be taken not to allow the application to continue too long, as vesication with obstinate ulceration, and even sphacelus may result. This caution is particularly necessary in cases where the patient is insensible, and the degree of pain can afford no criterion of the sufficiency of the action. The volatile oil, which is powerfully rubefacient, and capable of producing speedy vesication, has been considerably used in Germany. For external application as a rubefacient, 30 drops may be dissolved in a fluidounce of alcohol, or 6 or 8 drops in a fluidrachm of almond or olive oil. It has been given internally in colic, two drops being incorporated with a six-ounce mixture, and half a fluidounce given for a dose. (See *Am. Journ. of Pharm.*, xi. 9.) In overdoses it is highly poisonous,

inodorous, bitter, and soluble in alcohol and water, forming a yellow solution. It was at first thought by MM. Henry and Garot to be an acid, but they afterwards ascertained that it was neuter. It consists of sulphur, nitrogen, carbon, hydrogen, and oxygen. It may be obtained from white mustard seeds, previously deprived of the fixed oil by expression, by boiling them in water, evaporating the decoction to the consistence of honey, mixing the residue with 6 or 8 times its volume of anhydrous alcohol which precipitates various substances, then distilling off the alcohol, and setting aside the syrupy residue to crystallize. The crystals may be purified by repeated solution and crystallization in alcohol. (Berzelius, *Traité de Chimie.*) This principle, which has also been called *sinapin*, is considered by L. von Babo and Hirschbrunn to be the sulphocyanuret of an alkaloid, to which they propose to confine the name of *sinapin*, and for which they give the formula $NC_{32}H_{26}O_{12}$. The *sulphocyanuret of sinapin* is obtained from seeds, already so far exhausted by cold alcohol as to yield only a pale-yellow colour to that liquid, by boiling them in alcohol of the sp. gr. 0·833, evaporating the liquor, and crystallizing. It has an appearance like that of crystallized sulphate of quinia, is soluble with difficulty in cold water and alcohol, but readily in both liquids when hot, and is nearly insoluble in ether. When boiled with alkalies, it yields an acid called *sinapic acid.* It is difficult to separate the organic base sinapin from it, because this is decomposed by alkalies. It does not appear that sulphocyanuret of sinapin yields with synaptase the acrid principle developed in white mustard seeds by water; but the authors state that another substance rich in sulphur has been ascertained by Simon to exist in white mustard seeds, which plays an important part in the production of the pungent matter. (See *Chem. Gaz.*, March 1, 1853, p. 81.)

producing gastro-enteric inflammation, and probably perverting the vital processes by pervading the whole system. Its odour is perceptible in the blood, and it is said to impart the smell of horseradish to the urine.

Off. Prep. Cataplasma Sinapis; Emplastrum Cantharidis Compositum; Infusum Armoraciæ. W.

SODIUM.

Sodium.

Sodium, *Fr.;* Natrium, Natronmetall, *Germ.;* Sodio, *Ital., Span.*

Sodium is a peculiar metal, forming the radical of the alkali soda. It was discovered by Sir H. Davy in 1807, who obtained it in minute quantity by decomposing the alkali by the agency of galvanic electricity. It was afterwards procured in much larger quantities by Gay-Lussac and Thenard, by bringing the alkali in contact with iron turnings heated to whiteness. The iron became oxidized, and the metallic radical of the soda was liberated. It is now obtained by the cheaper process of Schoedler, which consists in converting, by ignition, the commercial acetate of soda into carbonate and charcoal, and heating the product to whiteness in an iron mercury-bottle, mixed with an additional portion of charcoal.

Sodium is a soft, malleable, sectile solid, of a silver-white colour. It possesses the metallic lustre in a high degree when protected from the action of the air, by which it is quickly tarnished and oxidized. Its sp. gr. is 0·97, fusing point about 200°, equivalent number 23·3, and symbol Na. Its chemical affinities resemble those of potassium, but are less energetic. Like potassium it has a strong attraction for oxygen. When thrown upon cold water it instantly fuses into a globule without inflaming, and traverses the surface in different directions with rapidity; on hot water it inflames. In both cases the water is decomposed, hydrogen is liberated, and a solution of soda generated. It combines also with a larger proportion of oxygen than exists in soda, forming a *sesquioxide.* This oxide is always formed when the metal is burnt in the open air.

Sodium is an ingredient in a number of important medicinal preparations, and is briefly described in this place as an introduction to these compounds. Its protoxide only is salifiable, constituting the alkali soda, which, united to acids, gives rise to a numerous class of compounds, called salts of soda. These are characterized by their communicating to the blowpipe flame a rich yellow colour, and by not being precipitable by any reagent, except the metantimoniate of potassa. (See *page* 585.) Protoxide of sodium (dry soda) consists of one eq. of sodium 23·3, and one of oxygen 8=31·3. United with one eq. of water 9, it forms hydrate of soda (caustic soda), weighing 40·3.

The officinal combinations containing sodium are chloride of sodium, the solutions of soda and chlorinated soda, the acetate, borate, carbonate, bicarbonate, phosphate, sulphate, and valerianate of soda, and the tartrate of potassa and soda. The description of a part of these combinations will immediately follow; while the remainder will be noticed, under their respective titles, in the second part of this work. B.

SODÆ ACETAS. *U. S., Dub.*

Acetate of Soda.

Terra foliata tartari, *Lat.;* Acétate de soude, *Fr.;* Essigsaures Natron, *Germ.;* Acetato di soda, *Ital.*

Acetate of soda is included among the Preparations by the Dublin College; but, as it is obtained on a large scale by the manufacturing chemist, it is more

properly placed in the catalogue of the Materia Medica in the United States Pharmacopœia.

Preparation. The Dublin College obtains this salt by the following process. "Take of Crystallized Carbonate of Soda of commerce *one pound* [avoirdupois], or a sufficient quantity; Acetic Acid of commerce (sp. gr. 1·044) *one pint* [Imp. meas.]. To the Acid, placed in a porcelain capsule, add by degrees the Carbonate of Soda, and, taking care that there shall be a slight excess of Acid, evaporate the resulting solution till a pellicle begins to form on its surface, and set it by to crystallize. The crystals, when drained of the mother liquor, and dried by a short exposure to air on a porous brick, should be enclosed in a well stopped bottle." *Dub.*

Acetate of soda is prepared by the manufacturer of crude pyroligneous acid, for the purpose of being decomposed so as to yield the officinal acetic acid by the action of sulphuric acid. The steps of the process by which it is made from the crude acid have already been given under the head of *Acidum Aceticum*, page 18.

Properties, &c. Acetate of soda is a white salt, crystallized in long striated prisms, and possessing a sharp, bitterish, not disagreeable taste. Exposed to a dry air it effloresces slowly, and loses about forty per cent. of its weight. It is soluble in about three parts of cold water, and in twenty-four of alcohol. Subjected to heat it undergoes first the aqueous and then the igneous fusion, and is finally decomposed; the residue being a mixture of carbonate of soda and charcoal. By the affusion of sulphuric acid it is decomposed, the acetic acid being liberated, known by its acetous odour, and sulphate of soda formed. The salt should be perfectly neutral to test paper, and not precipitated by chloride of barium, nitrate of silver, or chloride of platinum. The non-action of these tests proves the absence of sulphates, chlorides, and salts of potassa. For the proper action of the nitrate of silver test, the solution should be dilute; for if it be strong, there will be a crystalline precipitate of acetate of silver, which dissolves on the addition of water. Acetate of soda consists, when crystallized, of one eq. of acetic acid 51, one of soda 31·3, and six of water 54=136·3.

Medical Properties and Uses. Acetate of soda is diuretic, and possesses generally the same medical properties as acetate of potassa, to which article the reader is referred. It is, however, more convenient for exhibition than the latter salt, as it is not deliquescent. The dose is from a scruple to two drachms. It is employed principally to yield acetic acid by the action of sulphuric acid.

B.

SODÆ BORAS. *U. S.*

Borate of Soda.

Off. Syn. BORAX. *Lond., Ed., Dub.*

Borate de soude, Borax, *Fr.;* Boraxsaures Natron, Borax, *Germ.;* Borace, *Ital.;* Borrax, *Span.;* Boorak, *Arab.*

Borax was known to the ancients, but its chemical nature was first ascertained by Geoffroy in 1732. It exists native, and may be obtained by artificial means. It occurs in several localities in Europe, in Peru, and in beds associated with borate of lime in the district of Iquique, in the Republic of Ecuador. This mineral, as analyzed by M. Le Canu, contained from 13 to 19 per cent. of borate of soda, and from 23 to 26 per cent. of borate of lime. (*Journ. de Pharm.*, July, 1853, p. 22.) It has already become an article of commerce. Borax is found abundantly in certain lakes of Thibet and Persia, from which it is obtained by spontaneous evaporation. The impure borax concretes on the margins of these lakes, and is dug up in lumps, called in commerce *tincal* or *crude borax*. In this

state it is in the form of crystalline masses, which are sometimes colourless, sometimes yellowish or greenish, and always covered with an earthy coating, greasy to the touch, and having the odour of soap. The greasy appearance is derived from a fatty matter, saponified by soda. The tincal thus obtained in the interior is transferred to the seaports of India, especially Calcutta, from which it is exported to this country in chests. Besides Indian tincal, there is another commercial variety of borax which comes from China, and which is partially refined. Both varieties require to be purified before being used in medicine or the arts.

Purification. The method of refining borax was originally possessed as a secret by the Venetians and Dutch, but is now practised in several European countries. The process pursued in France, as reported by Robiquet and Marchand, is as follows. The tincal is placed in a large wooden vessel, and covered to the depth of three or four inches with water; in which state it is allowed to remain for five or six hours, being agitated from time to time. Slaked lime is now added, in the proportion of one part to four hundred of the impure salt; and the whole, being thoroughly mixed, is allowed to remain at rest till the succeeding day. The salt is next separated by means of a sieve, the crystals being crumbled between the hands, and placed so as to drain. The object of this treatment is to separate the soapy matter, with which the lime forms an insoluble soap; and at the same time sulphate of soda and chloride of sodium are removed, with only a minute loss of the borax. The borax being drained is next dissolved, by the assistance of heat, in two and a half times its weight of water, and the solution treated with one-fiftieth of its weight of chloride of calcium, in order to complete the separation of the soapy matter; after which it is strained through a coarse bag. The liquor is then concentrated by heat, and run into wooden vessels, lined with lead, having the shape of an inverted quadrangular pyramid. If care be taken that the cooling proceeds very gradually, distinct crystals will be obtained, such as are found in commerce; otherwise, crystalline crusts will be formed. The Chinese borax is purified in a similar manner; but, being less impure than the common tincal, does not require to be washed.

Preparation of Artificial Borax. Large quantities of borax are now made by the direct combination of *native boracic acid* with soda. The acid is found in solution in certain lagoons in Tuscany, from which hot vapours are ejected, and which are situated within a space of ten or twelve miles. The water of the lagoons is economically concentrated by the hot vapours themselves. In 1846, the product of these lagoons was estimated by M. Larderel, the original manufacturer of the acid, at three millions of Tuscan pounds. As here procured, the acid contains from 17 to 20 per cent. of impurities, consisting principally of the sulphates of ammonia, magnesia, lime, and alumina, muriate of ammonia, chloride of iron, and clay, sand, and sulphur. It is added to saturation to a solution of carbonate of soda, heated by steam, and the liquor, after boiling, is allowed to stand for ten or twelve hours. It is then drawn off into wooden vessels lined with lead, where it crystallizes. The impure crystals, thus obtained, are refined by dissolving them in water heated by steam, adding carbonate of soda to the solution, and crystallizing. The merit of introducing the process for obtaining artificial borax belongs to Cartier and Payen, who succeeded in establishing its manufacture in France, notwithstanding the strong prejudice felt against the use of the artificial salt. In the process for artificial borax of M. Koehnke, a solution of caustic soda is used, extemporaneously obtained by the action of lime. For the details of his process, see the *Am. Journ. of Pharm.*, xvii. p. 111.

Properties. Borax is a white salt, generally crystallized in flattened hexahedral prisms, terminated by triangular pyramids, and possessing a sweetish, feebly alkaline taste, and an alkaline reaction. It dissolves in twelve times its

weight of cold, and twice its weight of boiling water. Exposed to the air it effloresces slowly, and the surface of the crystals becomes covered with a white powder. Subjected to a moderate heat it undergoes the aqueous fusion, swells considerably, and finally becomes a dry porous mass, with loss of half its weight. Above a red heat it melts into a limpid liquid, and, after cooling, concretes into a transparent solid, called *glass of borax*, much used as a flux in assays with the blowpipe. Borax has been found, in the English market, adulterated to the extent of twenty per cent. with phosphate of soda. The foreign salt may be detected by exposing the suspected borax to the heat of a drying room for a few hours, when the phosphate, if present, will effloresce, and may be picked out. Sulphuric acid, added to a saturated solution of the salt, unites with the soda, and precipitates the *boracic acid* in white, shining, scaly crystals, possessing the property of imparting a green colour to the flame of burning alcohol. Boracic acid consists of one eq. of boron 10·9, and three of oxygen 24=34·9.

Borax has the property of rendering cream of tartar very soluble in water, and forms a combination with it called *soluble cream of tartar*, which is sometimes used in medicine. This preparation is made by boiling six parts of cream of tartar and two of borax in sixteen of water for five minutes, allowing the solution to cool, and then filtering to separate some tartrate of lime. Soluble cream of tartar attracts moisture from the air, and is soluble in its own weight of cold, and half its weight of boiling water. A similar preparation may be made by substituting boracic acid for the borax, the proportions being four parts of cream of tartar to one of the acid. This combination is even more soluble than the other. It has not been well ascertained what is the nature of these compounds. Thenard has thrown out the suggestion, that the former consists of two double salts, tartrate of potassa and soda (Rochelle salt), and tartrate of potassa and boracic acid, the boracic acid acting the part of a base; and Berzelius inclines to the opinion that the latter is a double tartrate of potassa and boracic acid. According to the formula of the Paris Codex, soluble cream of tartar is made with boracic acid. Four hundred parts of cream of tartar and one hundred of the acid are dissolved in a silver basin, at the temperature of ebullition, in 2400 parts of water. The solution is kept boiling until the greater part of the water is consumed. The fire is then moderated, and the solution continually stirred while the evaporation proceeds. When the matter has become very thick, it is removed by portions, which are flattened in the hand, completely dried by the heat of a stove, reduced to powder, and kept in well stopped bottles.

Composition. Borax consists of two eqs. of boracic acid 69·8, and one of soda 31·3=101·1. It ordinarily crystallizes in prisms, and contains ten eqs. of water (*prismatic borax*); but a variety of the salt exists, which crystallizes in octohedrons, and contains only five eqs. of water (*octohedral borax*). The latter is obtained in the artificial production of borax, by crystallizing from a concentrated solution at a temperature between 174° and 133°. When a solution of borax is evaporated at 212°, the salt is left as an amorphous, transparent, brittle mass, containing four eqs. of water. (*Schweitzer.*) From the composition of borax in equivalents, it is evidently a *biborate*, though sometimes called a subborate on account of its possessing an alkaline reaction.

Medical Properties and Uses. Borax is a mild refrigerant and diuretic. It is supposed also to exercise a specific influence over the uterus, promoting menstruation, facilitating parturition, and favouring the expulsion of the placenta. (Vogt's *Pharmakodynamik*, cited by Pereira.) Dr. Binswanger, in a prize essay published in 1848, denies its specific power of exciting uterine contractions, or promoting menstruation. Nevertheless Dr. Daniel Stahl, of Indiana, found it useful in dysmenorrhœa, occurring in sanguineous constitutions, venesection being premised. He gives it in doses of about nine grains every two

hours in a tablespoonful of flaxseed tea, for two days before the time of the expected return of the menses. (See *Am. Journ. of Med. Sci.*, xx. 536.) Virey deemed it aphrodisiac; and, according to Dr. J. C. Hubbard, it is eminently so, when used in the form of enema. (*New York Journ. of Med.*, for Nov. 1848, from the *Annalist.*) Binswanger considers borax as the best remedy that can be used in nephritic and calculous complaints, dependent on an excess of uric acid. It probably acts in such cases as an alkali, the soda of the salt neutralizing the uric acid, occurring in the urinary passages, and the boracic acid being set free. The dose is from thirty to forty grains. Cream of tartar, rendered soluble by borax or boracic acid, is a convenient preparation, where it is desirable to administer large quantities of the former salt. Externally the solution of borax is used as a wash in scaly cutaneous eruptions. A solution formed by dissolving a drachm of the salt in two fluidounces of distilled vinegar has been found, both by Dr. Abercrombie and Dr. Christison, an excellent lotion for ringworm of the scalp. Borax is very much used as a detergent in aphthous affections of the mouth in children. When employed for this purpose, it is generally applied in powder, either mixed with sugar in the proportion of one part to seven, or rubbed up with honey. (See *Mel Boracis.*)

Off. Prep. Mel Boracis. B.

SODÆ CARBONAS. *U. S., Lond., Ed.*

Carbonate of Soda.

Off. Syn. SODÆ CARBONAS CRYSTALLIZATUM. *Dub.*

Carbonate de soude, *Fr.;* Einfach Kohlensaures Natron, *Germ.;* Carbonato di soda, *Ital.;* Carbonato de soda, *Span.*

In the U. S. Pharmacopœia this salt has been always placed in the list of the Materia Medica; the crystallized carbonate of soda, obtained on a large scale by the manufacturing chemist, being a nearly pure salt, and that which is sold in the shops of our apothecaries. The same position is now given to it by the three British Colleges; the officinal processes for preparing it having been abandoned by the Edinburgh College in 1839, and by the Dublin and London Colleges in their recent Pharmacopœias of 1850 and 1851.

Before entering upon the consideration of the carbonate of soda as a pure salt, we shall speak generally of the sources of the alkali soda.

The sources of carbonated soda may be divided into the natural and artificial. The natural sources are the minerals of native soda, and certain marine plants which yield the alkali in their ashes; the artificial are certain salts which furnish it by chemical decomposition.

Native soda, sometimes called *natron*, is found chiefly in Hungary, Egypt, and South America, and exists, in these countries, either in the earth of the surface, which often exhibits a saline efflorescence, or in solution in small lakes, from which it is extracted by taking advantage of the drying up of the water during the heats of summer. That from Egypt, called *trona* by the natives, is a *sesquicarbonate;* while that from South America is less carbonated. Native soda, in the form of a sesquicarbonate, has been found in a soda lake in the territory of the Nizam, India. (See *Am. Journ. of Pharm.*, July, 1853, p. 350.)

Impure soda, derived from the ashes of plants growing on the surface or borders of the sea, is called barilla or kelp, according to the character of the plants incinerated. Barilla is obtained from several vegetables, principally belonging to the genera *Salsola*, *Salicornia*, and *Chenopodium*. In Spain, Sicily, and some other countries, the plants are regularly cultivated for the purpose of yielding soda by their combustion. When ripe, they are cut down,

dried, and burnt in heaps. The ashes form a semi-fused, hard, and compact saline mass, which is broken up into fragments by means of pickaxes, and thrown into commerce. Kelp, called *vareck* in France, is procured by the incineration of various kinds of sea-weeds, principally the algæ and fuci, which grow on the rocky coasts of many countries. The Orkneys and Hebrides, and the rocky coasts of Wales, Scotland, and Ireland, furnish large quantities of these weeds. The plants are allowed to ferment in heaps, then dried, and afterwards burnt to ashes in ovens, roughly made with brick or stone, and built in the ground. The alkali in the ashes melts, and forms the whole into one solid mass. When cold, it is broken up with iron instruments into large heavy masses, in which state it is found in commerce. About twenty-four tons of sea-weeds are required to produce one of kelp.

Barilla, when of good quality, is in hard, dry, porous, sonorous, grayish-blue masses, which become covered with a saline efflorescence after exposure to the air. It possesses an alkaline taste and peculiar odour. *Spanish barilla* contains from twenty-five to forty per cent. of real carbonated alkali; the residue being made up of sulphate of soda, sulphuret and chloride of sodium, carbonate of lime, alumina, silica, oxidized iron, and a small portion of charcoal which has escaped combustion. Before the introduction of artificial soda, barilla formed the source of the crystallized carbonate employed in medicine. At present barilla is principally used in the manufacture of soap.

Kelp is in hard, vesicular masses, of a dark-gray, bluish, or greenish colour, sulphurous odour, and acrid, caustic taste. It is still less pure than barilla, containing only from five to eight per cent. of carbonated soda; the rest being made up of a large proportion of the sulphates of soda and potassa, and the chlorides of potassium and sodium, a small quantity of iodide of sodium, and insoluble and colouring matters. Large quantities of kelp were formerly manufactured in Great Britain and the neighbouring islands, particularly the Orkney Islands; but the demand and production have greatly fallen off, since the introduction of artificial soda at a comparatively low price. At present kelp is used principally in the manufacture of iodine. (See *Iodinium.*)

Artificial Soda. Several plans have been proposed for obtaining soda by chemical decomposition; but none are at present used, except that of decomposing sulphate of soda. This salt is procured from the manufacturers of chlorinated lime (bleaching powder), or, what is more usual on account of the insufficient supply from that source, is made expressly for the purpose, by decomposing common salt (chloride of sodium) by sulphuric acid. The dried sulphate is mixed with its own weight of ground limestone, and half its weight of small coal, ground and sifted, and the whole is heated in a reverberatory furnace, where it fuses and forms a black mass, called *black ash*, *soda ball*, or *British barilla*. The coal, at the temperature employed, converts the sulphate of soda into sulphuret of sodium. This reacts with the limestone, so as to form sulphuret of calcium and carbonate of soda (NaS and $CaO,CO_2 = CaS$ and NaO,CO_2.) If this compound were digested in water, sulphuret of sodium and carbonate of lime would be reproduced. To prevent this result a large excess of lime is used, which gives rise to the formation of an oxysulphuret of calcium ($3CaS,CaO$), which is insoluble in water, and without action on carbonate of soda. British barilla contains about 36 per cent. of alkali, imperfectly carbonated on account of the high heat used; the remainder being principally oxysulphuret of calcium, caustic lime, and coaly matter. It is next digested in warm water, which takes up the alkali and other soluble matters, and leaves the insoluble impurities, called *soda waste*. The solution is evaporated to dryness, and the mass obtained is calcined with one-fourth of its weight of sawdust, in order to convert the alkali fully into carbonate, by means of the carbonic acid resulting from the

combustion of the sawdust. The product is redissolved in water, and the solution evaporated to dryness. The alkali, in this stage of its purification, contains about 50 per cent. of carbonate of soda and is called *soda-ash.* It is brought to the state of crystallized carbonate of soda by dissolving it in water, straining the solution, evaporating it to a pellicle, and setting it aside to crystallize. On the subject of the products of the soda manufacture, see the elaborate paper of John Brown, Esq , in the *Lond., Ed., and Dub. Philos. Mag.* for Jan. 1849.

The chemical process here described for obtaining carbonated soda was discovered in 1784 by Le Blanc and Dizé. It is at present pursued on an immense scale in Great Britain, especially at Liverpool and Glasgow; and its product is so cheap that its use has nearly superseded that of barilla and kelp as sources of soda.

Carbonate of soda may also be obtained by the patented process of Mr. Henry Pemberton, of Philadelphia. This consists in converting sulphate of soda into sulphuret of sodium in the usual manner, and decomposing the latter by means of a stream of carbonic acid, derived from the chimneys of furnaces in which coal or wood is used as fuel. By the aid of the elements of water, carbonate of soda is formed, and sulphuretted hydrogen disengaged. A patent for the same process was subsequently obtained, in England, by Mr. W. E. Newton (Nov. 1852). In Mr. Newton's plan, the sulphuretted hydrogen is decomposed, so as to furnish sulphur or sulphurets. (See *Am. Journ. of Pharm.*, xxvi. 46.)

The different kinds of impure carbonate of soda, whether barilla, kelp, or soda-ash, being exceedingly variable in composition, it is important to have a ready method of determining the quantity of real carbonated alkali which they contain. The mode in which this is done, by means of an instrument called an alkalimeter, has been already explained. (See *page* 584.) These various forms of carbonated soda are largely consumed in the manufacture of soap and glass, and in dyeing and bleaching.

The following are descriptions of the different grades of artificial soda, known under the names of British barilla, soda-ash, and crystallized carbonate of soda.

British barilla, so called to distinguish it from Spanish barilla, which has its source in the ashes of maritime plants, is a blackish-brown substance, becoming darker by exposure to the air. When broken it exhibits an imperfect metallic lustre, and a close striated texture. Its taste is caustic and hepatic. By exposure to a moist atmosphere, it becomes covered with a yellow efflorescence, and quickly falls to powder, with disengagement of heat and sulphuretted hydrogen; at the same time increasing in weight by the absorption of carbonic acid and water.

Soda-ash is in white or gray compact masses, and contains about half its weight of foreign salts, consisting principally of chloride of sodium and sulphate of soda.

Crystallized carbonate of soda is a colourless salt, possessing an alkaline and disagreeable taste, and crystallizing usually in large oblique rhombic prisms, which speedily effloresce and fall into powder when exposed to the air. It is soluble in twice its weight of cold water, but insoluble in alcohol, and displays an alkaline reaction with tests. When heated it undergoes the aqueous fusion; and, if the heat be continued, it dries and finally suffers the igneous fusion. The most usual impurities are sulphate of soda and common salt, which may be detected by converting the salt into a nitrate, and testing separate portions of this severally with the chloride of barium and nitrate of silver. Common salt is seldom entirely absent, but good specimens are free from sulphate of soda. When badly prepared, it is liable to contain a portion of sulphuret of sodium, which may be detected by the production of the smell of sulphuretted hydrogen upon dissolving the salt in water. Carbonate of soda is incompatible with acids, acidulous salts, lime-water, muriate of ammonia, and earthy and metallic salts. It consists of one eq. of carbonic acid 22, and one of soda 31·3=53·3. When

fully crystallized it contains ten eqs. of water 90, giving as the number representing the crystallized salt 143·3. It is thus perceived that this salt, when perfectly crystallized, contains nearly two-thirds of its weight of water; but the quantity actually present in it, as found in the shops, is variable, being dependent on the extent to which it may have undergone efflorescence.

Medical Properties and Uses. Carbonate of soda is antacid, antilithic, and resolvent. It is given principally in diseases attended with acidity of the stomach; such as gout, uric acid gravel, and certain forms of dyspepsia. It is more frequently exhibited than carbonate of potassa, as, from its less acrid taste, it is more easily taken. It has also been recommended in hooping-cough, scrofula, and bronchocele. In the latter disease, Dr. Peschier, of Geneva, considers it more efficacious than iodine. It is also employed with advantage, internally and externally, in skin diseases, especially those of a papular and scaly character. A lotion suitable for these cases may be formed by dissolving from two to three drachms of the carbonate in a pint of water. For a bath, from eight to sixteen ounces of the salt may be dissolved in the necessary quantity of water. The ointment should vary in strength from eight to sixty grains to the ounce of lard, according to the character of the affection. Carbonate of soda is given in doses of from ten grains to half a drachm, either in powder, or in solution in some bitter infusion. In consequence of the variable state in which it exists in the shops, as to the amount of water of crystallization which it contains, the dose cannot be indicated with precision. It is on this account that the salt is most conveniently administered in the dried state, which admits of its being given in the pilular form. (See *Sodæ Carbonas Exsiccatus.*) When taken in an overdose it acts as a corrosive and irritant poison. The best antidotes are fixed oils, acetic acid, and lemon juice.

Pharm. Uses. Carbonate of soda is used as a chemical agent by the Edinburgh College in preparing sulphate of quinia, and by the London College in making ammonio-citrate of iron.

Off. Prep. Calcis Carbonas Præcipitatus; Ferri Carbonas Saccharatum; Ferri Subcarbonas; Liquor Sodæ; Liquor Sodæ Chlorinatæ; Magnesiæ Carbonas; Magnesiæ Carbonas Ponderosum; Pilulæ Ferri Carbonatis; Pil. Ferri Compositæ; Sodæ Acetas; Sodæ Bicarbonas; Sodæ Carbonas Exsiccatus; Sodæ Carbonatis Liquor; Sodæ et Potassæ Tartras; Sodæ Phosphas; Zinci Carbonas Præcipitatus. B.

SODÆ SULPHAS. *U. S., Lond., Ed., Dub.*

Sulphate of Soda.

Vitriolated soda, Glauber's salt; Sulfate de soude, *Fr.;* Schwefelsaures Natron, Glaubersalz, *Germ.;* Solfato di soda, *Ital.;* Sulfato de soda, Sal de Glaubero, *Span.*

Sulphate of soda, in small quantities, is extensively diffused in nature, and is obtained artificially in several chemical operations. It exists in solution in many mineral springs, among which may be mentioned those of Cheltenham and Carlsbad; and it is found combined with sulphate of lime, constituting a distinct mineral. Many ponds containing this salt are found in the country between Santa Fe and the head waters of the Arkansas, and on the route to the Rocky Mountains. The water in one of these ponds forms a solution so highly concentrated that, in dry weather, the salt crystallizes on the surface to the depth of several inches, so as to have the appearance of limpid ice. (*Am. Journ. of Pharm.*, xii. 110.) As an artificial product, it is formed in the processes for obtaining muriatic acid and chlorine, and in the preparation of muriate of ammonia from sulphate of ammonia and common salt. It may also be procured from sea-water, in which its ingredients are present.

Of the Pharmacopœias commented on in this work, the Edinburgh is the only one which gives a formula for preparing this salt. It is directed to be obtained from the salt, left after the distillation of muriatic acid, by the following process. Dissolve *two pounds* of the salt, which is a supersulphate of soda, in *three pints* (Imp. meas.) of boiling water. Then saturate the excess of acid with powdered white marble, and, having boiled the liquid and filtered it, wash the insoluble matter with boiling water, and add the washings to the original liquid. Lastly concentrate the solution to a pellicle, and set it aside to crystallize. In this process the excess of acid is removed by converting it into the insoluble sulphate of lime.

Immense quantities of sulphate of soda are made in Great Britain and France by the process of decomposing common salt by sulphuric acid, for the purpose of being manufactured into soda-ash and carbonate of soda; and, so far from the generated muriatic acid being a product of value, its absorption in a convenient way, so as to avoid the nuisance of its escape into the atmosphere in a gaseous state, is an object of importance to the manufacturer. (See *Acidum Muriaticum.*) MM. Thomas, Dellisse, and Boucard have proposed a new process for preparing sulphate of soda, by double decomposition between chloride of sodium and sulphate of iron. It is stated that this process furnishes the salt cheaply; and, at the same time, it avoids the production of muriatic acid vapours.

The residuum of the process for obtaining chlorine, by the action of sulphuric acid and deutoxide of manganese on common salt, is a mixture of sulphate of soda and sulphate of protoxide of manganese. (See *Chlorinii Liquor.*) Large quantities of this residuum are formed in manufacturing chlorinated lime (bleaching salt); and the sulphate of soda in it, roughly purified, supplies a part of the consumption of this salt in making soda-ash and carbonate of soda. (See *Sodæ Carbonas.*)

In the process for obtaining muriate of ammonia from sulphate of ammonia and common salt, water is decomposed, and a double decomposition takes place, resulting in the formation of sulphate of soda and muriate of ammonia. By exposing the mixed salts to heat, the muriate of ammonia sublimes, and the sulphate of soda remains behind. (See *Ammoniæ Murias.*)

In some of our Northern States, particularly Massachusetts, a portion of Glauber's salt is procured from sea-water in the winter season. The circumstances under which it is formed have been explained by Mr. Daniel B. Smith, in a paper published in the fourth volume of the *Journal of the Philadelphia College of Pharmacy.* The constituents of a number of salts exist in sea-water; and the binary order in which these constituents will precipitate during evaporation, depends on the temperature. During the prevalence of rigorous cold, sulphate of soda is the least soluble salt which can be formed out of the acids and bases present, and consequently separates in the form of crystals.

Properties. Sulphate of soda is a colourless salt, possessing a cooling, nauseous, very bitter taste, and crystallizing with great facility in six-sided striated prisms. When recently prepared, it is beautifully transparent; but by exposure to the air it effloresces, and the crystals become covered with an opaque white powder. By long exposure it undergoes complete efflorescence, and falls to powder with loss of more than half its weight. It is soluble in three times its weight of cold water, and in its own weight of boiling water, but is insoluble in alcohol. Subjected to heat, it dissolves in its water of crystallization, then dries, and afterwards, by the application of a red heat, melts, with the loss of 55½ per cent. of its weight. Occasionally it contains an excess of acid or alkali, which may be discovered by litmus or turmeric paper. The presence of common salt may be detected by sulphate of silver; that of iron by ferrocyanuret of potassium or tincture of galls. This salt is not subject to adulteration. It is incompatible with carbonate of potassa, chloride of calcium, the salts of baryta, acetate and

subacetate of lead, and with nitrate of silver if the solutions are strong. It consists of one eq. of sulphuric acid 40, one of soda 31·3, and ten of water 90=161·3.

Medical Properties and Uses. Sulphate of soda, in doses of from half an ounce to an ounce, is an efficient cathartic; in smaller doses, largely diluted, an aperient and diuretic. When in an effloresced state, the dose must be reduced one-half, on account of its having lost about one-half of its weight in water. It is much less used than formerly, having been almost entirely superseded by sulphate of magnesia, which is less disagreeable to the palate. Its nauseous taste, however, may be readily disguised by the admixture of a little lemon-juice or cream of tartar, or the addition of a few drops of sulphuric acid. It is an ingredient in the artificial Cheltenham salt. (See *Appendix.*) The only use of sulphate of soda in the arts is to make carbonate of soda, and as an ingredient in some kinds of glass. It has no officinal preparations. B.

SODII CHLORIDUM. *U. S., Lond., Dub.*

Chloride of Sodium.

Off. Syn. SODÆ MURIAS. *Ed.*

Muriate of soda, Sea salt, Common salt; Chlorure de sodium, Hydro-chlorate de soude, Sel marin, *Fr.;* Chlornatrium, Kochsalz, *Germ.;* Salt, *Dan., Swed.;* Chloruro di sodio, Sal commune, *Ital.;* Sal, *Span.*

This mineral production, so necessary to mankind, is universally distributed over the globe, and is the most abundant of the native soluble salts. Most animals have an instinctive relish for it; and from its frequent presence in the solids and fluids of the animal economy, it may be supposed to perform an important part in nutrition and assimilation.

Natural State. Common salt exists in nature, either in the solid state or in solution. In the solid state, called *rock salt*, *fossil salt*, and *sal gemmæ*, it is often found forming extensive beds, and even entire mountains, from which it is extracted in blocks or masses by mining operations. Its geological position is very constant, occurring almost invariably in secondary formations, associated with clay and gypsum. In solution it occurs in certain springs and lakes, and in the waters of the ocean. The principal salt mines are found in Poland, Hungary, and Russia; in various parts of Germany, particularly the Tyrol; in England in the county of Cheshire; in Spain; in various parts of Asia and Africa; and in Peru, and other countries of South America. In the United States there are no salt mines, but numerous salt springs, which either flow naturally, or are produced artificially by sinking shafts to various depths in places where salt is known to exist. These are found principally in Missouri, Kentucky, Illinois, Ohio, Pennsylvania, Virginia, and New York. In the last-mentioned State the springs are the most productive; the chief ones being situated at Salina, Montezuma, and Galen. In Virginia an important salt region exists, extending fifteen miles on both sides of the great Kenhawa river. Rock salt is always transparent or translucent; but it often exhibits various colours, such as red, yellow, brown, violet, blue, &c., which are supposed to be derived from iron and manganese.

Extraction. Mines of salt are worked in two ways. When the salt is pure it is merely dug out in blocks and thrown into commerce. When impure it is dissolved in water, and extracted afterwards from the solution by evaporation. When the salt is naturally in solution, the mode of extraction depends upon the strength of the brine, and the temperature of the place where it is found. When the water contains from fourteen to fifteen per cent. of salt, it is extracted by evaporation in large iron boilers. If, however, it contains only two, three, four, or five per cent., the salt is obtained in a different manner. If the climate be

warm it is procured by spontaneous evaporation, effected by the heat of the sun; if temperate, by a peculiar mode of evaporation to be mentioned presently, and the subsequent application of artificial heat.

Sea-water is a weak saline solution, containing 2·7 per cent. of common salt, which is extracted by the agency of solar heat in warm countries. Salt thus obtained is called *bay salt.* The extraction is conducted in Europe principally on the shores of the Mediterranean, the waters of which are salter than those of the open ocean. The mode in which it is performed is by letting the sea-water into shallow dikes, lined with clay, and capable, after being filled, of being shut off from the sea. In this situation the heat of the sun gradually concentrates the water, and the salt is deposited. In temperate climates, weak brines are first concentrated in buildings, called *graduation houses.* These are rough wooden structures open on the sides, ten or eleven yards high, five or six wide, and three or four hundred long, and containing an oblong pile of brushwood somewhat smaller than the building itself. The brine is pumped up into troughs full of holes, placed above the brushwood, upon which it is allowed to fall; and in its descent it becomes minutely divided. This operation, by greatly increasing the surface of the brine, promotes its evaporation; and being repeated several times, the solution is at last brought to the requisite degree of strength to permit of its final concentration in iron boilers by artificial heat. Sometimes, to save fuel, the last concentration is performed by allowing the brine to trickle down a number of vertical ropes, on the surface of which the salt is deposited in the form of a crust.

Properties. Chloride of sodium is white, without odour, and of a peculiar taste called saline. It is usually crystallized in cubes; but by hasty evaporation it often assumes the form of hollow quadrangular pyramids. When pure it undergoes no change in the air; but, when contaminated with chloride of magnesium, as not unfrequently happens, it is deliquescent. Water at 54° F. dissolves 36 per cent. of this salt, and at the boiling temperature, 40 per cent. (*Fehling.*) It is but sparingly soluble in alcohol. One hundred parts of this liquid (sp. gr. 0·815) dissolve, at the temperature of 59°, only 0·174 parts of common salt. (*R. Wagner.*) Exposed to a gradually increasing heat, it first decrepitates from the presence of interstitial moisture, next melts, and finally volatilizes in white fumes without decomposition. It is decomposed by several of the acids, particularly the sulphuric and nitric, which disengage vapours of muriatic acid; by carbonate of potassa with the assistance of heat; and by the nitrates of silver and of the protoxide of mercury.

Several varieties of common salt are distinguished in commerce; as *stoved salt, fishery salt, bay salt,* &c.; but they are characterized by the size and compactness of the grains, rather than by any difference in composition.

Composition. Common salt, in its pure state, consists of one eq. of chlorine 35·42, and one of sodium 23·3=58·72. It contains no water of crystallization. When in solution it is by some supposed to become muriate of soda, in consequence of the decomposition of water, the hydrogen and oxygen of which are alleged to convert the chlorine and sodium into muriatic acid and soda. The common salt of commerce, besides pure chloride of sodium, contains, generally speaking, insoluble matter, and usually more or less of the sulphates of lime and magnesia, and chlorides of calcium and magnesium. When pure it is not precipitated by carbonate of soda, chloride of barium, or ferrocyanuret of potassium. Chloride of calcium is generally present in very small amount; but the chloride of magnesium sometimes amounts to 28 parts in 1000. Sulphate of lime is usually present, constituting variously from 1 to 23½ parts in 1000; and sulphate of magnesia is sometimes present and sometimes absent. To separate the earths, a boiling solution of carbonate of soda must be added, as long as any precipitate is formed. The earths will fall as carbonates, and must be separated

by filtration, and the sulphate of soda and chloride of sodium, resulting from the double decomposition, will remain in solution. The sulphate of soda may then be decomposed by the cautious addition of chloride of barium, which will generate chloride of sodium and insoluble sulphate of baryta.

Medical Properties and Uses. Chloride of sodium, in small doses, acts as a stimulant tonic and anthelmintic; in larger ones as a purgative and emetic. It certainly promotes digestion, and the almost universal animal appetency for it, proves it to be a salutary stimulus in health. When taken in larger quantities than usual with food, it is useful in some forms of dyspepsia. According to the experiments of M. Plouviez, made upon himself, at intervals, during twenty-five months, a saline regimen has the effect of increasing the weight and strength of the body. He began with a teaspoonful daily, which he increased to a tablespoonful, continuing to take this dose for a period of three or four months. The regimen appeared to produce plethora. The blood, analyzed while under the full effects of the salt, was found to contain more of the globules and salts, but less of the albumen and water.

On the sudden occurrence of hæmoptysis, common salt is usefully resorted to as a styptic, in the dose of a teaspoonful, taken dry, and often proves successful in stopping the flow of blood. Externally applied in solution it is stimulant, and may be used either locally or generally. Locally, it is sometimes employed as a fomentation in sprains and bruises; and as a general external application, it forms the salt-water bath, a valuable remedy as a tonic and excitant in depraved conditions of the system, occurring especially in children, and supposed to be dependent on the scrofulous diathesis. A pound of salt dissolved in four gallons of water, forms a solution of about the strength of sea-water, and suitable for a bath. It is frequently used as an ingredient in stimulating enemata. The dose, as a tonic, is from ten grains to a drachm; as a cathartic, though seldom used for that purpose, from two drachms to half an ounce. In doses of from half an ounce to an ounce, dissolved in four or five times its weight of water, it frequently proves a prompt and efficient emetic, invigorating rather than depressing the powers of the system. As a clyster, it may be used in the amount of from one to two tablespoonfuls, dissolved in a pint of water.

The uses of common salt in domestic economy as a condiment and antiseptic are well known. In agriculture it is sometimes employed as a fertilizer, and in the arts to prepare muriate of ammonia, as also to form sulphate of soda, with a view to the conversion of the latter into carbonate of soda.

Chloride of sodium, in concentrated solution, is employed by the Edinburgh College, as a chemical agent, to prepare biniodide of mercury.

Off. Prep. Acidum Muriaticum Purum; Chlorinei Aqua; Hydrargyri Chloridum Corrosivum; Hydrargyri Chloridum Mite; Liquor Sodæ Chlorinatæ; Sodæ Murias Purum. B.

SOLIDAGO. *U. S. Secondary.*

Golden-rod.

The leaves of Solidago odora. *U. S.*

Solidago. *Sex. Syst.* Syngenesia Superflua.—*Nat. Ord.* Compositæ Asteroideæ, *De Candolle;* Asteraceæ, *Lindley.*

Gen. Ch. Calyx imbricated, scales closed. *Radical florets* about five, yellow. *Receptacle* naked, punctate. *Pappus* simple pilose. *Nuttall.*

This is a very abundant genus, including, according to Eaton's enumeration, upwards of sixty species belonging to this country. Of these *S. odora* only is officinal. *S. Virgaurea,* which is common to the United States and Europe, was

formerly directed by the Dublin College, but has been omitted. It is astringent, and has been supposed to possess lithontriptic virtues.

Solidago odora. Willd. *Sp. Plant.* iii. 2061; Bigelow, *Am. Med. Bot.* i. 187. The *sweet-scented golden-rod* has a perennial creeping-root, and a slender, erect, pubescent stem, which rises two or three feet in height. The leaves are sessile, linear-lanceolate, entire, acute, rough at the margin, elsewhere smooth, and covered with pellucid dots. The flowers are of a deep golden-yellow colour, and are arranged in a terminal, compound, panicled raceme, the branches of which spread almost horizontally, are each accompanied by a small leaf, and support the flowers on downy pedicels, which put forth from the upper side of the peduncle, and have small linear bractes at their base. The florets of the ray are ligulate, oblong, and obtuse; those of the disk, funnel-shaped, with acute segments.

The plant grows in woods and fields throughout the United States, and is in flower from August to October. The leaves, which are the officinal portion, have a fragrant odour, and a warm, aromatic, agreeable taste. These properties depend on a volatile oil, which may be separated by distillation with water. It is of a pale greenish-yellow colour, and lighter than water.

Medical Properties and Uses. Golden-rod is aromatic, moderately stimulant and carminative, and, like other substances of the same class, diaphoretic when given in warm infusion. It may be used to relieve pain arising from flatulence, to allay nausea, and to cover the taste or correct the operation of unpleasant or irritating medicines. For these purposes it may be given in infusion. The volatile oil dissolved in alcohol is employed in the Eastern States. According to Pursh, the dried flowers are used as a pleasant and wholesome substitute for common tea. W.

SPIGELIA. *U. S., Ed.*

Pinkroot.

The root of Spigelia Marilandica. *U. S., Ed.*

Spigélie du Maryland, *Fr.;* Spigelie, *Germ.;* Spigelia, *Ital.*

SPIGELIA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Gentianæ, *Juss.;* Spigeliaceæ, *Martius, Lindley.*

Gen. Ch. Calyx five-parted. *Corolla* funnel-shaped, border five-cleft, equal. *Capsule* didymous, two-celled, four-valved, many-seeded. *Nuttall.*

Two species of Spigelia have attracted attention as anthelmintics, *S. Anthelmia* of South America and the West Indies, and *S. Marilandica* of this country. The former is an annual plant, used only in the countries where it grows, the latter is much employed, both in this country and in Europe.

Spigelia Marilandica. Willd. *Sp. Plant.* i. 825; Bigelow, *Am. Med. Bot.* i. 142; Barton, *Med. Bot.* ii. 75. The *Carolina pink* is an herbaceous plant with a perennial root, which sends off numerous fibrous branches. The stems, several of which rise from the same root, are simple, erect, four-sided, nearly smooth, and from twelve to twenty inches high. The leaves are opposite, sessile, ovate-lanceolate, acuminate, entire, and smooth, with the veins and margins slightly pubescent. Each stem terminates in a spike, which leans to one side, and supports from four to twelve flowers with very short peduncles. The calyx is persistent, with five long, subulate, slightly serrate leaves, reflexed in the ripe fruit. The corolla is funnel-shaped, and much longer than the calyx, with the tube inflated in the middle, and the border divided into five acute, spreading segments. It is of a rich carmine colour externally, becoming paler at the base, and orange-yellow within. The edges of the segments are slightly tinged with green. The stamens, though apparently very short, and inserted into the upper part of the

tube between the segments, may be traced down its internal surface to the base. The anthers are oblong, heart-shaped; the germ superior, ovate; the style about the length of the corolla, and terminating in a linear fringed stigma, projecting considerably beyond it. The capsule is double, consisting of two cohering, globular, one-celled portions, and containing many seeds.

The plant is a native of our Southern and South-western States, being seldom if ever found north of the Potomac. It grows in rich soils on the borders of woods, and flowers from May to July. The root is the only part recognised in the Pharmacopœias. The drug was formerly collected in Georgia and the neighbouring States by the Creek and Cherokee Indians, who disposed of it to the white traders. The whole plant was gathered and dried, and came to us in bales or casks. After the emigration of the Indians, the supply of spigelia from this source very much diminished, and has now nearly if not entirely failed. The consequence was for a time a great scarcity and increase in the price of the drug; but a new source of supply was opened from the Western and South-western States, and it is now again plentiful. As we receive spigelia at present, it consists chiefly if not exclusively of the root, without the stem and leaves. We have been informed that most of it comes in casks or bales from St. Louis by the way of New Orleans. That contained in casks is to be preferred, as less liable to be damp and mouldy.

Properties. Pinkroot consists of numerous slender, branching, crooked, wrinkled fibres, from three to six inches long, attached to a knotty head or caudex, which exhibits traces of the stems of former years. It is of a brownish or yellowish-brown colour externally, of a faint, peculiar smell, and a sweetish, slightly bitter, not very disagreeable taste. Its virtues are extracted by boiling water. The root, analyzed by M. Feneulle, yielded a fixed and volatile oil, a small quantity of resin, a bitter substance supposed to be the active principle, a mucilaginous saccharine matter, albumen, gallic acid, the malates of potassa and lime, &c., and woody fibre. The principle upon which the virtues of the root are thought to depend, is brown, of a bitter nauseous taste, like that of the purgative matter of the leguminous plants, and, when taken internally, produces vertigo and a kind of intoxication.

The stalks of the dried plant are oval below the first pair of leaves, and then become obscurely four-sided. The leaves, when good, have a fresh greenish colour, and an odour somewhat like that of tea. In taste they resemble the root, and afforded to M. Feneulle nearly the same principles. The quantity, however, of the bitter substance was less, corresponding with their inferior efficacy. This circumstance should cause their rejection from the shops; as the inequality in power of the two portions of the plant would lead to uncertainty in the result, when they are both employed.

The roots are sometimes mixed with those of other plants, particularly of a small vine which twines round the stem of the Spigelia. These are long, slender, crooked, yellowish, thickly set with short capillary fibres, and much smaller and lighter-coloured than the pinkroot. They should be separated before the latter is used. The activity of spigelia is somewhat diminished by time.

Medical Properties and Uses. Pinkroot is generally considered among the most powerful anthelmintics. In the ordinary dose it usually produces little sensible effect on the system; more largely given it acts as a cathartic, though unequal and uncertain in its operation; in overdoses it excites the circulation, and determines to the brain, giving rise to vertigo, dimness of vision, dilated pupils, spasms of the facial muscles, and sometimes even to general convulsions. Spasmodic movements of the eyelids have been observed among the most common attendants of its narcotic action. The death of two children, who expired in convulsions, was attributed by Dr. Chalmers to the influence of spigelia. The

narcotic effects are said to be less apt to occur when the medicine purges, and to be altogether obviated by combining it with cathartics. The danger from its employment cannot be great; as it is in very general use in the United States, both in regular and domestic practice, and we never hear at present of serious consequences. Its effects upon the nervous system have been erroneously conjectured to depend on other roots sometimes mixed with the genuine. The vermifuge properties of spigelia were first learned from the Cherokee Indians. They were made known to the medical profession by Drs. Lining, Garden, and Chalmers, of South Carolina. The remedy has also been recommended in infantile remittents and other febrile diseases; but is entitled to little confidence in these complaints.

It may be given in substance or infusion. The dose of the powdered root for a child three or four years old, is from ten to twenty grains, for an adult from one to two drachms, to be repeated morning and evening for several days successively, and then followed by a brisk cathartic. The practice of preceding its use by an emetic has been generally abandoned. It is frequently given in combination with calomel. The infusion, however, is a more common form of administration. (See *Infusum Spigeliæ.*) It is usually combined with senna or some other cathartic, to ensure its action on the bowels. A preparation generally kept in the shops and much prescribed by physicians, under the name of *worm tea*, consists of pinkroot, senna, manna, and savine, mixed together, in various proportions, to suit the views of different individuals. Spigelia is also very often given in the form of fluid extract.

Off. Prep. Extractum Spigeliæ et Sennæ Fluidum; Infusum Spigeliæ.

W.

SPIRÆA. *U. S. Secondary.*

Hardhack.

The root of Spiræa tomentosa. *U. S.*

SPIRÆA. *Sex Syst.* Icosandria Pentagynia.—*Nat. Ord.* Rosaceæ.

Gen. Ch. Calyx spreading, five-cleft, inferior. *Petals* five, equal, roundish. *Stamens* numerous, exserted. *Capsules* three to twelve, internally bivalve, each one to three-seeded. *Nuttall.*

Spiræa ulmaria, queen of the meadow, or *meadow-sweet*, which is a European plant, though introduced into this country, has been found by M. Tessier, of Lyons, to possess valuable diuretic properties, united with those of a moderate tonic and astringent. All parts of it are active. M. Tessier employed it in the form of decoction, of which he gave a quart daily. See, for more extended observations in relation to this medicine, Bouchardat's *Annuaire de Thérapeutique* (A.D. 1852, p. 119).

Spiræa tomentosa. Willd. *Sp. Plant.* ii. 1056; Rafinesque, *Med. Flor.* vol. ii. This is an indigenous shrub, two or three feet high, with numerous simple, erect, round, downy, and purplish stems, furnished with alternate leaves closely set upon very short footstalks. The leaves are ovate-lanceolate, unequally serrate, somewhat pointed at both ends, dark-green on their upper surface, whitish and tomentose beneath. The flowers are beautifully red or purple, and disposed in terminal, compound, crowded spikes or racemes.

The hardhack flourishes in low grounds, from New England to Carolina, but is most abundant in the Northern States. It flowers in July and August. All parts of it are medicinal. The root, though designated in the Pharmacopœia, is, according to Dr. A. W Ives, the least valuable portion. The taste of the plant is bitter and powerfully astringent. Among its constituents are tannin, gallic acid, and bitter extractive. Water extracts its sensible properties and medicinal virtues.

Medical Properties and Uses. Spiræa is tonic and astringent, and may be used in diarrhœa, cholera infantum, and other complaints in which astringents are indicated. In consequence of its tonic powers it is peculiarly adapted to cases of debility; and, from the same cause, should not be given during the existence of inflammatory action, or febrile excitement. It is said to have been employed by the aborigines of our country; but was first brought to the notice of the medical profession by Dr. Cogswell, of Hartford, Connecticut. It is said to be less apt to disagree with the stomach than most other astringents.

The form in which it is best administered is that of an extract, prepared by evaporating the decoction of the leaves, stems, or root, or an infusion of the same parts made by percolation. The dose is from five to fifteen grains, repeated several times a day. A decoction, prepared by boiling an ounce of the plant in a pint of water, may be given in the dose of one or two fluidounces. W.

SPIRITUS PYROXILICUS. *Dub.*

Pyroxylic Spirit.

Pyroligneous spirit, Wood spirit, Pyroligneous ether, Wood naphtha, Pyroxylic alcohol, Wood alcohol, Methylic alcohol, Hydrated oxide of methyle, Bihydrate of methylene; Esprit pyroxylique, Esprit de bois, Alcool méthylique, *Fr.*

This substance was discovered in 1812 by P. Taylor, and was afterwards examined by Macaire and Marcet, Liebig, Dumas and Peligot, Kane, and others.

When wood is subjected to destructive distillation, there is formed, besides acetic acid, tar, and other products (see *page* 18), about one per cent. of an inflammable, volatile liquid, which, when separated and purified, constitutes pyroxylic spirit. The crude liquor, derived from the wood, separates on standing into two liquids; the lighter containing the tarry matters, and the heavier consisting of water, acetic acid, pyroxylic spirit, &c. The heavier liquid is saturated with lime, and subjected to distillation, whereby the impure pyroxylic spirit first comes over, mixed, however, with various compounds, among which are aldehyd and pyroacetic spirit (acetone). This, after having been redistilled, and deprived of water by repeated rectifications from lime, forms the *pyroxylic spirit of commerce.* The spirit of commerce is purified by adding to it as much chloride of calcium as it can dissolve, and allowing the mixture to stand for a few days. The pyroxylic spirit unites with the chloride of calcium, and the compound formed is subjected to distillation to separate certain contaminating substances, which distil over. Finally, the pyroxylic spirit is separated from the chloride of calcium by the addition of water and a new distillation, and from water by rectification from dry lime.

Properties. Pure anhydrous pyroxylic spirit is a mobile, colourless liquid, having a hot and pungent taste, and a peculiar aromatic smell, recalling that of acetic ether. It mixes in all proportions with water, alcohol, and ether, without having its transparency disturbed. It burns like alcohol, but with a less luminous flame. Its sp. gr. as a liquid is 0·798; as a vapour, 1·041. (*Regnault.*) It boils at 140°, and during ebullition its vapour causes concussions, which render its distillation difficult, and which may be prevented by placing in the bottom of the vessel a layer of mercury. It forms a set of compounds precisely analogous to those of the alcohol series; and from this circumstance, and from its being supposed to contain a compound radical called *methyle* (C_2H_3), it is called *methylic alcohol.* As a solvent it resembles alcohol, all bodies soluble in that menstruum being likewise soluble in pyroxylic spirit. It consists of two eqs. of carbon 12, four of hydrogen 4, and two of oxygen 16=32; and its empirical formula is $C_2H_4O_2$. Considered as a hydrated oxide of methyle, its formula is $C_2H_3,O+HO$. Viewed as a bihydrate of methylene, it is represented by C_2H_2+2HO. Accord-

ing to Mr. Reuben Phillips, pyroxylic spirit usually contains sulphur, not easily separated from it. (*Chem. Gaz.*, July 1, 1852, p. 252.)

The officinal pyroxylic spirit is directed by the Dublin College to have the sp. gr. 0·846. The density, thus recognised, shows that the College contemplated, not the pure, but the commercial pyroxylic spirit, which has a straw-yellow colour, and a powerful odour of wood-smoke. But the commercial spirit is often too impure for medicinal use. According to Mr. Morson, of London, it may be purified "by largely diluting it with water, when an oily substance separates, after the removal of which the spirit may be recovered by distillation." Pyroxylic spirit has been confounded with pyroacetic spirit. They may be distinguished, according to Mr. Scanlan, by chloride of calcium, which is without action on the latter, but dissolves in the former. In applying the test, a drop or two of a *saturated* solution of chloride of calcium is added to the doubtful liquid in a test tube. This solution is immiscible with pyroacetic spirit, separating after agitation, but dissolves instantly in pyroxylic spirit. The liquid examined must be sufficiently pure not to separate into two layers, nor to become milky on the addition of water. (*Pharm. Journ. and Trans.* April, 1850.)

Medical Properties, &c. Pyroxylic spirit, under the incorrect name of naphtha, was introduced as a therapeutic agent, some years ago, by Dr. John Hastings, who proposed it as a remedy for pulmonary consumption. It exerts no curative power over this disease, but may be usefully employed to palliate the cough and lessen the febrile excitement which attend it. The therapeutic properties of pyroxylic spirit have not as yet been fully investigated; but so far as observation has gone, it may be ranked as a narcotic, sedative, and anti-emetic. As an anti-emetic remedy in chronic vomiting, whether dependent on functional or organic disease, Dr. Christison has found it useful, having frequently seen the vomiting arrested or greatly mitigated by its use. Dr. D. W. Yandell speaks favourably of its efficacy as a remedy in diarrhœa and dysentery. The dose is from ten to forty drops, three times a day, sufficiently diluted with water. At one time it was doubtful whether the substance, used by Dr. Hastings under the name of naphtha, was pyroxylic or pyroacetic spirit; but it is now decided to have been the former, both by the admission of Dr. Hastings, and by a careful examination of the medicinal agent currently employed.

Crude pyroxylic spirit, varying in density from 0·846 to 0·890, is employed by hatters and varnish-makers for dissolving resinous substances, and by chemists for burning in lamps as a substitute for alcohol. B.

SPIRITUS VINI GALLICI. *U. S., Lond.*

Brandy.

Eau de vie, *Fr.;* Brantwein, *Germ.;* Acquavite, *Ital.;* Aqua ardiente, *Span.*

All liquids which have undergone the alcoholic fermentation, yield an ardent spirit by distillation. (See *Alcohol*, page 60.) When the alcoholic liquid is wine, the product of the distillation is brandy. This ardent spirit is subject to variation, according to the character of the wine from which it is distilled. The most esteemed French brandies are those of Cognac and Armagnac.

Brandy has an agreeable, vinous, aromatic odour, and a peculiar, well known taste. Its sp. gr. varies from 0·902 to 0·941, and it contains on an average about 53 per cent. by measure of alcohol of the density 0·825. Besides alcohol, water, and volatile oil, it contains colouring matter, tannin, œnanthic ether described under *wine*, and a little acetic ether. Brandy is distinguished by its colour into the pale and high-coloured. *Pale brandy* has a yellow colour,

derived from the cask in which it is kept. *High-coloured* brandy has its deep-red colour given to it, before importation, by burnt sugar (caramel), which is said to impart a more agreeable flavour. *Factitious brandy* is sometimes made by adding acetic ether to alcohol, deprived of fusel oil, and reduced to the proper proof by water, in the proportion of one or two drachms to the quart. The proper colour is then given to the mixture by burnt sugar. The spurious liquid may be known by its leaving on evaporation a residue, containing sugar and no tannin; the absence of the latter being shown by its not striking a black colour with the salts of sesquioxide of iron.

Medical Properties. Brandy is esteemed cordial and stomachic, and is frequently given, in the form of toddy or milk punch, in the sinking stages of low fevers. The only officinal preparation of it is the *Mistura Spiritûs Vini Gallici* of the London College, which is an imitation of the compound known under the name of *egg-flip*.

Off. Prep. Mistura Spiritûs Vini Gallici. B.

SPONGIA. *U. S., Ed.*

Sponge.

Spongia officinalis. *U. S., Ed.*

Eponge, *Fr.;* Badeschwamm, *Germ.;* Spugna, *Ital.;* Esponja, *Span.;* Isfung, *Arab.*

The sponge is now generally admitted to be an animal. It is characterized as "a flexile, fixed, torpid, polymorphous animal, composed either of reticulate fibres, or masses of small spires interwoven together, and clothed with a gelatinous flesh full of small mouths on its surface, by which it absorbs and ejects water." More than two hundred and fifty species have been described by naturalists, of which several are probably employed, though *Spongia officinalis* is the only one designated in the Pharmacopœias. Sponges inhabit the bottom of the sea, where they are fixed to rocks or other solid bodies; and are most abundant within the tropics. They are collected chiefly in the Mediterranean and Red Seas, and in those of the East and West Indies. In the Grecian Archipelago many persons derive their support altogether from diving for sponges. When collected they are enveloped in a gelatinous coating, which forms part of the animal, and is separated by first rubbing them with fine sand (*Landerer*), and then washing them with water. Large quantities of the coarser kinds are imported from the Bahamas; but the finest and most esteemed are brought from the Mediterranean.

Sponge, as found in commerce, is in yellowish-brown masses of various shape and size, light, porous, elastic, and composed of fine, flexible, tenacious fibres, interwoven in the form of cells and meshes. It usually contains numerous minute fragments of coral or stone, or small shells, from which it must be freed before it can be used for ordinary purposes. Sponge is prepared by macerating it for several days in cold water, beating it in order to break up the concretions which it contains, and dissolving what cannot thus be separated of the calcareous matter by muriatic acid diluted with thirty parts of water. By this process, it is rendered perfectly soft, and fit for surgical use. It may be bleached by steeping it in water impregnated with sulphurous acid, or by exposure in a moist state to the action of chlorine. When intended for surgical purposes, the softest, finest, and most elastic sponges should be selected; for forming *burnt sponge*, the coarser will answer equally well.

According to Mr. Hatchett, the chemical constituents of sponge are gelatin, coagulated albumen, common salt, and carbonate of lime. Magnesia, silica, iron, sulphur, and phosphorus have been detected in it; as also have iodine and bromine,

combined with sodium and potassium. From the experiments of Mr. Croockewit, it would appear that sponge is closely analogous to, if not identical with the fibroïn of Mulder, differing from it only in containing iodine, sulphur, and phosphorus. (*Annal. der Chem. und Pharm.*, xlviii. 43.) *Fibroïn* is an animal principle found by Mulder in the interior of the fibres of silk.

Medical Properties and Uses. Sponge, in its unaltered state, is not employed as a medicine; but, in consequence of its softness, porosity, and property of imbibing liquids, it is very useful in surgical operations. From the same qualities it may be advantageously applied over certain ulcers, the irritating sanies from which it removes by absorption. Compressed upon a bleeding vessel, it is sometimes useful for promoting the coagulation of the blood, especially in hemorrhage from the nostrils. In the shape of *sponge tent* it is also useful for dilating sinuses. This is prepared by dipping sponge into melted wax, compressing it between two flat surfaces till the wax hardens, and then cutting it into pieces of a proper form and size. By the heat of the body the wax becomes soft, and the sponge, expanding by the imbibition of moisture, gradually dilates the wound or sinus in which it may be placed. After having been partially charred by heat, sponge has long been used as a remedy in goitre. (See *Spongia Usta.*) Its efficacy in this complaint, formerly considered doubtful by many physicians, has been generally admitted since the discovery of iodine.

Off. Prep. Spongia Usta. W.

STANNUM. *U. S., Ed., Dub.*

Tin.

Etain, *Fr.;* Zinn, *Germ.;* Stagno, *Ital.;* Estanno, *Span.*

Tin is one of those metals which have been known from the earliest ages. It exists generally as an oxide (*tin stone* and *wood tin*), rarely as a sulphuret (*tin pyrites*), and is by no means generally diffused. It is found in England, Spain, Germany, Bohemia, and Hungary, in Europe; in the island of Banca and the peninsula of Malacca in Asia; and in Chili and Mexico. Tin mines are particularly abundant and rich in the Tenasserim provinces of British India. (*Dr. Royle*) A valuable tin ore has been discovered in the United States, at Jackson, New Hampshire. The Cornwall mines are the most productive, but those of Asia furnish the purest tin. The metal is extracted from the native oxide. When this occurs in its purest state, in detached roundish grains, called *stream tin*, the reduction is effected by heating with charcoal. When the oxide called *mine tin*, is extracted from mines, it requires to be freed, by pounding and washing, from the adhering gangue; after which it is roasted to drive off sulphur, arsenic, and antimony, and finally reduced in furnaces by means of stone coal. The metal, as thus obtained, is not pure. To render it so, it requires to be subjected to a gentle heat, whereby the pure tin enters first into fusion, and is thus separated from the impurities, which consist of tin united with copper, arsenic, iron, and antimony. The pure metal, thus obtained, is called *grain tin;* while the impure residue, after being fused, constitutes *block-tin.*

Properties. Tin is a malleable, rather soft metal, of a silver-white colour. It may be beaten out into thin leaves, called *tin-foil.* It undergoes a superficial tarnish in the air. Its taste is slight, and when rubbed it exhales a peculiar smell. Its ductility and tenacity are small; and, when bent to and fro, it emits a crackling noise, which is characteristic of this metal. Its sp. gr. is 7·29, melting point 442°, equivalent number 58·9, and symbol Sn. It forms three oxides, a protoxide, sesquioxide, and deutoxide. The *protoxide* is of a grayish-black colour, and consists of one eq. of tin 58·9, and one of oxygen 8=66·9. When

perfectly pure it has, according to Dr. Roth, a red colour. The *sesquioxide* is gray, and is composed of two eqs. of tin 117·8, and three of oxygen 24=141·8. The *deutoxide* (*stannic acid*) is of a white colour, and constitutes the native oxide. It consists of one eq. of tin 58·9, and two of oxygen 16=74·9.

The tin of commerce is often impure, being contaminated with other metals introduced by fraud, or present in consequence of the mode of extraction from the ore. A high specific gravity is an indication of impurity. When its colour has a bluish or grayish cast, the presence of copper, lead, iron, or antimony may be suspected. Arsenic renders it whiter, but at the same time harder; and lead, copper, and iron cause it to become brittle. Pure tin is converted by nitric acid into a white powder (*deutoxide*), without being dissolved. Boiled with muriatic acid, it forms a solution which gives a white precipitate with ferrocyanuret of potassium. A blue precipitate with this test indicates iron; a brown one, copper; and a violet-blue one, both iron and copper. If lead be present, a precipitate will be produced by sulphate of magnesia. The Malacca and Banca tin, and the English grain tin are the purest kinds found in commerce. Banca tin, from recent analyses by Mulder, is particularly pure, containing only $\frac{1}{25}$th of one per cent. of foreign metals. Block tin and the metal obtained from Germany are always of inferior quality.

Uses. Tin enters into the composition of bronze, bell-metal, pewter, and plumbers' solder. It is used also in making tin-plate, which is sheet-iron coated with tin, in silvering looking-glasses, and in forming the solution of bichloride of tin, a combination essential to the perfection of the scarlet dye. It is employed in fabricating various vessels and instruments, useful in domestic economy and the arts. Being unaffected by weak acids, it forms a good material for vessels intended for boiling operations in pharmacy. For its medical properties, see *Stanni Pulvis.*

Off. Prep. Stanni Pulvis. B.

STAPHISAGRIA. *Lond., Ed.*

Stavesacre.

Delphinium Staphisagria. The seed. *Lond., Ed.*

Staphisaigre, *Fr.;* Stephanskraut, Läusekraut, *Germ.;* Stafisagria, *Ital.;* Abarraz, *Span.*

DELPHINIUM. See DELPHINIUM.

Delphinium Staphisagria. Willd. *Sp. Plant.* ii. 1231; Woodv. *Med. Bot.* p. 471, t. 168. Stavesacre is a handsome annual or biennial plant, one or two feet high, with a simple, erect, downy stem, and palmate, five or seven-lobed leaves, supported on hairy footstalks. The flowers are bluish or purple, in terminal racemes, with pedicels twice as long as the flower, and bracteoles inserted at the base of the pedicel. The nectary is four-leaved and shorter than the petals, which are five in number, the uppermost projected backward so as to form a spur, which encloses two spurs of the upper leaflets of the nectary. The seeds are contained in straight, oblong capsules. The plant is a native of the South of Europe.

Properties. Stavesacre seeds are about as large as a grain of wheat, irregularly triangular, wrinkled, externally brown, internally whitish and oily. They have a slight but disagreeable odour, and an extremely acrid, bitter, hot, nauseous taste. Their virtues are extracted by water and alcohol. Analyzed by MM. Lassaigne and Feneulle, they yielded a brown and a yellow bitter principle, a volatile oil, a fixed oil, albumen, an azotized substance, a mucilaginous saccharine matter, mineral salts, and a peculiar organic alkali called *delphine* or *delphinia*, which exists in the seeds combined with an excess of malic acid. It is white,

pulverulent, inodorous, of a bitter acrid taste, fusible by heat and becoming hard and brittle upon cooling, slightly soluble in cold water, very soluble in alcohol and ether, and capable of forming salts with the acids. It is obtained by boiling a decoction of the seeds with magnesia, collecting the precipitate, and treating it with alcohol, which dissolves the *delphinia*, and yields it upon evaporation. According to M. Couerbe, it is impure as thus obtained, consisting of three distinct principles—one of a resinous nature separated from its solution in diluted sulphuric acid by the addition of nitric acid, another distinguished by its insolubility in ether, and named by M. Couerbe *staphisain*, and the third soluble both in alcohol and ether, and considered as pure delphinia. (*Journ. de Pharm.*, xix. 519.)

Medical Properties and Uses. The seeds were formerly used as an emetic and cathartic, but have been abandoned in consequence of the violence of their action. Powdered and mixed with lard, they are employed in some cutaneous diseases, and to destroy lice in the hair. An infusion in vinegar has been applied to the same purpose. A preparation made by mixing three parts of the seeds in fine powder with five parts of lard, and maintaining the mixture at the temperature of 212° for twenty-four hours, is recommended by Dr. Bourguignon as very efficacious in the itch. (*Journ. de Pharm.*, 3*e sér.*, xviii. 421.) M. Bazin has obtained good effects from the external and internal use of stavesacre in eczema. He gave the extract in the dose of a grain and a half from four to twelve times a day. (*Ann. de Thérap.*, A. D. 1851, p. 18.) Dr. Turnbull states that he has employed a strong tincture with advantage as an embrocation in rheumatic affections. In some countries the seeds are used to intoxicate fish in the same manner as Cocculus Indicus.

Delphinia is highly poisonous, exerting its effects chiefly on the nervous system. Experiments made by Drs. Falck and Rörig on the lower animals show that, introduced into the rectum, the cellular tissue, or the veins, it produces death by asphyxia, preceded by symptoms of local irritation, convulsive movements, and extreme anæsthesia, without apparent disturbance of the cerebral functions until the moment before death. Introduced into the stomach, it caused salivation, vomiting, and diarrhœa without other signs of absorption. (*Arch. Gén.*, 4*e sér.*, xxx. 482.) Dr. Turnbull, in his work "*On the Medical Properties of the Ranunculaceæ*," states that pure delphinia may be given to the extent of three or four grains a day, in doses of half a grain each, without exciting vomiting, and without producing much intestinal irritation, though it sometimes purges. In most instances it proves diuretic, and gives rise to sensations of heat and tingling in various parts of the body. Externally employed, it acts like veratria, and is applicable to the same complaints; but, according to Dr. Turnbull, produces more redness and burning, and less tingling than that substance. He has employed it in neuralgia, rheumatism, and paralysis. It may be applied by friction, in the form of ointment or alcoholic solution, in proportions varying from ten to thirty grains of the alkaloid to an ounce of the vehicle; and the friction should be continued till a pungent sensation is produced. W.

STATICE. *U. S.*

Marsh Rosemary.

The root of Statice Caroliniana. *U. S.*

Statice. *Sex. Syst.* Pentandria Pentagynia.—*Nat. Ord.* Plumbaginaceæ. *Gen. Ch. Calyx* one-leaved, entire, plaited, scariose. *Petals* five. *Seed* one, superior. *Nuttall.*

Statice Caroliniana. Walter, *Flor. Car.* 118; Bigelow, *Am. Med. Bot.* ii. 51.

This is considered by Nuttall, Torrey, and some other botanists, as a mere variety of the *Statice Limonium* of Europe. Pursh, Bigelow, and others follow Walter in considering it as a distinct species. It is an indigenous maritime plant with a perennial root, sending up annually tufts of leaves, which are obovate or cuneiform, entire, obtuse, mucronate, smooth, and supported on long footstalks. They differ from the leaves of *S. Limonium* in being perfectly flat on the margin, while the latter are undulated. The flower-stem is round, smooth, from a few inches to a foot or more in height, sending off near its summit numerous alternate subdividing branches, which terminate in spikes, and form altogether a loose panicle. The flowers are small, bluish-purple, erect, upon one side only of the common peduncle, with a mucronate scaly bracte at the base of each, a five-angled, five-toothed calyx, and spatulate, obtuse petals.

Marsh rosemary grows in the salt marshes along the seacoast, from New England to Florida, and flowers in August and September. The root, which is the officinal portion, is large, spindle-shaped or branched, fleshy, compact, rough, and of a purplish-brown colour. It is bitter and extremely astringent to the taste, but without odour. Mr. Edward Parrish, of Philadelphia, found it to contain tannic acid, gum, extractive, albumen, volatile oil, resin, caoutchouc, colouring matter, lignin, and various salts, among which were common salt and the sulphates of soda and magnesia. The proportion of tannic acid was 12·4 per cent. (*Am. Journ. of Pharm.*, xiv. 116.)

Medical Properties and Uses. Statice is powerfully astringent, and in some parts of the United States, particularly in New England, is much employed. It may be used for all the purposes for which kino and catechu are given; but its chief popular application is to aphthous and ulcerative affections of the mouth and fauces. Dr. Baylies, of Massachusetts, found it highly useful in cynanche maligna, both as an internal and local remedy. It is employed in the form of infusion or decoction. W.

STILLINGIA. *U. S.*

Queen's-root.

The root of Stillingia sylvatica. *U. S.*

STILLINGIA. *Sex. Syst.* Monœcia Monadelphia.—*Nat. Ord.* Euphorbiaceæ. *Gen. Ch.* MALE. *Involucre* hemispherical, many-flowered, or wanting. *Calyx* tubular, eroded. *Stamens* two and three, exserted. FEMALE. *Calyx* one-flowered, inferior. *Style* trifid. *Capsule* three-grained. *Nuttall.*

From the fruit of *Stillingia sebifera*, the Chinese procure a *vegetable tallow* in large quantities, which is said to be almost pure stearin, and is much used in making candles. It exists between the shell of the seeds, and the outer husk; the kernel, contained within the shell, yielding a liquid oil by expression. (*Pharm. Journ. and Trans.*, xii. 73.)

Stillingia sylvatica. Willd. *Sp. Plant.* iv. 588. This is an indigenous perennial plant, commonly called *Queen's delight*, with herbaceous stems, two or three feet high, and alternate, sessile, oblong or lanceolate-oblong, obtuse, serrulate leaves, tapering at the base, and accompanied with stipules. The male and female flowers are distinct upon the same plant. They are yellow, and arranged in the form of a spike, of which the upper part is occupied by the male, the lower by the female flowers. The male florets are scarcely longer than the bracteal scales.

The plant grows in pine barrens from Virginia to Florida, flowering in May and June. When wounded, it emits a milky juice. The root, which is the part used, is large, thick, and woody. A specimen presented to us by Dr. J. B.

Holmes, of Charleston, S. C., is in long cylindrical pieces, from a third of an inch to more than an inch thick, wrinkled from drying, of a dirty yellowish-brown colour externally, and, when cut across, exhibiting an interior soft yellowish ligneous portion, surrounded by a pinkish-coloured bark. The odour is slight, peculiar, and somewhat oleaginous, but in the recent root is said by Dr. Frost to be strong and acrimonious. The taste is bitterish and pungent, leaving an impression of disagreeable acrimony in the mouth and fauces. It imparts its virtues to water and alcohol. Dr. Frost thinks that the active principle is somewhat volatile, and states that the root loses much of its activity when long kept.

Medical Properties and Uses. In large doses, stillingia is emetic and cathartic, in smaller doses alterative, with some influence over the secretions. It has been long popularly used in South Carolina; but was first introduced to the notice of the profession by Dr. Thomas Young Simons, in a paper published in the *American Medical Recorder* for April, 1828 (vol. xiii. p. 312), as a valuable alterative remedy in syphilitic affections, and others ordinarily requiring the use of mercury. Dr. Simons's statements have been confirmed and extended by Dr. A. Lopez, of Mobile, (*N. Orleans Med. and Surg. Journ.*, iii. 40), and Dr. H. R. Frost, of Charleston, S. C. (*South. Journ. of Med. and Pharm.* for November, 1846). From the reports in its favour there seems no reason to doubt the efficacy of this medicine in secondary syphilis, scrofula, cutaneous diseases, chronic hepatic affections, and other complaints ordinarily benefitted by alterative medicines. It may be given in substance, decoction, or tincture; but the two latter forms are preferable. The dose of the powder is stated at from fifteen to thirty grains. The decoction, made by slowly boiling an ounce of the bruised root in a pint and a quarter of water to a pint, may be given in the quantity of one or two fluidounces three or four times a day, increased as the stomach will bear it. The dose of a tincture made with two ounces of the root and a pint of diluted alcohol is about a fluidrachm. Stillingia is sometimes advantageously combined with sarsaparilla and other alteratives. W.

STRAMONII FOLIA. *U. S.*

Stramonium Leaves.

The leaves of Datura Stramonium. *U. S.*

Off. Syn. STRAMONII FOLIUM. Datura Stramonium. The leaf. *Lond.* STRAMONIUM. Herb of Datura Stramonium. *Thornapple. Ed.*

STRAMONII RADIX. *U. S.*

Stramonium Root.

The root of Datura Stramonium. *U. S.*

STRAMONII SEMEN. *U. S., Lond.*

Stramonium Seed.

The seeds of Datura Stramonium. *U. S. Lond.*

Off. Syn. STRAMONIUM. Datura Stramonium. The seeds. *Dub.*

Thornapple; Stramoine, Pomme épineuse, *Fr.;* Stechapfel, *Germ.;* Stramonio, *Ital.;* Estramonio, *Span.*

DATURA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Solanaceæ.

Gen. Ch. Corolla funnel-shaped, plaited. *Calyx* tubular, angular, deciduous. *Capsule* four-valved. *Willd.*

Datura Stramonium. Willd. *Sp. Plant.* i. 1008; Bigelow, *Am. Med. Bot.* i. 17; Woodv. *Med. Bot.* p. 197, t. 74. The thornapple is an annual plant, of rank and vigorous growth, usually about three feet high, but in a rich soil sometimes rising six feet or more. The root is large, whitish, and furnished with numerous fibres. The stem is erect, round, smooth, somewhat shining, simple below, dichotomous above, with numerous spreading branches. The leaves, which stand on short round footstalks in the forks of the stem, are five or six inches long, of an ovate-triangular form, irregularly sinuated and toothed at the edges, unequal at the base, of a dark-green colour on the upper surface, and pale beneath. The flowers are large, axillary, solitary, and peduncled; having a tubular, pentangular, five-toothed calyx, and a funnel-shaped corolla with a long tube, and a waved plaited border, terminating in five acuminate teeth. The upper portion of the calyx falls with the deciduous parts of the flower, leaving its base, which becomes reflexed and remains attached to the fruit. This is a large, fleshy, roundish-ovate, four-valved, four-celled capsule, thickly covered with sharp spines, and containing numerous seeds, attached to a longitudinal receptacle in the centre of each cell. It opens at the summit.

There are two varieties of this species of Datura, one with green stems and white flowers; the other with a dark-reddish stem minutely dotted with green, and purplish flowers striped with deep purple on the inside. The latter, however, is considered by some botanists as a distinct species, being the *D. Tatula* of Linnæus. The properties of both are the same.

It is doubtful to what country this plant originally belonged. Many European botanists refer it to North America, while we in return trace it to the old continent. Nuttall considers it as having originated in South America or Asia; and it is probable that its native country is to be found in some portion of the East. Its seeds, being retentive of life, are taken in the earth put on shipboard for ballast from one country to another, not unfrequently springing up upon the passage, and thus propagating the plant in all regions which have any commercial connexion. In the United States it is found everywhere in the vicinity of cultivation, frequenting dung-heaps, the road-sides and commons, and other places where a rank soil is created by the deposited refuse of towns and villages. Its flowers appear from May to July or August, according to the latitude. Where the plant grows abundantly, its vicinity may be detected by the rank odour which it diffuses to some distance around. All parts of it are medicinal. The herbaceous portion is directed by the Edinburgh College; the seeds by that of Dublin; the leaves and seeds by the London College; and the leaves, root, and seeds by the U. S. Pharmacopœia. The leaves may be gathered at any time from the appearance of the flowers till the autumnal frost. In this country the plant is generally known by the name of *Jamestown weed*, derived probably from its having been first observed in the neighbourhood of that old settlement in Virginia. In great Britain it is called *thornapple.*

1. The *fresh leaves* when bruised emit a fetid narcotic odour, which they lose upon drying. Their taste is bitter and nauseous. These properties, together with their medical virtues, are imparted to water and alcohol. Water distilled from them, though possessed of their odour in a slight degree, is destitute of their active properties. They contain, according to Promnitz, 0·58 per cent. of gum, 0·6 of extractive, 0·64 of green starch, 0·15 of albumen, 0·12 of resin, 0·23 of saline matters, 5·15 of lignin, and 91·25 of water. The leaves, if carefully dried, retain their bitter taste.

2. The *seeds* are small, kidney-shaped, flattened on the sides, of a dark-brown almost black colour, inodorous, and of the bitter nauseous taste of the leaves, with some degree of acrimony. They were analyzed by Brandes, who found, besides a peculiar alkaline principle called *daturia*, a glutinous matter, albumen,

gum, a butyraceous substance, green wax, resin insoluble in ether, fixed oil, bassorin, sugar, gummy extractive, orange-coloured extractive, and various saline and earthy substances. Chemists, however, have failed to obtain the daturia of Brandes by his own process; and Berzelius states that it has been admitted, even by that chemist himself, to be nothing more than phosphate of magnesia. (*Traité de Chimie*, vi. 319.) But Geiger and Hesse succeeded in isolating an alkaline principle, to which the same name has been given, and which Trommsdorff has repeatedly procured by their process.

As described by Geiger and Hesse, *daturia* crystallizes in colourless, inodorous, shining prisms, which, when first applied to the tongue, are bitterish, but ultimately have a flavour like that of tobacco. It is dissolved by 280 parts of cold, and 72 of boiling water, is very soluble in alcohol, and less so in ether. It has been shown to have a poisonous action upon animals, and strongly dilates the pupil. Crystals of it are asserted to have been obtained from the urine of a person fatally poisoned by stramonium. (See *Am. Journ. of Med. Sci.*, xvi. 485.) It may be procured from the seeds in the same manner as *hyoscyamia* from those of Hyoscyamus niger. (See *Hyoscyamus.*) The product is exceedingly small. In the most favourable case, Trommsdorff got only $\frac{1}{50}$ of one per cent. (*Annal. der Pharm.*, xxxii. 275.) Mr. Morries obtained a poisonous empyreumatic oil by the destructive distillation of stramonium. According to Dr. A. Von Planta, daturia is identical with atropia, its formula being $NC_{34}H_{23}O_6$. (See *Am. Journ. of Pharm.*, xxiii. 38.)

Medical Properties and Uses. Stramonium is a powerful narcotic. When taken in quantities sufficient to affect the system moderately, it usually produces more or less cerebral disturbance, indicated by vertigo, headache, dimness or perversion of vision, and confusion of thought, sometimes amounting to slight delirium or a species of intoxication. At the same time peculiar deranged sensations are experienced about the fauces, œsophagus, and trachea, increased occasionally to a feeling of suffocation, and often attended with nausea. A disposition to sleep is sometimes but not uniformly produced. The pulse is not materially affected. The bowels are rather relaxed than confined, and the secretions from the skin and kidneys not unfrequently augmented. These effects pass off in five or six hours, or in a shorter period, and no inconvenience is subsequently experienced. In poisonous doses, this narcotic produces cardialgia, excessive thirst, nausea and vomiting, a sense of strangulation, anxiety and faintness, partial or complete blindness with dilatation of the pupil, sometimes deafness, flushing and swelling of the face, headache, vertigo, delirium sometimes of a furious, sometimes of a whimsical character, tremors of the limbs, palsy, and ultimately stupor and convulsions. From all these symptoms the patient may recover; but they have frequently terminated in death. To evacuate the stomach by emetics or the stomach pump is the most effectual remedy.

Though long known as a poisonous and intoxicating herb, stramonium was first introduced into regular practice by Baron Störck, of Vienna, who found some advantage from its use in mania and epilepsy. Subsequent observation has confirmed his estimate of the remedy; and numerous cases are on record in which benefit has accrued from it in these complaints. Other diseases in which it has been found beneficial are neuralgic and rheumatic affections, dysmenorrhœa, syphilitic pains, cancerous sores, and spasmodic asthma. In the last complaint it has acquired considerable reputation. It is employed only during the paroxysm, which it very often greatly alleviates or altogether subverts. The practice was introduced into Great Britain from the East Indies, where the natives are in the habit of smoking the dried root and lower part of the stem of *Datura ferox*, in the paroxysms of this distressing complaint. The same parts of *D. Stramonium* were substituted, and found equally effectual. To prepare the roots for use, they

are quickly dried, cut into pieces, and beat so as to loosen the texture. The dried leaves answer the same purpose. They are smoked by means of a common tobacco-pipe. These and other narcotic leaves have also been used in the shape of cigars. The smoke produces a sense of heat in the lungs, followed by copious expectoration, and attended frequently with temporary vertigo or drowsiness, and sometimes with nausea. The remedy should never be used in plethoric cases, unless preceded by ample depletion, and in no case where there is determination to the head. Dangerous and even fatal consequences have resulted from its incautious or improper use; and General Gent, who was instrumental in introducing the practice into England, is said at last to have fallen a victim to it. Stramonium has sometimes been given by the stomach in the same complaint. It is used by Dr. H. D. W. Pawling in the treatment of delirium tremens, and, as represented in the inaugural dissertation of his pupil Dr. G. W. Holstein, with great success. Dr. Pawling employs a decoction of the leaves.

Externally the medicine is used advantageously as an ointment or cataplasm in irritable ulcers, inflamed tumours, swelling of the mammæ, and painful hemorrhoidal affections. Dr. J. Y. Dortch, of North Carolina, has found it very useful in tinea capitis. (*Thesis*, Feb. 1846.) By American surgeons it is very frequently applied to the eye, in order to produce dilatation of the pupil, previously to the operation for cataract; and is found equally efficacious with belladonna. For this purpose the extract, mixed with lard, is generally rubbed over the eyelid, or a solution of it dropped into the eye.

Of the parts of the plant employed, the seeds are the most powerful. They may be given in the dose of a grain twice a day; and an extract made by evaporating the decoction, in one quarter or half the quantity. The dose of the powdered leaves is two or three grains. The inspissated juice of the fresh leaves, which is the officinal extract, is more commonly prescribed than any other preparation, and may be administered in the quantity of one grain. (See *Extractum Stramonii.*) There is also an officinal tincture, to which the reader is referred. The dose should be gradually increased till the narcotic operation becomes evident, or relief from the symptoms of the disease is obtained. Fifteen or twenty grains of the powdered leaves, and a proportionate amount of the other preparations, have often been given daily without unpleasant effects.

Off. Prep. of the Leaves. Extractum Stramonii Foliorum.

Off. Prep. of the Seeds. Extractum Stramonii Seminis; Tinctura Stramonii.

W.

STYRAX. *U. S., Lond., Ed.*

Storax.

The concrete juice of Styrax officinale. *U. S.* Balsamic exudation. *Ed.* An uncertain plant. The liquid balsam. *Lond.*

Storax, *Fr., Germ.;* Storace, *Ital.;* Estoraque, *Span.*

STYRAX. See BENZOINUM.

Styrax officinale. Willd. *Sp. Plant.* ii. 623; Woodv. *Med. Bot.* p. 291, t. 101. This species of Styrax is a tree which rises from fifteen to twenty-five feet in height, sends off many branches, and is covered with a rough gray bark. The leaves are alternate, petiolate, entire, oval, pointed, bright-green on their upper surface, white with a cotton-like down upon the under, about two inches in length, and an inch and a half in breadth. The flowers are united in clusters of three or four at the extremities of the branches. They are white, and bear considerable resemblance to those of the orange.

This tree is a native of Syria and other parts of the Levant, and has been naturalized in Italy, Spain, and the South of France, where, however, it does

not yield balsam. This circumstance has induced some naturalists to doubt whether *Styrax officinale* is the real source of storax; and, as the *Liquidambar styraciflua* of this country affords a balsam closely analogous to that under consideration, Bernard de Jussieu conjectured that the latter might be derived from another species of the same genus, the *L. orientale* of Lamarck, which is more abundant in Syria than the *Styrax*.

Storax is obtained in Asiatic Turkey by making incisions into the trunk of the tree. Several kinds are mentioned in the books. The purest is the *storax in grains*, which is in whitish, yellowish-white, or reddish-yellow tears, about the size of a pea, opaque, soft, adhesive, and capable of uniting so as to form a mass. Another variety, formerly called *styrax calamita*, from the circumstance, as is supposed, that it was brought wrapped in the leaves of a kind of reed, consists of dry and brittle masses, formed of yellowish agglutinated tears, in the interstices of which is a brown or reddish matter. The French writers call it *storax amygdaloïde*. Both this and the preceding variety have a very pleasant odour like that of vanilla. Neither of them, however, is brought to our markets.

A third variety, which is sometimes sold as the *styrax calamita*, is in brown or reddish-brown masses of various shapes, light, friable, yet possessing a certain degree of tenacity, and softening under the teeth. Upon exposure, it becomes covered upon the surface with a white efflorescence of benzoic acid. It evidently consists of sawdust, united either with a portion of the balsam, or with other analogous substances. As found in our shops, it is usually in the state of a coarse, soft, dark-coloured powder, mingled with occasional light friable lumps of various magnitude, and containing very little of the balsam. When good, it should yield, upon pressure between hot plates, a brown resinous fluid, having the odour of storax.

Another variety, found in our market, is a semi-fluid adhesive matter, called *liquid storax*, which is brown or almost black upon the surface exposed to the air, but of a slightly greenish-gray colour within, and of an odour somewhat like that of the Peruvian balsam, though less agreeable. It is kept in jars, and is the most employed. What is the source of liquid storax is not certainly known. Some suppose it to be derived by decoction from the young branches of *Liquidambar styraciflua*; but some of the genuine juice of this plant, brought from New Orleans, which we have had an opportunity of inspecting, has an odour entirely distinct from that of the substance under consideration. According to Landerer, who resides in Greece, liquid storax is obtained, in the islands of Cos and Rhodes, from the bark and young twigs of Styrax officinale, by subjecting them to pressure. The plant, according to the same authority, grows also on the mainland of Greece, but in that situation does not yield balsam.

General Properties. Storax has a fragrant odour and aromatic taste. It melts with a moderate heat, and when the temperature is raised takes fire and burns with a white flame, leaving a light spongy carbonaceous residue. It imparts its odour to water, which it renders yellow and milky. Its active constituents are dissolved by alcohol and ether. Newmann obtained from 480 grains of storax 120 of watery extract; and from an equal quantity, 360 grains of alcoholic extract. Containing volatile oil and resin, and yielding benzoic or cinnamic acid by distillation, it is entitled to be ranked as a balsam. Besides oil, resin, and benzoic acid, Reinsch found in styrax calamita, gum, extractive, lignin, a matter extracted by potassa, water, and traces of ammonia. Simon found, in liquid storax, cinnamic acid, and a resinous substance which he considered identical with the *styracine* of Bonastre. According to Toel, styracine is a compound of cinnamic acid with a peculiar substance which he calls *styrone*, and is in composition perfectly analogous to the natural fats. (*Chem. Gaz.*, July 2, 1849.)

Medical Properties and Uses. This balsam is a stimulating expectorant, and was formerly recommended in phthisis, chronic catarrh, asthma, and amenor-

rhœa; but it is very seldom used at present, except as a constituent of the compound tincture of benzoin. Liquid storax has been recommended in gonorrhœa and leucorrhœa as equally effectual with copaiba, and less disagreeable. From ten to twenty grains may be given twice a day, and the dose gradually increased.

Off. Prep. Styrax Purificata. W.

SUCCINUM. *U. S., Dub.*

Amber.

Succin, Ambre jaune, Karabé, *Fr.;* Bernstein, *Germ.;* Ambra gialla, Succino, *Ital.;* Succino, *Span.*

Amber is a kind of fossil resin, derived, probably, from extinct coniferæ, occurring generally in small detached masses, in alluvial deposits, in different parts of the world. It is found chiefly in Prussia, either on the sea-shore, where it is thrown up by the Baltic, or underneath the surface, in the alluvial formations along the coast. It occurs also in considerable quantities near Catania, in Sicily. It is most frequently associated with lignite, and sometimes encloses insects and parts of vegetables. In the United States, it was found in Maryland, at Cape Sable, near Magothy river, by Dr. Troost. In this locality it is associated with iron pyrites and lignite. It has also been discovered in New Jersey. The amber consumed in this country, however, is brought from the ports of the Baltic.

Properties. Amber is a brittle solid, generally in small irregular masses, permanent in the air, having a homogeneous texture and vitreous fracture, and susceptible of a fine polish. It becomes negatively electric by friction. Its colour is generally yellow, either light or deep; but is occasionally reddish-brown or even deep-brown. It has no taste, and is inodorous unless heated, when it exhales a peculiar, aromatic, not unpleasant smell. It is usually translucent, though occasionally transparent or opaque. Its sp. gr. is about 1·07. Water and alcohol scarcely act on it. When heated in the open air, it softens, melts at 548°, swells, and at last inflames, leaving, after combustion, a small portion of ashes. Subjected to distillation in a retort furnished with a tubulated receiver, it yields, first, a yellow acid liquor; and afterwards a thin yellowish oil, with a yellow waxy substance, which is deposited in the neck of the retort and the upper part of the receiver. This waxy substance, exhausted by cold ether of the part soluble in that menstruum, is reduced to a yellow micaceous substance, identical with the *chrysene* of Laurent. A white crystalline substance, identical with the *idrialine* of Dumas, may be separated from the micaceous substance by boiling alcohol. Both chrysene and idrialine are carbohydrogens. (Pelletier and Walter, *Journ. de Pharm.*, v. 60.) As the distillation proceeds, a considerable quantity of combustible gas is given off, which must be allowed to escape from the tubulure of the receiver. By continuing the heat, the oil gradually deepens in colour, until, towards the end of the distillation, it becomes black and of the consistence of pitch. The oil obtained is called *oil of amber*, and the acid liquor is a solution of impure *succinic acid*. When amber is distilled repeatedly from nitric acid, it yields an acid liquor, from which, after it has been neutralized with caustic potassa, ether separates pure camphor. (Doepping, *Journ. de Pharm.*, vi. 168.) Camphor is also obtained by distilling to dryness powdered amber with an extremely concentrated solution of caustic potassa. (G. Reich, *Ibid.*, xiii. 33, Jan. 1848.)

Composition. According to Berzelius, amber consists of 1. a volatile oil of an agreeable odour in small quantity; 2. a yellow resin, intimately united with a volatile oil, very soluble in alcohol, ether, and the alkalies, easily fusible, and resembling ordinary resins; 3. another resin, also combined with volatile oil, soluble in ether and the alkalies, sparingly soluble in cold, but more soluble in

boiling alcohol; 4. succinic acid; 5. a bituminous principle insoluble in alcohol, ether, and the alkalies, having some analogy to the lac resin of John, and constituting more than four-fifths of the amber. It also contains a strongly odorous, bright-yellow substance, which hardens by time, but preserves in part its odour. The ultimate constituents of amber are carbon 80·59, hydrogen 7·31, oxygen 6·73, ashes (silica, lime, and alumina) 3·27=97·90. (*Drassier*, cited in *Pereira's Elem. of Mat. Med.*)

Pharmaceutical Uses, &c. Amber was held in high estimation by the ancients as a medicine; but at present is employed only in pharmacy and the arts. In pharmacy it is used to prepare oil of amber and succinic acid. (See *Oleum Succini* and *Succinic Acid* in the Appendix.) In the arts it is made into ornaments, and employed in preparing varnishes. When put to the latter use it requires to be first subjected to roasting, whereby it is rendered soluble in a mixture of linseed oil and oil of turpentine. This solution forms *amber varnish.*

Off. Prep. Oleum Succini. B.

SULPHUR. *U. S., Lond., Ed.*

Sulphur.

Sublimed sulphur. *U.S., Lond.* Sulphur entirely sublimed by heat, and free from acidity. *Ed.*

Off. Syn. SULPHUR SUBLIMATUM. *Dub.*

SULPHUR LOTUM. *U. S.*

Washed Sulphur.

Sublimed sulphur, thoroughly washed with water. *U. S.*

Off. Syn. SULPHUR SUBLIMATUM. *Ed.*

Brimstone; Soufre, *Fr.;* Schwefel, *Germ.;* Zolfo, *Ital.;* Azufre, *Span.*

The officinal forms of sulphur are the *sublimed*, the *washed*, and the *precipitated.* The sublimed sulphur is designated in the United States and London Pharmacopœias by the single word *Sulphur;* the washed sulphur in the United States Pharmacopœia by the name *Sulphur Lotum.* The Dublin College has dismissed washed sulphur as an officinal preparation; and the Edinburgh College only recognises sulphur which is free from acidity; calling it "Sulphur Sublimatum" under the Preparations, and "Sulphur" in the Materia Medica list. Sublimed sulphur and washed sulphur will be noticed in this place; the precipitated sulphur in Part II, under the Preparations.

Natural States. Sulphur is very generally disseminated throughout the mineral kingdom, and is almost always present, in minute quantity, in animal and vegetable matter. Among vegetables, it is particularly abundant in the cruciform plants, as for example in mustard. It occurs in the earth, either native or in combination. When native it is found in masses, translucent or opaque, or in the powdery form mixed with various earthy impurities. In combination it is usually united with certain metals, as iron, lead, mercury, antimony, copper and zinc, forming compounds called sulphurets. *Native sulphur* is most abundant in volcanic countries, and is hence called *volcanic sulphur.* The most celebrated mines of native sulphur are found at Solfatara in the kingdom of Naples, in Sicily, and in the Roman States. It occurs, also, in different localities in the United States.

Extraction, &c. Sulphur is obtained either from sulphur earths, or from the native sulphurets of iron and copper, called iron and copper pyrites. The sulphur earths are placed in earthen pots, set in oblong furnaces of brickwork.

From the upper and lateral part of each pot proceeds a tube, which communicates with the upper part of another pot, situated outside the furnace, and perforated near its bottom to allow the melted sulphur to flow out into a vessel containing water, placed beneath. Fire being applied, the sulphur rises in vapour, leaving the impurities behind, and, being condensed again, flows from the perforated pot into the vessel containing the water. Sulphur, as thus obtained, is called *crude sulphur*, and contains about one-twelfth of its weight of earthy matter. For purification, it is generally melted in a cast iron vessel. When the fusion is complete, the impurities subside, and the purer sulphur is dipped out and poured into cylindrical wooden moulds, which give it the form of solid cylinders, about an inch in diameter, called in commerce *roll sulphur* or *cane brimstone*. The dregs of this process, ground to powder, constitute a very impure kind of sulphur, of a gray colour, known in the shops by the name of *sulphur vivum* or *horse brimstone*.

The above process purifies the sulphur but imperfectly. At the same time it causes a considerable loss; as the dregs just mentioned contain a large proportion of sulphur. A more eligible mode of purification consists in distilling the crude sulphur from a large cast iron still, set in brick-work over a furnace, and furnished with an iron head. The head has two lateral communications, one with a chamber of brick-work, the other with an iron receiver, immersed in water, which is constantly renewed to cool it sufficiently to cause the sulphur to condense in the liquid form. When the tube between the still and receiver is shut, and that communicating with the chamber is open, the sulphur condenses on its walls in the form of an impalpable powder, and constitutes *sublimed sulphur* or *flowers of sulphur*. If, on the other hand, the communication with the chamber be closed and that with the receiver opened, the sulphur condenses in the latter in the fused state, and, when cast in cylindrical moulds, forms the *roll sulphur* of commerce.

The extraction of sulphur from the bisulphuret of iron (iron pyrites) is performed by distilling it in stone-ware cylinders. Half the sulphur contained in the bisulphuret is volatilized by the heat, and conducted, by means of an adopter, into vessels containing water, where it condenses. The residue of the mineral is employed for making sulphate of iron, or green vitriol, by exposure to air and moisture. In the island of Anglesea, large quantities of sulphur are obtained from copper pyrites in the process for extracting that metal. The furnaces in which the ore is roasted are connected by horizontal flues with chambers, in which the volatilized sulphur is condensed. Each chamber is furnished with a door, through which the sulphur is withdrawn once in six weeks.

According to Berzelius, a very economical method of extracting sulphur from iron pyrites is practised in Sweden, which saves the expenditure of fuel. The pyrites is introduced into furnaces with long horizontal chimneys, of which the part next to the furnace is of brick-work, while the rest is formed of wood. The pyrites is kindled below, and continues to burn of itself; and the heat generated causes the stratum immediately above the part kindled to give off half its sulphur, which becomes condensed in flowers in the wooden chimney. As the fire advances, the iron and the other half of the sulphur enter into combustion, and, by the increase of heat thus generated, cause the volatilization of a fresh portion of sulphur. In this manner the process continues until the whole of the pyrites is consumed. The sulphur thus obtained is pulverulent and very impure, and requires to be purified by distillation from iron vessels.

Crude sulphur is employed by the manufacturers of sulphuric acid; and, as it is very variable in quality, it becomes important to ascertain its exact value. This may be done by drying a given weight of it, and submitting it to combustion. The weight of the incombustible residue, added to that lost by desiccation, gives the amount of impurity.

Crude sulphur comes to this country principally from Trieste, Messina in Sicily, and the ports of Italy, being imported for the use of the sulphuric acid manufacturers. Roll sulphur and the flowers are usually brought from Marseilles. Good Sicilian sulphur does not contain more than three per cent. of impurity, consisting chiefly of earths.

Properties. Sulphur is an elementary non-metallic brittle solid, of a pale yellow colour, permanent in the air, and exhibiting a crystalline texture and shining fracture. It has a slight taste, and a perceptible smell when rubbed. When pure, its sp. gr. is about 2; but it varies a little in density, according to its molecular state. (*Charles Brame.*) Occasionally, from impurity, its sp. gr. is as high as 2·35. Its equivalent number is 16, and symbol S. It is a bad conductor of heat, and becomes negatively electric by friction. It is insoluble in water, but soluble in alkaline solutions, petroleum, the fixed and volatile oils, and, provided it be in a finely divided state, in alcohol and ether. Upon being heated, it begins to volatilize at about 180°, when its peculiar odour is perceived; it melts at 225°, and, at 600°, in close vessels, boils and rises in the form of a yellow vapour, which may be condensed again, either in the liquid or pulverulent form, according as the temperature of the recipient is above or below the melting point of the sulphur. When heated to 340°, it becomes brownish and viscid, and, by continuing the heat, is rendered more and more so until the temperature reaches to between 450° and 500°. If, in this state, it be suddenly cooled by throwing it into water, it is converted into an allotropic modification of sulphur, called *brown viscid sulphur*, which is used for taking impressions of coins, seals, &c. The same allotropic modification is obtained by precipitation, by acting on sulphuret of copper by aqua regia, which dissolves the copper, and sets the brown sulphur free. In open vessels, sulphur takes fire at about the temperature of 300°, and burns with a blue flame, combining with the oxygen of the air, and giving rise to a peculiar gaseous acid, called sulphurous acid. The combinations of sulphur are numerous, and among the most powerful agents of chemistry. It forms with oxygen four principal acids, the *hyposulphurous*, *sulphurous*, *hyposulphuric*, and *sulphuric*, with hydrogen, *sulphohydric acid* (*hydrosulphuric acid* or *sulphuretted hydrogen*), and with the metals, various *sulphurets*. Some of the sulphurets are analogous to acids, others to bases; and these different sulphurets, by combining with each other, form compounds analogous to salts, and called by Berzelius *sulpho-salts*.

Sulphur, when obtained by roasting the native sulphurets, sometimes contains arsenic, and is thereby rendered poisonous. Sicilian sulphur, being volcanic, is not subject to this impurity. The common English roll sulphur is sometimes made from iron pyrites, and is then apt to contain orpiment (*tersulphuret of arsenic*). This impurity may be detected by heating the suspected sulphur with nitric acid. The arsenic, if present, will be converted into arsenic acid; and the nitric solution, diluted with water, neutralized with carbonate of soda, and acidulated with muriatic acid, will give a yellow precipitate of quintosulphuret of arsenic with a stream of sulphuretted hydrogen. Sulphur, when perfectly pure, is wholly volatilized by heat, and soluble without residue in oil of turpentine. According to Dr. Playfair, nitroprusside of sodium is a delicate test for the soluble sulphurets, producing with them a delicate violet tint. Prof. J. W. Bailey, of West Point, N. Y., has employed the same test for detecting sulphur in any compound. The substance suspected to contain it is heated with carbonate of soda, with the addition of carbonaceous matter if necessary. A small portion of the fused mass, containing the sulphur as sulphuret of sodium, if added to a drop of the nitroprusside, will occasion the characteristic violet tint. (*Silliman's Journ.*, May 1851, p. 351.)

Sublimed sulphur, usually called *flowers of sulphur* (*flores sulphuris*), is in the form of a crystalline powder of a fine yellow colour. It is always contami-

nated with a little sulphuric acid, which is formed at the expense of the oxygen of the air contained in the subliming chambers. It is on this account that sublimed sulphur always reddens litmus; and, if the acid be present in considerable quantity, it sometimes cakes. It may be freed from acidity by careful ablution with hot water, when it becomes the officinal washed sulphur.

Washed sulphur is placed in the list of the Materia Medica in the U. S. Pharmacopœia, with an explanatory note, that it is sublimed sulphur, thoroughly washed with water. The Edinburgh College includes it among the Preparations, and directs it to be prepared by subliming "sulphur," and washing the powder obtained with boiling water until it is freed from acid taste. Washed sulphur has the general appearance of sublimed sulphur, and is wholly volatilized by heat. When properly prepared it does not affect litmus, and undergoes no change by exposure to the atmosphere.

Medical Properties and Uses. Sulphur is laxative, diaphoretic, and resolvent. It is supposed to be rendered soluble by the soda of the bile. It evidently passes off by the pores of the skin; as is shown by the fact that silver, worn in the pockets of patients under a course of it, becomes blackened with a coating of sulphuret. The stools which it occasions are usually solid, and it is gentle in its operation, unless it contain a good deal of acid, when it causes griping; and the liability of the sublimed sulphur to contain acid, renders it less eligible for exhibition than the washed sulphur, from which all acidity is removed. The diseases in which sulphur is principally used are hemorrhoidal affections, chronic rheumatism and catarrh, atonic gout, asthma, and other affections of the respiratory organs unattended with acute inflammation. It is also much employed, both internally and externally, in cutaneous affections, especially scabies, for the cure of which it is considered a specific. In these affections, as well as in chronic rheumatism, it is sometimes applied as an air bath, in the form of sulphurous acid gas, the head being protected from its effects. The dose of sulphur is from one to three drachms, mixed with syrup or molasses, or taken in milk. It is often combined with bitartrate of potassa or with magnesia.

According to M. Hannon, of Belgium, brown viscid sulphur, recently prepared, possesses valuable therapeutic properties, not as a laxative, but as a stimulant to the circulation, lungs, and skin, far more active than ordinary sulphur. The dose of the brown sulphur, obtained by fusion, is from twenty to fifty grains; of the precipitated, which is more active, from five to twenty grains, both given in the form of pill. (*Ann. de Thérap.*, 1852, p. 186.)

Sulphur is consumed in the arts, principally in the manufacture of gunpowder and sulphuric acid.

Off. Prep. of Sulphur. Confectio Sulphuris; Emplastrum Ammoniaci cum Hydrargyro; Emplast. Hydrargyri; Ferri Sulphuretum; Hydrargyri Sulphuretum Nigrum; Hydrargyri Sulphuretum Rubrum; Potassæ Sulphas cum Sulphure; Potassii Sulphuretum; Sulphur Præcipitatum; Sulphuris Iodidum; Unguentum Sulphuris; Unguent. Sulphuris Compositum. B.

TABACUM. *U. S., Lond., Ed., Dub.*

Tobacco.

The leaves of Nicotiana Tabacum. *U. S., Lond., Ed., Dub.*

Tabac, *Fr.;* Tabak, *Germ.;* Tobacco, *Ital.;* Tobaco. *Span.*

NICOTIANA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Solanaceæ.

Gen. Ch. Corolla funnel-shaped, with the border plaited. *Stamens* inclined. *Capsules* two-valved, two-celled. *Willd.*

Nicotiana Tabacum. Willd. *Sp. Plant.* i. 1014; Bigelow, *Am. Med. Bot.* ii. 171; Woodv. *Med. Bot.* p. 208, t. 77. The tobacco is an annual plant, with

a large fibrous root, and an erect, round, hairy, viscid stem, which branches near the top, and rises from three to six feet in height. The leaves are numerous, alternate, sessile, and somewhat decurrent, very large, ovate-lanceolate, pointed, entire, slightly viscid, and of a pale-green colour. The lowest are often two feet long, and six inches broad. The flowers are disposed in loose terminal panicles, and are furnished with long, linear, pointed bractes at the divisions of the peduncle. The calyx is bell-shaped, hairy, somewhat viscid, and divided at its summit into five pointed segments. The tube of the corolla is twice as long as the calyx, of a greenish hue, swelling at top into an oblong cup, and ultimately expanding into a five-lobed, plaited, rose-coloured border. The whole corolla is very viscid. The filaments incline to one side, and support oblong anthers. The pistil consists of an oval germ, a slender style longer than the stamens, and a cleft stigma. The fruit is an ovate, two-valved, two-celled capsule, containing numerous reniform seeds, and opening at the summit.

There is good reason to believe that this plant is a native of tropical America, where it was found by the Spaniards upon their arrival. It is at present cultivated in most parts of the world, and nowhere more abundantly than within the limits of the United States. Virginia is, perhaps, the region most celebrated for its culture. The young shoots, produced from seeds thickly sown in beds, are transplanted into the fields during the month of May, and set in rows with an interval of three or four feet between the plants. Through the whole period of its growth, the crop requires constant attention. The development of the leaves is promoted by removing the top of each plant, and thus preventing it from running into flower and seed. The harvest is in August. The ripe plants, having been cut off above their roots, are dried under cover, and then stripped of their leaves, which are tied in bundles, and packed in hogsheads.

Two varieties of this species are mentioned by authors, one with narrow, the other with broad leaves; but they do not differ materially in properties. Great diversity in the quality of tobacco is produced by difference of soil and mode of cultivation; and several varieties are recognised in commerce. Other species of Nicotiana are also cultivated, especially *N. rustica* and *N. paniculata*, the former of which is said to have been the first introduced into Europe, and is thought to have been cultivated by the aborigines of this country, as it is naturalized near the borders of some of our small northern lakes. The *N. quadrivalvis* of Pursh affords tobacco to the Indians of the Missouri and Columbia rivers; and *N. fructicosa*, a native of China, was probably cultivated in Asia before the discovery of this continent by Columbus.

Properties. Tobacco, as it occurs in commerce, is of a yellowish-brown colour, a strong narcotic penetrating odour which is less obvious in the fresh leaves, and a bitter, nauseous, and acrid taste. These properties are imparted to water and alcohol. They are destroyed by long boiling; and the extract is, therefore, feeble or inert. An elaborate analysis of tobacco was made by Vauquelin, who discovered in it, among other ingredients, an acrid, volatile, colourless substance, slightly soluble in water, very soluble in alcohol, and supposed to be the active principle. It was separated by a complicated process, of which, however, the most important step was the distillation of tobacco juice with potassa. In the results of this distillation Vauquelin recognised alkaline properties, which he ascribed to ammonia, but which were, in part at least, dependent upon the acrid principle alluded to. To this principle the name of *nicotin* was given; but its alkalinity was not ascertained till a subsequent period. Another substance was obtained by Hermstadt by simply distilling water from tobacco, and allowing the liquid to stand for several days. A white crystalline matter rose to the surface, which, upon being removed, was found to have the odour of tobacco, and to resemble it in effects. It was fusible, volatilizable, similar to the nicotin of

Vauquelin in solubility, and without alkaline or acid properties. It was called *nicotianin* by Hermstadt, and appears to partake of the nature of volatile oils. Two German chemists, Posselt and Reimann, subsequently analyzed tobacco, and ascertained the alkaline nature of its active principle, which, however, neither they nor Vauquelin obtained in a state of purity. According to these chemists, 10,000 parts of the fresh leaves contain 6 parts of an alkaline substance, which they call *nicotin*, 1 of the *nicotianin* of Hermstadt, 287 of slightly bitter extractive, 174 of gum mixed with a little malate of lime, 26·7 of green resin, 26 of albumen, 104·8 of a substance analogous to gluten, 51 of malic acid, 12 of malate of ammonia, 4·8 of sulphate of potassa, 6.3 of chloride of potassium, 9·5 of potassa, which was combined in the leaves with malic and nitric acids, 16·6 of phosphate of lime, 24·2 of lime which had been combined with malic acid, 8·8 of silica, 496·9 of lignin, traces of starch, and 8828 parts of water. (Berzelius, *Traité de Chimie.*) According to M. E. Goupet, tobacco also contains a little citric acid. (*Chem. Gaz.*, Aug. 1846, p. 319.) The nicotin obtained by Vauquelin, and by Posselt and Reimann, was a colourless, volatile liquid, and, as subsequently ascertained by MM. Henry and Boutron, was in fact an aqueous solution of the alkaline principle in connexion with ammonia. It was reserved for these chemists to obtain nicotin, or *nicotia*, as it should now be called, in a state of purity. It exists in tobacco combined with an acid in excess, and in this state is not volatile. The following is the process employed by the last-mentioned chemists. Five hundred parts of smoking tobacco were exposed to distillation, in connexion with about 6000 parts of water and 200 parts of caustic soda; the heat applied being at first very moderate, and afterwards increased to the boiling point. The product of the distillation was received in a vessel containing about 30 or 40 parts of sulphuric acid, diluted with three times its weight of water; and the process was continued till nearly one-half of the liquid had come over. The product, in which care was taken to preserve a slight excess of acid, was evaporated to about 100 parts, and was then allowed to cool. A slight deposit which had formed was separated by filtration, an excess of caustic soda was added, and the liquor again distilled. A colourless, very volatile, acrid liquid now came over, which, being concentrated under the receiver of an air-pump, lost the ammonia which accompanied it, and assumed a syrupy consistence, and more or less of the colour of amber. In this liquid, after a few days, minute crystalline plates formed; but, in consequence of their great affinity for moisture, it was difficult to isolate the crystals. This product was pure nicotia.

Nicotia. (*Nicotina. Nicotin.*) This is a colourless or nearly colourless fluid; of the sp. gr. 1·048; remaining liquid at 22° F.; of little smell when cold; of an exceedingly acrid burning taste, even when largely diluted; entirely volatilizable, and, in the state of vapour, very irritant to the nostrils, with an odour recalling that of tobacco; inflammable; very soluble in water, alcohol, ether, the fixed oils, and oil of turpentine; strongly alkaline in its reaction; and capable of forming crystallizable salts with the acids. These salts are deliquescent, have a burning and acrid taste, and, like the salts of ammonia, lose a portion of their base by heat. Nicotia contains a much larger proportion of nitrogen than most of the other organic alkalies. Its formula is $N_2C_{20}H_{14}$, and combining number consequently 162. In its action on the animal system, it is one of the most virulent poisons known. A drop of it in the state of concentrated solution was sufficient to destroy a dog; and small birds perished at the approach of a tube containing it. Tannin forms with it a compound of but slight solubility, and might be employed as a counter-poison. It exists in tobacco in small proportion. Henry and Boutron found different varieties of tobacco to give products varying from 3·8 to 11·28 parts in 1000. It has been found in the seeds, and in very small proportion in the root. (See *Journ. de Pharm.*, xxii. 689.)

There can be little doubt that tobacco owes its activity to this alkali.* It has been employed as a poison. For a very interesting account of it in all its toxicological relations, the reader is referred to a memoir by Orfila, translated by Dr. Lee, and published in the *N. Y. Journ. of Med.* (N. S., ix. 112, 219, and 369). It has the remarkable property of resisting decomposition in the decaying tissues of the body, and it was detected by Orfila in the bodies of animals destroyed by it two or three months after their death.

Nicotianin is probably the odorous principle of tobacco. Posselt and Reimann prepared it by distilling six pounds of the fresh leaves with twelve pounds of water, till one half of the liquid passed over, then adding six pounds more of water, and again distilling, and repeating this process three times. The nicotianin was obtained to the amount of eleven grains, floating on the surface of the water. It was a fatty substance, having the smell of tobacco-smoke, and an aromatic somewhat bitter taste. It was volatilizable by heat, insoluble in water, soluble in alcohol and ether, and not affected by the dilute acids, but dissolved by solution of potassa. This was not obtained by MM. Henry and Boutron. According to Landerer, it does not exist in the fresh leaves, but is generated in the drying process. It produces sneezing when applied to the nostrils, and a grain of it swallowed by Hermstadt occasioned giddiness and nausea.

When distilled at a temperature above that of boiling water, tobacco affords an empyreumatic oil, which Mr. Brodie proved to be a most virulent poison. A single drop injected into the rectum of a cat occasioned death in about five minutes, and double the quantity, administered in the same manner to a dog, was followed by the same result. This oil is of a dark-brown colour, and an acrid taste, and has a very peculiar smell, exactly resembling that of tobacco pipes which have been much used. It has been shown to contain nicotia. (*Ann. de Chim. et de Phys.*, 3e *sér.*, ix. 465.)

Medical Properties and Uses. Tobacco unites with the powers of a sedative narcotic, those of an emetic and diuretic; and produces these effects to a greater or less extent to whatever surface it may be applied. In addition, when snuffed up the nostrils, it excites violent sneezing and a copious secretion of mucus; when chewed, it irritates the mucous membrane of the mouth, and increases the flow of saliva; and, when injected into the rectum, it sometimes operates as a cathartic. Moderately taken, it quiets restlessness, calms mental and corporeal inquietude, and produces a state of general languor or repose, which has great charms for those habituated to the impression. In larger quantities, it gives rise to confusion of the head, vertigo, stupor, faintness, nausea, vomiting, and general debility of the nervous and circulatory functions, which, if increased, eventuates in alarming and even fatal prostration. The symptoms of its excessive action are severe retching, with the most distressing and continued nausea, great feebleness of pulse, coolness of the skin, fainting, and sometimes convulsions. It probably operates both through the medium of the nervous system,

* M. Schloesing obtained a much larger proportion than that stated above by the following process. Tobacco is exhausted by boiling water, the infusion evaporated to a semi-solid consistence, and the extract shaken with twice its volume of alcohol of 36°. Two layers form, of which the upper contains all the nicotia. This is decanted, most of the alcohol evaporated, and alcohol anew added in order to precipitate certain matters. The extract is treated with a concentrated solution of potassa, and, after cooling, is shaken with ether, which dissolves the nicotia. To the ethereal solution powdered oxalic acid is added, which unites with the nicotia, and separates in the form of a syrupy mass. This being washed with ether, treated with potassa, taken up by water, and distilled in a salt-water bath, yields the nicotia, which may be obtained pure by rectification in a current of hydrogen. (*Journ. de Pharm.*, 3e sér., xii. 157.) Orfila, in his memoir on nicotia, states that Havana tobacco yields 2 per cent. of this alkaloid, Maryland, 2·3 per cent., and Virginia 6·9 per cent.

and by entering the circulation. As its local action is stimulant, we can thus account for the fact, that it excites the functions of the kidneys, at the same time that it reduces the nervous and secondarily the arterial power. The experiments of Brodie lead to the inference that the function of the heart is affected by tobacco, through the medium of the nervous system; for in a decapitated animal in which the circulation was sustained by artificial respiration, the infusion injected into the rectum did not diminish the action of the heart; while, on the contrary, this organ almost immediately ceased to contract, when an equal dose of the poison was administered to a healthy animal. Mr. Brodie observed a remarkable difference between the operation of the infusion and that of the empyreumatic oil. After death from the former the heart was found completely quiescent, while it continued to act with regularity for a considerable time after apparent death from the latter. We may infer from this fact, either that there are two poisonous principles in tobacco, or that a new narcotic product is formed during its destructive distillation. In cases of poisoning from tobacco, the indications are, after the evacuation of the poison, to support the system by external and internal stimulants, and to allay irritation of stomach by the use of opiates.

The use of tobacco was adopted by the Spaniards from the American Indians. In the year 1560, it was introduced into France by the ambassador of that country at the court of Lisbon, whose name—Nicot—has been perpetuated in the generic title of the plant. Sir Walter Raleigh is said to have introduced the practice of smoking into England. In the various modes of smoking, chewing, and snuffing, the drug is now largely consumed in every country on the globe. It must have properties peculiarly adapted to the propensities of our nature, to have thus surmounted the first repugnance to its odour and taste, and to have become the passion of so many millions. When employed in excess, it enfeebles digestion, produces emaciation and general debility, and lays the foundation of serious nervous disorders. The late Dr. Chapman informed us that he had met with several instances of mental disorder, closely resembling delirium tremens, which resulted from its abuse, and which subsided in a few days after it had been abandoned; and Dr. Kirkbride, in the *Annual Report of the Pennsylvania Hospital for the Insane for* 1850, refers to four cases of insanity, the origin of which was ascribed to the abuse of tobacco.

Its remedial employment is less extensive than might be inferred from the variety of its powers. The excessive and distressing nausea which it is apt to occasion, interferes with its internal use; and it is very seldom administered by the stomach. As a narcotic it is employed chiefly to produce relaxation in spasmodic affections. For this purpose, the infusion or smoke of tobacco, or the leaf in substance in the shape of a suppository, is introduced into the rectum in cases of strangulated hernia, obstinate constipation from spasm of the bowels, and retention of urine from a spasmodic stricture of the urethra. For a similar purpose, the powdered tobacco, or common snuff, mixed with simple cerate, as recommended by the late Dr. Godman, is sometimes applied to the throat and breast in cases of croup; and Dr. Chapman directed the smoking of a cigar in the same complaint, with decided benefit. One of the worst cases of spasm of the rima glottidis which we have seen, and which resisted powerful depletion by the lancet, yielded to the application of a tobacco cataplasm to the throat. A similar application to the abdomen is highly recommended in painters' colic, and has proved useful in hysterical convulsions. Tetanus is said to have been cured by baths made with the decoction of the fresh leaves. The relaxation produced by smoking, in a person unaccustomed to it, was very happily resorted to by Dr. Physick, in a case of obstinate and long-continued dislocation of the jaw; and the same remedy has frequently been found useful in the paroxysm of spasmodic asthma. Tobacco has been highly recommended, in the form of

cataplasm, in articular gout and rheumatism; and has been employed in the same way, as well as by injection, in cases of obstinate verminose affections. As an emetic it is seldom employed, unless in the shape of a cataplasm to the epigastrium, to assist the action of internal medicines in cases of great insensibility of stomach. As a diuretic it was used by Fowler in dropsy and dysury; but the practice is not often imitated. There is no better errhine than tobacco, for the ordinary purposes for which this class of medicines is employed. As a sialagogue, it is beneficial in rheumatism of the jaws, and often relieves toothache by its anodyne action. It is also used externally in the shape of cataplasm, infusion, or ointment, in cases of tinea capitis, psora, and some other cutaneous affections. The empyreumatic oil mixed with simple ointment, in the proportion of twenty drops to the ounce, has been applied with advantage, by American practitioners, to indolent tumours and ulcers; but, in consequence of its liability to be absorbed, and to produce unpleasant effects on the system, it should be used with great caution. (See *Oleum Tabaci.*) This remark is applicable to all the modes of employing tobacco; particularly to the injection of the infusion into the rectum, which has in several instances caused the death of the patient. It is even more dangerous than a proportionate quantity introduced into the stomach; as, in the latter case, the poison is more apt to be rejected. Even the external application of the leaves or powder is not without danger, especially when the cuticle is removed. A case of death is on record, occurring in a child eight years old, in consequence of the application of the expressed juice of the leaves to the head, for the cure of tinea capitis. Death has also been produced in several instances by the inhalation of the smoke.

Five or six grains of powdered tobacco will generally act as an emetic; but the remedy is not given in this shape. The infusion used in dropsy by Fowler was made in the proportion of an ounce to a pint of boiling water, and given in the dose of sixty or eighty drops. The officinal infusion, which is employed for injection, is much weaker. (See *Infusum Tabaci.*) A wine and an ointment of tobacco are directed by the U. S. Pharmacopœia.

Off. Prep. Infusum Tabaci; Oleum Tabaci; Unguentum Tabaci; Vinum Tabaci. W.

TAMARINDUS. *U. S., Lond., Ed.*

Tamarinds.

The preserved fruit of Tamarindus Indica. *U. S.* Pulp of the fruit. *Lond.* Pulp of the pods of Tamarindus indica. *Ed.*

Off. Syn. PULP OF TAMARINDS. Tamarindicus Indica. The pulp of the pods. *Dub.*

Tamarins, *Fr.;* Tamarinden, *Germ.;* Tamarindi, *Ital.;* Tamarindos, *Span.*

TAMARINDUS. *Sex. Syst.* Monadelphia Triandria.—*Nat. Ord.* Fabaceæ or Leguminosæ.

Gen. Ch. Calyx four-parted. *Petals* three. *Nectary* with two short bristles under the filaments. *Legume* filled with pulp. *Willd.*

Tamarindus Indica. Willd. *Sp. Plant.* iii. 577; Woodv. *Med. Bot.* p. 448, t. 161. The tamarind tree is the only species of this genus. It rises to a great height, sends off numerous spreading branches, and has a beautiful appearance. The trunk is erect, thick, and covered with a rough, ash-coloured bark. The leaves are alternate and pinnate, composed of many pairs of opposite leaflets, which are almost sessile, entire, oblong, obtuse, unequal at their base, about half an inch long by a sixth of an inch broad, and of a yellowish-green colour. The flowers, which are in small lateral racemes, have a yellowish calyx, and petals which are also yellow, but beautifully variegated with red veins. The

fruit is a broad, compressed, reddish ash-coloured pod, very much curved, from two to six inches long, and with numerous brown, flat, quadrangular seeds, contained in cells formed by a tough membrane. Exterior to this membrane is a light-coloured acid pulpy matter, between which and the shell are several tough ligneous strings, running from the stem to the extremity of the pod, the attachment of which they serve to strengthen. The shells are very fragile and easily separated.

Tamarindus Indica appears to be a native of the East and West Indies, Egypt, and Arabia, though believed by some authors to have been imported into America. De Candolle is doubtful whether the East and West India trees are of the same species. The pods of the former are much larger than those of the latter, and contain a greater number of seeds. At least such is the statement made by authors, who inform us that East India tamarinds contain six or seven seeds, those from the West Indies rarely more than three or four. We found, however, in a parcel of the latter in our possession, numerous pods with from eight to ten seeds, and the number generally exceeded four. The fruit is the officinal portion.

Tamarinds are brought to us chiefly, if not exclusively, from the West Indies, where they are prepared by placing the pods, previously deprived of their shell, in layers in a cask, and pouring boiling syrup over them. A better mode, sometimes practised, is to place them in stone jars, with alternate layers of powdered sugar. They are said to be occasionally prepared in copper boilers.

Properties. Fresh tamarinds, which are sometimes, though rarely, brought to this country, have an agreeable sour taste, without any mixture of sweetness. As we usually find them, in the preserved state, they form a dark-coloured adhesive mass, consisting of syrup mixed with the pulp, membrane, strings, and seeds of the pod, and of a sweet acidulous taste. The seeds should be hard, clean, and not swollen, the strings tough and entire, and the smell without mustiness. From the analysis of Vauquelin, it appears that in 100 parts of the pulp of tamarinds, independently of the sugar added to them, there are 9·40 parts of citric acid, 1·55 of tartaric acid, 0·45 of malic acid, 3·25 of bitartrate of potassa, 4·70 of gum, 6·25 of jelly, 34·35 of parenchymatous matter, and 27·55 of water; so that the acidity is chiefly owing to the presence of citric acid. It is said that copper may sometimes be detected in preserved tamarinds, derived from the boilers in which they are occasionally prepared. Its presence may be ascertained by the reddish coat which it imparts to the blade of a knife immersed in the tamarinds.

Medical Properties and Uses. Tamarinds are laxative and refrigerant, and infused in water form a highly grateful drink in febrile diseases. Convalescents often find the pulp a pleasant addition to their diet, and useful by preserving the bowels in a loose condition. It is sometimes prescribed in connexion with other mild cathartics, and is one of the ingredients of the confection of senna. Though frequently prescribed with the infusion of senna to cover the taste of that medicine, it is said to weaken its purgative power; and the same observation has been made of its influence upon the resinous cathartics in general. From a drachm to an ounce or more may be taken at a dose.

Off. Prep. Confectio Sennæ; Infusum Sennæ Compositum; Tamarindi Pulpa.

W.

TANACETUM. *U. S. Secondary.*

Tansy.

The herb of Tanacetum vulgare. *U. S.*

Tanaisie, *Fr.;* Gemeiner Rheinfarrn, Wurmkraut, *Germ ;* Tanaceto, *Ital., Span.*

TANACETUM. *Sex. Syst.* Syngenesia Superflua.—*Nat. Ord.* Compositæ-Senecionideæ, *De Candolle;* Asteraceæ, *Lindley.*

Gen. Ch. Receptacle naked. *Pappus* somewhat marginate. *Calyx* imbricate, hemispherical. *Corolla* rays obsolete, trifid. *Willd.*

Tanacetum vulgare. Willd. *Sp. Plant.* iii. 1814; Woodv. *Med. Bot.* p. 66, t. 27. This is a perennial herbaceous plant, rising two or three feet in height. The stems are strong, erect, obscurely hexagonal, striated, often reddish, branched towards the summit, and furnished with alternate, doubly pinnatifid leaves, the divisions of which are notched or deeply serrate. The flowers are yellow, and in dense terminal corymbs. Each flower is composed of numerous florets, of which those constituting the disk are perfect and five-cleft, those of the ray very few, pistillate, and trifid. The calyx consists of small, imbricated, lanceolate leaflets, having a dry scaly margin. The seeds are small, oblong, with five or six ribs, and crowned by a membranous pappus.

Tansy is cultivated in our gardens, and grows wild in the roads and in old fields; but was introduced from Europe, where it is indigenous. It is in flower from July to September.

There is a variety of the plant with curled leaves, which is said to be more grateful to the stomach than that above described, but has less of the peculiar sensible properties of the herb, and is probably less active.

The odour of tansy is strong, peculiar, and fragrant, but much diminished by drying; the taste is warm, bitter, somewhat acrid, and aromatic. These properties are imparted to water and alcohol. According to Peschier, the leaves contain volatile oil, fixed oil, wax or stearin, chlorophylle, yellow resin, yellow colouring matter, tannic and gallic acids, bitter extractive, gum, lignin, and a peculiar acid which he calls *tanacetic*, and which precipitates lime, baryta, oxide of lead, and oxide of copper. The medical virtues of the plant depend on the bitter extractive and volatile oil. The latter, when separated by distillation, has a greenish-yellow colour, with the flavour of the plant, is lighter than water, and deposits camphor upon standing. The seeds contain the largest proportion of the bitter principle, and the least of volatile oil.

Medical Properties and Uses. Tansy has the medical properties common to the aromatic bitters. It has been recommended in intermittents, hysteria, amenorrhœa, and as a preventive of arthritic paroxysms; but at present it is chiefly used as an anthelmintic, and in this country is scarcely employed, for any purpose, in regular practice. The seeds are said to be most effectual as a vermifuge. The dose of the powder is from thirty grains to a drachm two or three times a day; but the infusion is more frequently administered. A fatal case of poisoning with half an ounce of oil of tansy is recorded in the *Medical Magazine* for November, 1834. Frequent and violent clonic spasms were experienced, with much disturbance of respiration; and the action of the heart gradually became weaker till death took place from its entire suspension. No inflammation of the stomach or bowels was discovered upon dissection. (*Am. Journ. of the Med. Sci.*, xvi. 256.) Two other fatal cases have since been recorded, one in which more than a fluidounce was taken, the other only a fluidrachm. In both death followed speedily, preceded by coma and violent convulsions. In two of the three cases above referred to, the oil seems to have been taken with the view of producing abortion, but no such effect followed in either. (*Ibid.*, xxiii. 136, and xxiv. 279.) W.

TAPIOCA. *U. S., Ed., Dub.*

Tapioca.

The fecula of the root of Janipha Manihot. *U. S., Ed., Dub.*

JANIPHA. *Sex. Syst.* Monœcia Monadelphia.—*Nat. Ord.* Euphorbiaceæ.

Gen. Ch. Calyx campanulate, five-parted. *Stamens* ten, distinct, alternately

shorter. *Stigmas* three, many-lobed. *Fruit* three-celled, with solitary seeds. (Lindley, *Med. and Æconom. Bot.*, 82.)

Botanists have generally followed Kunth in separating this genus from Jatropha. Its name was derived from the Indian designation of another species. *Janipha Manihot.* Curtis's *Bot. Mag.* 3071.—*Jatropha Manihot.* Willd. *Sp. Plant.* iv. 562. This is the *cassava* plant of the West Indies, the *mandioca* or *tapioca* of Brazil. It is a shrub about six or eight feet in height, with a very large, white, fleshy, tuberous root, which often weighs thirty pounds. The stem is round, jointed, and furnished at its upper part with alternate petiolate leaves, deeply divided into three, five, or seven oval-lanceolate, very acute lobes, which are somewhat wavy upon their borders, of a deep-green colour on their upper surface, glaucous and whitish beneath. The flowers are in axillary racemes.

Janipha Manihot is a native of South America, and is cultivated extensively in the West Indies, Brazil, and other parts of tropical America, for the sake of its root, which is much employed as an article of food. The plant is of quick growth, and the root arrives at perfection in about eight months. There are two varieties, distinguished by the names of *sweet* and *bitter*. The root of the former may be eaten with impunity; that of the latter, which is most extensively cultivated, abounds in an acrid milky juice, which renders it highly poisonous if eaten in the recent state. By MM. Henry and Boutron-Charlard it has been ascertained that the bitter cassava owes its poisonous properties to the presence of hydrocyanic acid. (*Journ. de Pharm.*, xxii. 119.) Both varieties contain a large proportion of starch. The root is prepared for use by washing, scraping, and grating or grinding it into a pulp, which, in the case of the bitter variety, is submitted to pressure so as to separate the deleterious juice. It is now in the state of meal or powder, which is made into bread, cakes, or puddings. As the poisonous principle is volatile, the portion which may have remained in the meal is entirely dissipated by the heat employed in cooking. The preparation denominated tapioca among us is obtained from the expressed juice. This, upon standing, deposits a powder, which, after repeated washings with cold water, is nearly pure starch. It is dried by exposure to heat, which renders it partly soluble in cold water, and enables it to assume the consistence by which it is characterized. When dried without heat, it is pulverulent, and closely resembles the fecula of arrow-root.

Tapioca is in the form of irregular, hard, white, rough grains, possessing little taste, partially soluble in cold water, and affording a fine blue colour when iodine is added to its filtered solution. The partial solubility in cold water is owing to the rupture of the starch-granules by heat. Examined under the microscope, the granules appear partly broken, partly entire. The latter are muller-shaped, about the two-thousandth of an inch in diameter, more uniform in size than the granules of most other varieties of fecula, with a distinct hilum which is surrounded by rings, and cracks in a stellate manner. The tapioca meal, called sometimes Brazilian arrow-root, and by the French *moussache*, is the fecula dried without heat. Its granules are identical with those already described. Being nutritious, and at the same time easy of digestion, and destitute of all irritating properties, tapioca forms an excellent diet for the sick and convalescent. It is prepared for use by boiling it in water. Lemon juice and sugar will usually be found grateful additions; and, in low states of disease or cases of debility, it may be advantageously impregnated with wine and nutmeg or other aromatic.

A factitious tapioca is found in the shops, consisting of very small, smooth, spherical grains, and supposed to be prepared from potato starch. It is sold under the name of *pearl tapioca*. W.

TARAXACUM. *U. S., Lond., Ed.*

Dandelion.

The root of Leontodon Taraxacum. *U. S.* Taraxacum Dens-leonis. The recent root. *Lond.* The root of Taraxacum Dens-leonis. *Ed.*

Off. Syn. TARAXACUM DENS-LEONIS. The root. *Dub.*

Pissenlit, Dent de lion, *Fr.;* Löwenzahn, *Germ.;* Tarassaco, *Ital.;* Diente de leon, *Span.*

LEONTODON. *Sex. Syst.* Syngenesia Æqualis.—*Nat. Ord.* Compositæ-Cichoraceæ, *De Candolle;* Cichoraceæ, *Lindley.*

Gen. Ch. Receptacle naked. *Calyx* double. *Seed-down* stipitate, hairy. *Willd.*

Leontodon Taraxacum. Willd. *Sp. Plant.* iii. 1544; Woodv. *Med. Bot.* p. 39, t. 16.—*Taraxacum Dens-leonis.* De Cand. *Prodrom.* vii. 145. The dandelion is an herbaceous plant, with a perennial fusiform root. The leaves, which spring immediately from the root, are long, pinnatifid, generally runcinate, with the divisions toothed, smooth, and of a fine green colour. The common name of the plant was derived from the fancied resemblance of its leaves to the teeth of a lion. The flower-stem rises from the midst of the leaves, six inches or more in height. It is erect, simple, naked, smooth, hollow, fragile, and terminated by a large golden-coloured flower, which closes in the evening, and expands with the returning light of the sun. The calyx is smooth and double, with the outer scales bent downwards. The florets are very numerous, ligulate, and toothed at their extremities. The receptacle is convex and punctured. The seed-down is stipitate, and at the period of maturity is disposed in a spherical form, and is so light and feathery as to be easily borne away by the wind, with the seeds attached.

This species of Leontodon grows spontaneously in most parts of the globe. It is abundant in this country, adorning our grass-plats and pasture-grounds with its bright-yellow flowers, which, in moist places, show themselves with the first opening of spring, and continue to appear till near the close of summer. All parts of the plant contain a milky bitterish juice, which exudes when they are broken or wounded. The leaves, when very young, and blanched by the absence of light during their growth, are tender and not unpleasant to the taste, and on the continent of Europe are sometimes used as a salad. When older and of their natural colour, they are medicinal. The Pharmacopœias recognise only the root, which is by far the most efficacious part. It should be full grown when collected, and should be employed in the recent state, as it is then most active. It does not, however, as stated by Duncan, lose nearly all its bitterness by drying; and the root dug up in the warmer seasons might, if dried with care, be employed with propriety in the succeeding winter. The juice of the root is thin and watery in the spring; milky, bitter, and spontaneously coagulable in the latter part of summer and autumn; and sweet and less bitter in the winter, when affected by the frost. The months of July, August, and September are, therefore, the proper period for collecting it.

The fresh full-grown root of the dandelion is several inches in length, as thick as the little finger or thicker, round and tapering, somewhat branched, of a light-brown colour externally, whitish within, having a yellowish ligneous cord running through its centre, and abounding in a milky juice. In the dried state it is much shrunk, wrinkled longitudinally, brittle, and when broken presents a shining somewhat resinous fracture. It is without smell, but has a sweetish, mucilaginous, bitterish, herbaceous taste. Its active properties are yielded to water by boiling, and do not appear to be injured in the process. The milky

juice, examined by John, was found to contain bitter extractive, gum, caoutchouc, saline matters, a trace of resin, and a free acid. Besides these ingredients, starch or inulin, and saccharine matter exist in the root. Mannite, which has been found in the infusion of the root, has been demonstrated by the Messrs. Smith, of Edinburgh, not to pre-exist in the root, but to be formed by spontaneous changes consequent on exposure. (*Pharm. Journ. and Trans.*, viii. 481.) A crystallizable principle has been extracted from the juice of the root by M. Pollex, who has named it *taraxacin*. It is bitter and somewhat acrid, fusible but not volatile, sparingly soluble in cold water, but very soluble in boiling water, alcohol, and ether. It is obtained by boiling the milky juice in distilled water, filtering the concentrated liquor, and allowing it to evaporate spontaneously in a warm place. The taraxacin crystallizes, and may be purified by repeated solution and crystallization in alcohol or water. (*Pharm. Journ. and Transact.*, i. 425.)

The root of *Aspargia hispida* has been largely substituted for dandelion in England by the herb gatherers (*Pharm. Journ. and Trans.*, xi. 107); and we are informed that a similar fraudulent substitution is not unfrequent, in this country, of the root of *Cichorium Intibus*, or *chicory*. This is distinguishable from the genuine root by its lighter colour, and greater bitterness.

Medical Properties and Uses. Taraxacum is slightly tonic, diuretic, and aperient, and is thought to have a specific action upon the liver, exciting it when languid to secretion, and resolving its chronic engorgements. It has been much employed in Germany, and is a popular remedy with many practitioners in this country. The diseases to which it appears to be especially applicable, are those connected with derangement of the hepatic apparatus, and of the digestive organs generally. In congestion and chronic inflammation of the liver and spleen, in cases of suspended or deficient biliary secretion, and in dropsical affections dependent on obstruction of the abdominal viscera, it appears to be capable of doing good, if employed with a due regard to the degree of excitement. Our own experience is in its favour. An irritable condition of the stomach and bowels, and the existence of acute inflammation, contra-indicate its employment. It is usually given in the form of extract or decoction, though some prefer the infusion. (See these preparations in the second part of this work.) Bitartrate of potassa is sometimes added to the decoction when an aperient effect is desired; and aromatics will occasionally be found useful in correcting a tendency to griping or flatulence. The root is sometimes prepared and ground with coffee, the taste of which covers that of the dandelion. (*Pharm. Journ. and Trans.* xii. 505.)

Off. Prep. Decoctum Scoparii Compositum; Decoctum Taraxaci; Extractum Taraxaci; Infusum Taraxaci. W.

TEREBINTHINA. *U. S., Lond., Dub.*

Turpentine.

The juice of Pinus palustris, and other species of Pinus. *U. S.* Pinus palustris and P. Tæda. An oleo-resin effused from the stem on the removal of the bark. *Lond.* Pinus sylvestris. Common turpentine. *Dub.*

TEREBINTHINA CANADENSIS. *U. S.*

Canada Turpentine.

The juice of Abies balsamea. *U. S.*

Off. Syn. BALSAMUM CANADENSE. Fluid resinous exudation of Abies balsamea; *Canada balsam. Ed.*

TEREBINTHINA CHIA. *Lond., Ed.*

Chian Turpentine.

Pistacia Terebinthus. An oleo-resin effused from the incised stem. *Lond.* Liquid resinous exudation of Pistacia Terebinthus. *Ed.*

TEREBINTHINA VENETA. *Ed.*

Venice Turpentine.

Liquid resinous exudation of Abies Larix. *Ed.*

Térébenthine, *Fr.;* Terpentin, *Germ.;* Trementina, *Ital., Span.*

The term *turpentine* is now generally applied to certain vegetable juices, liquid or concrete, which consist of resin combined with a peculiar essential oil, called *oil of turpentine.* They are generally procured from different species of pine, fir, or larch, though other trees afford products which are known by the same general title, as for instance the *Pistacia Terebinthus,* which yields the Chian turpentine. Some of the French writers extend the name of turpentine to other juices consisting of resin and essential oil, without benzoic or cinnamic acid, as copaiba, balm of Gilead, &c. We shall describe particularly, in this place, only the officinal turpentines. A brief botanical view of the plants from which they are respectively derived, will be in accordance with the plan of this work. It is proper first to observe that the original genus Pinus of Linnæus has been divided into the three genera, Pinus, Abies, and Larix, which are now very generally recognised, though Lindley unites the two latter in his Flora Medica.

PINUS. *Sex. Syst.* Monœcia Monadelphia.—*Nat. Ord.* Pinaceæ or Coniferæ. *Gen. Ch. Flowers* monœcious. MALES. *Catkins* racemose, compact, and terminal; squamose; the scales staminiferous at the apex. *Stamens* two; the *anthers* one-celled. FEMALES. *Catkins* or *cones* simple, imbricated with acuminate scales. *Ovaries* two. *Stigmas* glandular. *Scales* of the cone oblong, club-shaped, woody; umbilicato-angular at the apex. *Seeds* in pairs, covered with a sharp-pointed membrane. *Cotyledons* digitato-partite. *Leaves* two or many, in the same sheath. (*Pereira's Mat. Med.* from *Bot. Gall.*)

1. *Pinus palustris.* Willd. *Sp. Plant.* iv. 499.—*P. Australis.* Michaux, *N. Am. Sylv.* iii. 133. "Leaves in threes, very long; stipules pinnatifid, ramentaceous, persistent; strobiles subcylindrical, armed with sharp prickles."

This is a very large indigenous tree, growing in dry, sandy soils, from the southern part of Virginia to the Gulf of Mexico. Its mean elevation is sixty or seventy feet, and the diameter of its trunk about fifteen or eighteen inches for two-thirds of this height. The leaves are about a foot in length, of a brilliant green colour, and united in bunches at the ends of the branches. The names by which the tree is known in the Southern States are *long-leaved pine, yellow pine,* and *pitch pine;* but the first is most appropriate, as the last two are applied also to other species. This tree furnishes by far the greater proportion of the turpentine, tar, &c., consumed in the United States, or sent from this to other countries. (See *Pix Liquida.*)

2. *Pinus Tæda.* Willd. *Sp. Plant.* iv. 498; Michaux, *N. Am. Sylv.* iii. 156. "Leaves in threes, elongated, with elongated sheaths; strobiles oblong-conical, deflexed, shorter than the leaf; spines inflexed."

This is the *loblolly,* or *old field pine* of the Southern States. It is abundant in Virginia, where it occupies the lands which have been exhausted by cultivation. It exceeds eighty feet in height, has a trunk two or three feet in diameter,

and expands into a wide spreading top. The leaves are about six inches long, and of a light-green colour. It yields turpentine in abundance, but less fluid than that which flows from the preceding species.

3. *Pinus sylvestris.* Willd. *Sp. Plant.* iv. 494; Woodv. *Med. Bot.* p. 1, t. 1; Michaux, *N. Am. Sylv.* iii. p. 125. "Leaves in pairs, rigid; strobiles ovate-conical, of the length of the leaves; scales echinate."

This species of pine, when of full size, is eighty feet high, with a trunk four or five feet in diameter. It inhabits the northern and mountainous parts of Europe. In Great Britain it is called the *wild pine*, or *Scotch fir;* the latter name having been applied to it from its abundance in the mountains of Scotland. It yields a considerable proportion of the common European turpentine.

Besides the pines above described, various others yield medicinal products. *Pinus maritima* (*P. Pinaster* of Aiton and Lambert), growing in the southern and maritime parts of Europe, yields much of the turpentine, pitch, and tar consumed in France, and is admitted among the officinal plants in the French Codex. From the branches of *Pinus Pumilio*, which inhabits the mountains of Eastern and South-eastern Europe, a terebinthinate juice exudes spontaneously, called *Hungarian balsam. Pinus Cembra*, or the *Siberian stone-pine* of the Alps and Carpathian mountains, is said to afford the product called *Carpathian balsam;* and the seeds both of that species, and of *Pinus Pinea*, or *stone-pine* of the South of Europe and North of Africa, are used in Europe in desserts, under the name of *pine nuts.* The *Pinus rigida*, or *pitch pine* of this country, and probably others besides those mentioned, are sometimes employed in the preparation of tar.

Abies. See PIX BURGUNDICA.

Abies balsamea. Lindley, *Flor. Med.* p. 554. — *A. balsamifera.* Michaux, *N. Am. Sylv.* iii. 191.—*Pinus balsamea*, Willd. *Sp. Plant.* iv. 504. "Leaves solitary, flat, emarginate or entire, glaucous beneath, somewhat pectinate, sub-erect above, recurved, spreading; cones cylindrical, erect; bractes abbreviate, obovate, conspicuously mucronate, sub-serrulate."

This is the *American silver fir*, or *balm of Gilead tree*, inhabiting Canada, Nova Scotia, Maine, and the mountainous regions further to the south. It is an elegant tree, seldom rising more than forty feet in height, with a tapering trunk, and numerous branches, which diminish in length in proportion to their height, and form an almost perfect pyramid. The leaves are six or eight lines long, inserted in rows on the sides and tops of the branches, narrow, flat, rigid, bright-green on their upper surface, and of a silvery whiteness beneath. The cones are large, erect, nearly cylindrical, of a purplish colour, and covered with a resinous exudation which gives them a glossy, rich, and beautiful appearance. It is from this tree that the *Canada balsam* is obtained.

Several other species of Abies are officinal. *Abies excelsa* of Europe, and *A. Canadensis* of the United States, have already been described as the sources respectively of Burgundy and Canada pitch. (See *Pix Burgundica* and *Pix Canadensis.*) The *A. Picea* (*Abies pectinata* of De Candolle, *A. taxifolia* of the French Codex, *Pinus Picea* of Linnæus), or *European silver fir*, growing in the mountainous regions of Switzerland, Germany, and Siberia, yields the *Strasburg turpentine*, which is much used in some parts of Europe. The *Abies nigra* (*Pinus nigra*), or *black spruce* of this country, yields a product, which, though not recognised by the Pharmacopœia, is considerably employed. The substance alluded to is the *essence of spruce*, prepared from the young branches by boiling them in water, and evaporating the decoction. It is a thick liquid, having the colour and consistence of molasses, with a bitterish, acidulous, astringent taste. It is much used in the preparation of the beverage commonly known by the

name of *spruce beer*, which is a pleasant and wholesome drink in summer, and useful in long sea-voyages as a preventive of scurvy.*

Larix. Sex. Syst. Monœcia Monadelphia. — *Nat. Ord.* Pinaceæ or Coniferæ.

Gen. Ch. As in Abies, except that the *cotyledons* are simple, and never lobed; the *cones* lateral; the *leaves*, when first expanding, in tufted fascicles, becoming somewhat solitary by the elongation of the new branch. (*Pereira's Mat. Med.* from *Bot. Gall.*)

Larix Europæa. De Cand. *Flor. Fr.* 2064. — *Abies Larix.* Lamb. *Illust.* t. 785, f. 2. — *Pinus Larix.* Willd. *Sp. Plant.* iv. 503; Woodv. *Med. Bot.* p. 7, t. 4. "Leaves fascicled, deciduous; cones ovate-oblong; margins of the scales reflexed, lacerated; bractes panduriform."

The *European larch* is a large tree, inhabiting the mountains of Siberia, Switzerland, Germany, and the East of France. It yields the *Venice turpentine* of commerce, and a peculiar sweetish substance, called in France *Briançon manna*, which exudes spontaneously, and concretes upon its bark. When the larch forests of Russia take fire, a juice exudes from the trunk during their combustion, which concretes, and is called *Orenburgh gum.* It is wholly soluble in water. (*Lindley, Flor. Med.*)

Pistacia. See MASTICHE.

Pistacia Terebinthus. Willd. *Sp. Plant.* iv. 752; Woodv. *Med. Bot.* p. 29, t. 12. This is a small tree with numerous spreading branches, bearing alternate pinnate leaves, which consist of three or four pairs of ovate-lanceolate, entire, acute, smooth, and shining leaflets, with an odd one at the end. The male and female flowers are dioecious, small, and in branching racemes. This is a native of Barbary and Greece, and flourishes in the islands of Cyprus and Chio, the latter of which has given its name to the *Chian turpentine* obtained from the tree. A gall produced upon this plant by the puncture of an insect, has been used in Eastern Europe in pectoral affections.

We shall treat of the several varieties of turpentine under distinct heads.

1. White Turpentine.

Térébenthine de Boston, *Fr.*

The *common American* or *white turpentine* (*Terebinthina, U. S., Lond.*) is procured chiefly from *Pinus palustris*, partly also from *Pinus Tæda*, and perhaps some other species inhabiting the Southern States. In former times, large quantities were collected in New England; but the turpentine trees of that section of the Union are said to be nearly exhausted; and our commerce has been until recently almost exclusively supplied from North Carolina, and the south-eastern parts of Virginia. Within a few years, however, attention has been turned to the collection of this valuable product in Georgia and Florida; and there is no doubt that, in time, an abundant supply will be derived from the vast pine forests which occupy the southern portion of our country bordering on the Gulf of Mexico. The following is the process for obtaining the turpentine as described by Michaux. During the winter months, excavations of the capacity of about three pints are made in the trunk of the tree three or four inches from the ground. Into these the juice begins to flow about the middle of March, and continues to flow throughout the warm season, slowly at first, rapidly in the middle of summer, and more slowly again in the autumnal months. The liquid is removed from these excavations as they fill, and transferred into casks, where it gradually thickens, and

* The following is the formula usually followed. Take of essence of spruce *half a pint;* pimento bruised, ginger bruised, hops, each, *four ounces;* water, *three gallons.* Boil for five or ten minutes; then strain, and add of warm water *eleven gallons;* yeast *a pint;* molasses *six pints.* Mix, and allow the mixture to ferment for twenty-four hours.

ultimately acquires a soft solid consistence. Very large quantities are thus annually procured, sufficient not only to supply the whole consumption of this country, but also to furnish a valuable export.

White turpentine, as found in our shops, is yellowish-white, of a peculiar somewhat aromatic odour, and a warm, pungent, bitterish taste. It is somewhat translucent, and of a consistence which varies with the temperature. In the middle of summer it is almost semi-fluid and very adhesive, though brittle; in the winter it is often so firm and hard, as to be incapable of being made into pills without heat. Exposed to the air it ultimately becomes perfectly hard and dry. In the recent state it affords about seventeen per cent. of volatile oil. It is apt to contain small pieces of bark, wood, or other impurity.

2. Common European Turpentine.

Térébenthine de Bordeaux, Térébenthine commune, *Fr.;* Gemeiner Terpentin, *Germ.;* Trementina comune, *Ital.;* Trementina comun, *Span.*

This is the *Terebinthina Vulgaris* of the former London Pharmacopæia. It is furnished by several species of pine; but chiefly by *P. sylvestris* and *P. maritima*. From the latter tree it is obtained largely in the maritime districts of the South-west of France, especially in the department of the Landes, and is exported from Bordeaux. Hence it is called in commerce *Bordeaux turpentine*. The process for procuring it consists simply in making incisions into the trunk, or removing portions of the bark, and receiving the juice which flows out in small troughs, or in holes dug at the foot of the tree. It is purified by heating, and filtering it through straw, or by exposing it to the sun in a barrel, through holes in the bottom of which the melted turpentine escapes. Thus prepared, it is whitish, turbid, thickish, and separates, upon standing, into two parts, one liquid and transparent, the other of a consistence and appearance like those of thickened honey. As found in European commerce it often consists wholly of this latter portion. It speedily hardens upon exposure to the air in thin layers. The most liquid specimens are completely solidified by the addition of one part of magnesia to thirty-two of the turpentine. (Guibourt, *Journ. de Pharm.*, xxv. 499.) It is scarcely ever given internally, but furnishes large quantities of oil of turpentine and resin. We do not import it into this country. The substance which the French call *galipot* or *barras*, is that portion of the turpentine which concretes upon the trunk of the tree when wounded, and is removed during the winter. (*Thenard.*) This, when purified by melting with water and straining, takes the name of *yellow* or *white pitch*, or *Burgundy pitch*. When turpentine has been deprived of its oil by distillation, the resin which remains is called *rosin*, and sometimes *colophony*, from the Ionian city of that name, where it was formerly prepared. It is the resin (*resina*) of the Dublin College, and is sometimes called yellow resin (*resina flava*). White resin (*resina alba*) is prepared by incorporating this, while in fusion, with a certain proportion of water. Tar (*pix liquida*) is the turpentine extracted from the wood by a slow combustion, and chemically altered by the heat. Common pitch (*pix*, *pix nigra*, or *resina nigra*) is the solid residue left after the evaporation by boiling of the liquid parts of tar.

3. Canada Turpentine.

Canada balsam, Balsam of fir; Baume de Canada, *Fr.;* Canadischer Balsam, Canadischer Terpentin, *Germ.;* Trementina del Canada, *Ital.*

This is the product of *Abies balsamea*, and is collected in Canada and the State of Maine. It is procured by breaking the vesicles which naturally form upon the trunk and branches, and receiving their liquid contents in a bottle. When fresh, it is colourless or slightly yellowish, transparent, of the consistence

of thin honey, very tenacious, of a strong, agreeable odour, and a bitterish, somewhat acrid taste. By time and exposure it becomes thicker and more yellow, and at last assumes a solid consistence. It is usually brought into market in bottles, and is kept in the shops under the name of *Canada balsam* or *balsam of fir*. In Europe, it is sometimes called *balm of Gilead*, from its supposed resemblance to that celebrated medicine. The term *balsam*, as at present understood, is improperly applied to it; as it contains no benzoic or cinnamic acid, and is in fact a true turpentine, consisting chiefly of resin and volatile oil. Bonastre obtained from 100 parts of Canada turpentine, 18·6 parts of volatile oil, 40·0 of resin easily dissolved by alcohol, 33·4 of sub-resin of difficult solubility in that fluid, 4·0 of caoutchouc similar to sub-resin, and 4·9 of bitter extractive and salts, besides traces of acetic acid. There is reason to believe that *Strasburg turpentine* is sometimes sold for it in the shops.

4. Venice Turpentine.

Térébenthine de mélèze, Térébenthine de Venise, *Fr.;* Venetianischer Terpentin, *Germ.;* Trementina di Venezia, *Ital.;* Trementina de Venecia, *Span.*

This turpentine received its name from the circumstance that it was formerly an extensive article of Venetian commerce. It is procured in Switzerland, and the French province of Dauphiny, from the *Larix Europæa* or larch, which grows abundantly upon the Alps and the Jura mountains. The peasants bore holes into the trunk about two feet from the ground, and conduct the juice by means of wooden gutters into small tubs, placed at a convenient distance. It is afterwards purified by filtration through a leather sieve. Genuine Venice turpentine is a viscid liquid, of the consistence of honey, flowing with difficulty, cloudy or imperfectly transparent, of a yellowish or slightly greenish colour, a strong not disagreeable odour, and a warm bitterish and very acrid taste. It does not readily concrete on exposure, is not solidified by one-sixteenth of magnesia, and is entirely soluble in alcohol. (Guibourt, *Journ. de Pharm.*, xxv. 500.) What is sold under the name of Venice turpentine in our shops, is usually quite brown, and is said to be a factitious substance, prepared by dissolving rosin in oil of turpentine. Dr. A. T. Thomson states that much of the Venice turpentine of the shops of London is obtained from America. It is probably the same preparation as that which passes under the name in this country.

5. Chian Turpentine.

Térébenthine de Chio, *Fr.;* Cyprischer Terpentin, *Germ.;* Trementina Cipria, *Ital.*

This variety of turpentine is collected chiefly in the island of Chio or Scio, by incisions made during the summer in the bark of *Pistacia Terebinthus*. The juice, flowing from the wounds, falls upon smooth stones placed at the foot of the tree, from which it is scraped with small sticks, and allowed to drop into bottles. The annual product of each tree is very small; and the turpentine, therefore, commands a high price even in the place where it is procured. Very little of it reaches this country. It is said to be frequently adulterated with the other turpentines. It is a thick, tenacious liquid, of a greenish-yellow colour, a peculiar penetrating odour more agreeable than that of the other substances of the same class, and a mild taste without bitterness or acrimony. It leaves a glutinous residue when treated with strong alcohol. (*Guibourt.*) On exposure to the air it speedily thickens, and ultimately becomes concrete and hard, in consequence of the loss of its volatile oil.

Besides the turpentines mentioned, various others are noticed in books on materia medica, though not found in the shops of this country. There are the *Strasburg turpentine*, much used in France, and obtained from the *Abies Picea*

(*Abies pectinata* of De Candolle), or European silver fir, which grows on the mountains of Switzerland and Germany, and bears a close resemblance, as well in its appearance as its product, to the *Abies balsamea* of Canada;* the *Damarra turpentine*, which speedily concretes into a very hard resin, and is derived from the *Pinus Damarra* of Lambert, the *Agathis Damarra* of Richard, growing in the East India islands; and the *Dombeya turpentine*, a glutinous, milky-looking fluid, of a strong odour and taste, derived from *Dombeya excelsa*, the *Araucaria Dombeyi* of Richard, which inhabits Chili, and is said to be identical with the Norfolk Island pine. These, with one or two other turpentines scarcely known, or having a doubtful claim to the title, are all that belong properly to this class of vegetable products.

General Properties. The turpentines resemble each other in odour and taste, though distinguished by shades of difference. Liquid at first, they become thick, and gradually solid by exposure, in consequence partly of the volatilization, partly of the oxidation of their essential oil. They are rendered more liquid or softened by heat, and at a high temperature take fire, burning with a white flame and much smoke. Water extracts only a minute proportion of their volatile oil. They are almost wholly soluble in alcohol and ether, and readily unite with the fixed oils. They yield by distillation a volatile oil, well known as the *oil of turpentine*, and leave a residue consisting exclusively of resin. (See *Oleum Terebinthinæ* and *Resina.*) A minute proportion of succinic acid passes over with the oil. From the experiments of M. Faure, of Bordeaux, it appears that some of the liquid turpentines, like copaiba, may be solidified by the addition of magnesia (*Journ. de Chim. Méd.*, 1830, p. 94); and, according to M. Thierry, the same result is obtained by the addition of one part of hydrate of lime to thirty-two parts of the common European turpentine. (*Journ. de Pharm.*, 3*e sér.*, i. 315.)

Medical Properties and Uses. The effects of the turpentines upon the system are dependent entirely on their volatile oil. They are stimulant, diuretic, anthelmintic, and in large doses laxative. When taken internally, or applied to the skin, they communicate a violet odour to the urine, and, if continued for some time, produce an irritation of the mucous membrane of the urinary passages, amounting frequently to strangury. The last effect is less apt to be experienced when they operate upon the bowels. Externally applied they act as rubefacients. Their medical virtues were known to the ancients. At present they are less used than formerly, having been superseded by their volatile oil. They are, however, occasionally prescribed in leucorrhœa, gleet, and other chronic diseases of the urinary passages; in piles and chronic inflammation or ulceration of the bowels; in chronic catarrhal affections; and in various forms of rheumatism, especially sciatica and lumbago. The white turpentine is usually employed in this country.

They may be given in the shape of pill made with powdered liquorice root; in emulsion with gum Arabic or yolk of egg, loaf sugar, and water; or in electuary formed with sugar or honey. Their dose is from a scruple to a drachm. In the quantity of half an ounce or an ounce, triturated with the yolk of an egg, and mixed with half a pint of mucilaginous liquid, they form an excellent injection in cases of ascarides, and of constipation attended with flatulence.

* This turpentine is described by Guibourt as being nearly as liquid as olive oil, at first turbid and whitish, but becoming by filtration or long standing transparent and almost colourless. Its odour is very agreeable, analogous to that of the citron, and its taste moderately acrid and bitter. It dries quickly in the air, is solidified by a sixteenth of magnesia, and is not entirely soluble in alcohol. It is procured, like the Canada turpentine, by incisions into the vesicles which form upon the surface of the tree, beneath the outer bark. According to Guibourt, this is the true *Venice turpentine*, while that described in the text, and generally recognised by authors as Venice turpentine, is in fact the *Strasburg.* (See *Journ. de Pharm.*, xxv. 487.)—*Note to the eighth edition.*

The vapour of turpentine, employed as a vapour-bath, has recently been highly recommended in the treatment of obstinate chronic rheumatism. According to M. A. Chevandier, it is borne well for about twenty-five minutes, at a temperature of from 140° to 160° F., producing acceleration of the pulse, and copious sweating, sometimes accompanied with a confluent eruption. (*Arch. Gén.*, 4*e sér.*, xxviii. 80.)

Off. Prep. Ceratum Resinæ Compositum; Emplastrum Cantharidis Comp.; Emplastrum Galbani Comp.; Unguentum Elemi; Unguentum Infusi Cantharidis. W.

TESTA. *U. S.*

Oyster-shell.

The shells of Ostrea edulis. *U. S.*

Ecailles des huitres, *Fr.;* Austerschalen, *Germ.;* Gusci della ostriche, *Ital.;* Cascaras, *Span.*

The common oyster is the *Ostrea edulis* of naturalists, an animal belonging to the class *Vermes*, order *Testacea*. It is found in many parts of the world, and is particularly abundant on our own coast, and in the bays of our large rivers. It consists of a soft pulpy portion, comprising the vital organs of the animal, enclosed in a hard bivalve shell, of the nature of mother-of-pearl. The flesh of the oyster forms a very digestible and nutritious article of food, particularly suited to convalescents; but the shell only is officinal.

Properties. Oyster-shells are too familiarly known to require description. They are made up, like other mother-of-pearl shells, of alternate layers of earthy matter, and of animal matter of the nature of coagulated albumen. According to the analysis of Bucholz and Brandes, their exact constituents are carbonate of lime 98·6, phosphate of lime 1·2, animal matter 0·5, alumina (accidental) 0·2=100·5. Thus it appears that the animal matter is present in but small amount. When calcined or burnt, the animal matter and carbonic acid are dissipated, and the shells are converted into a species of lime, called *oyster-shell lime.*

Crabstones, called crabs' eyes, and crabs' claws are both forms of carbonate of lime, resembling oyster-shell in containing a small proportion of animal matter. They were formerly officinal in the Edinburgh Pharmacopœia, but were very properly omitted on the last revision of that work. They will be noticed in the Appendix.

Pharmaceutical Uses. Oyster-shells require to be reduced to an impalpable powder, before they are fit for medicinal employment; and their preparation in this way constitutes their sole pharmaceutical use. When thus prepared they form *Testa Præparata*, under which head their medicinal properties will be noticed.

Off. Prep. Testa Præparata. B.

TORMENTILLA. *U. S. Secondary, Lond., Ed.*

Tormentil.

The root of Potentilla Tormentilla. *U. S., Ed.* The rhizoma. *Lond.*

Tormentille, *Fr.;* Tormentillwurzel, *Germ.;* Tormentilla, *Ital.;* Tormentila, *Span.*

POTENTILLA. *Sex. Syst.* Icosandria Polygynia.—*Nat. Ord.* Rosaceæ.

Gen. Ch. Calyx with a concave tube, a four or five-cleft limb, and four or five bractlets. *Petals* four or five. *Stamens* numerous. *Carpels* numerous, with a lateral style, on a procumbent, persistent, capitate, juiceless receptacle. *Seed* appended. Herbs or undershrubs, with compound leaves, stipules adnate to the petiole, and white, yellow, rarely red flowers. (*De Candolle.*)

Potentilla Tormentilla. Sibthorp. *Fl. Ox.* 162; Lindley, *Flor. Med.* 225.—*Tormentilla erecta.* Willd. *Sp. Plant.* ii. 1112; Woodv. *Med. Bot.* p. 503, t. 181.—*T. officinalis.* Smith, *Flor. Brit.* The tormentil, or *septfoil*, is a small perennial plant, very common throughout Europe. The stems, which rise about six or eight inches in height from a woody root, are slender, more or less erect, branching towards the top, and furnished with sessile leaves, which on the stalk usually consist of seven, on the branches of five, digitate, elliptical, villous, deeply serrated leaflets, three of which are larger than the others. The flowers are small, yellow, and solitary upon axillary peduncles. All parts of the plant are astringent, especially the root, which is the part employed. It is gathered in spring.

Properties. The root of tormentil is cylindrical or roundish, rather larger above than at the lower extremity, an inch or two in length, about as thick as the finger, knotty, sometimes contorted, brown or blackish externally, and reddish within. It has a slight aromatic odour, and a very astringent taste. Tannin is an abundant constituent. There is also a red colouring principle, soluble in alcohol, but insoluble in water. Besides these ingredients Meissner found resin, cerin, myricin, gummy extractive, gum, extractive, lignin, water, and a trace of volatile oil. The root is said to be used for tanning leather in the Orkneys and Western Islands of Scotland, and for staining leather red by the Laplanders. It yields all its medical virtues to boiling water.

Medical Properties and Uses. Tormentil is a simple and powerful astringent, applicable to all cases of disease in which this class of medicines is indicated. We seldom, however, employ it in this country, having indigenous plants of equal virtue. It may be given in substance, decoction, or extract. The dose of the powder is from thirty grains to a drachm.

Off. Prep. Decoctum Tormentillæ; Pulvis Cretæ Compositus. W.

TOXICODENDRON. *U. S. Secondary.*

Poison-oak.

The leaves of Rhus Toxicodendron. *U. S.*

Sumach vénéneux, *Fr.;* Gift-Sumach, *Germ.;* Albero del veleno, *Ital.*

RHUS. See RHUS GLABRUM.

Admitting, as appears generally to be done at present, that *Rhus Toxicodendron* and *Rhus radicans* of Linnæus are mere varieties of the same plant, there are three indigenous species of Rhus which possess poisonous properties—the one above mentioned, *R. vernix*, commonly known by the name of *swamp sumach* or *poison sumach*, and *R. pumilum* of the Southern States. Though the first only is designated in the Pharmacopœia, we shall briefly describe the three species; as their medical effects are probably similar, and their operation upon the system such that the plants should be known to every practitioner.

1. *Rhus radicans.* Willd. *Sp. Plant.* i. 1481; Bigelow, *Am. Med. Bot.* iii. 17.—*R. Toxicodendron.* Pursh, *Fl. Am. Sept.* p. 205. Though Elliott and Nuttall consider *R. radicans* and *R. Toxicodendron* as distinct species, the weight of botanical authority is on the other side, and Bigelow declares that he has "frequently observed individual shoots from the same stock, having the characters of both varieties." The difference, however, in their appearance is sufficiently striking to have led to the adoption of different common names, R. radicans being usually called *poison vine*, and R. Toxicodendron, *poison oak*. The former has a climbing stem, rising to a great height upon trees, rocks, and other objects, to which it adheres by strong rooting fibres, which it throws out from its sides. The leaves, which stand upon long footstalks, are ternate, with broad-ovate or rhomboidal, acute leaflets, smooth and shining on both sides, sometimes slightly hairy

on the veins beneath, entire, or irregularly lobed and toothed. The flowers are small, greenish-white, diœcious, and grow in lateral, usually axillary panicles, or compound racemes. The male flowers have five stamens, and the rudiments of a style; the female, which are of only half the size and on a different plant, have abortive stamens, and a short erect style, standing on a roundish germ, and terminating in three stigmas. The fruit consists of roundish, pale-green or whitish berries.

R. Toxicodendron, or poison-oak, has the form of a shrub from one to three feet high, with leaflets angularly indented, and pubescent beneath. But this character of the foliage is probably not constant; and the stunted growth may be owing to peculiarities of situation. Dr. Bigelow states that the young plants of R. radicans do not put forth rooting fibres until they are several years old, and that they are influenced in this respect by the contiguity of supporting objects.

This species of Rhus grows in woods, fields, and along fences from Canada to Georgia. It flowers in June and July. When wounded, it emits a milky juice, which becomes black on exposure to the air, and leaves upon linen or other cloth a stain, which cannot afterwards be removed by washing with soap and water, or by alcohol either hot or cold, but deepens by age. It has been proposed as an indelible ink. Ether dissolves it.

The juice applied to the skin frequently produces inflammation and vesication; and the same poisonous property is possessed by a volatile principle which escapes from the plant itself, and produces in certain persons when they come into its vicinity an exceedingly troublesome erysipelatous affection, particularly of the face. Itching, redness, a sense of burning, tumefaction, vesication, and ultimate desquamation, are some of the attendants of this poisonous action. The swelling of the face is sometimes so great as almost entirely to obliterate the features. The effects are experienced soon after exposure, and usually begin to decline within a week. A light cooling regimen, with saline purgatives, and the local use of cold lead-water, are the best remedies. All persons are not equally liable to the affection, and the great majority are wholly insusceptible of it from any ordinary exposure.

2. *Rhus vernix.* Willd. *Sp. Plant.* i. 1479; Bigelow, *Am. Med. Bot.* i. 96. The *swamp sumach* is a beautiful shrub or small tree, usually ten or fifteen feet high, but sometimes rising thirty feet. The bark of the trunk is dark-gray, of the branches lighter, of the extreme twigs and petioles beautifully red. The leaves are pinnate, with four or five pairs of opposite leaflets, and an odd terminal one. These are oblong or oval, entire or slightly sinuated, acuminate, smooth, and, except the one at the end, nearly sessile. The flowers, as in the preceding species, are diœcious. They are very small, greenish, and arranged in loose axillary panicles. The berries are small, roundish, and greenish-white.

The tree grows in swamps and low grounds, from Canada to Carolina, and flowers in June and July. It is thought to be identical with a species of Rhus which grows in Japan, and furnishes a fine black varnish, much used in that country. Dr. Bigelow found that the opaque whitish juice which exudes from our native plant when wounded, and which becomes permanently black on exposure, may be made to afford a brilliant, glossy, durable varnish, by boiling it sufficiently before applying it.

Rhus vernix produces, much more powerfully than *R. radicans*, the poisonous effects already described. Persons coming within its influence are much more apt to be affected with the poison, and generally suffer more severely. The whole body is sometimes enormously swollen, and the patient for many days scarcely able to move; but the complaint almost always spontaneously subsides without destroying life. As in the former instance, the susceptibility to the influence of the poison is exceedingly various, and some persons handle the plant with perfect impunity.

3. *Rhus pumilum.* Michaux, *Flor. Americ.* i. 182. This is a southern species, growing in upper Carolina, and not more than a foot in height. It is characterized by its pubescent branches and petioles; its pinnate leaves, with many pairs of oval, nearly acuminate, incised-dentate leaflets, downy beneath; and by its silky fruit. According to Pursh, it is the most poisonous of the genus.

It is probable that all parts of Rhus radicans (R. Toxicodendron) are possessed of active properties; but the leaves only are directed in the Pharmacopœia, under the title of Toxicodendron. These are inodorous, have a mawkish acrid taste, and yield their virtues to water. The presence of tannic and gallic acids has been detected in them.

Medical Properties and Uses. These leaves appear to be stimulant and narcotic, producing when swallowed more or less irritation of the stomach and bowels, and promoting the secretory function of the skin and kidneys. Orfila found them to act in the manner of the acrid poisons, and to produce a stupefying effect upon the nervous system. They were successfully used by Du Fresnoy, in France, in the cure of obstinate cutaneous diseases. Dr. Anderson, of Hull, in England, effected cures with the medicine in several cases of palsy. A sense of heat and pricking, with irregular twitchings, was excited by it in the affected parts. Dr. Horsfield, and other physicians of this country, have used it in consumption and dropsy, but with little success.

The dose of the leaves recommended by Dr. Anderson was half a grain or a grain three times a day; but this is much too small. Dr. Duncan gave them in larger doses, with little other than a laxative effect. Dr. Horsfield administered a teacupful of the strong infusion without disadvantage. In France, the extract is recommended in doses of fifteen or twenty grains, repeated two or three times a day, and gradually increased to one or two drachms. Some of Du Fresnoy's patients took an ounce without effect. The probability is, that the active principle is volatile, and that the extract is less efficient than the leaves themselves. The risk of experiencing the poisonous effects of the plant upon the system, will probably prevent its extensive employment as a remedy, unless it should prove much more useful than the trials hitherto made give us reason to expect.

W.

TRAGACANTHA. *U. S., Lond., Ed., Dub.*

Tragacanth.

The concrete juice of Astragalus verus. *U. S.* Juice exuded from the bark, hardened in the air. *Lond.* Gummy exudation from Astragalus gummifer and probably A. verus, and other species. *Ed.* Astragalus gummifer. The gummy exudation. *Dub.*

Gomme Adraganthe, *Fr.;* Tragant, *Germ.;* Dragante, *Ital.;* Gomo tragacanto, *Span.*

ASTRAGALUS. *Sex. Syst.* Diadelphia Decandria. —*Nat. Ord.* Fabaceæ or Leguminosæ.

Gen. Ch. Legume two-celled, more or less gibbous, with the lower suture turned inwards. *Carina* blunt. *Loudon's Encyc. of Plants.*

Numerous species belonging to this genus yield a gummy matter having the properties of tragacanth. The drug known in commerce by that name was at first erroneously supposed to be obtained from *A. Tragacantha* of Linnæus (*A. massiliensis* of Lamarck), which grows in the South of Europe and North of Africa, and is now said to yield no gum. It was afterwards ascribed, on the authority of Tournefort, to a species (*A. Creticus* of Lamarck) which grows in Crete and Ionia, and, on that of Olivier, to *A. verus*, which inhabits Asia Minor, Armenia, and Northern Persia. Labillardière described a species by the name of *A. gummifer*, which he found growing on Mount Libanus in Syria, and from which tragacanth

exudes, though not that of commerce. Sieber denies that any one of these species yields the officinal tragacanth, which he ascribes to *A. aristatus* growing in Anatolia, especially upon Mount Ida, where the gum is most abundantly collected. This plant, however, is not the *A. aristatus* of Villars, which, according to Sibthorp, furnishes tragacanth in Greece. (*Merat* and *De Lens.*) Professor Lindley received two specimens of plants, said to be those which furnish tragacanth in Turkistan, one of which proved to be *A. gummifer* of Labillardière, which was said to yield a white variety, and the other a new species which he called *A. strobiliferus*, and which was said to yield a red and inferior product. The fact seems to be, that the commercial drug is collected from various sources; and it is affirmed that all the species of Astragalus with thorny petioles are capable of producing it. These form a natural group, and so closely resemble each other that botanists have found some difficulty in distinguishing them. As *A. verus* is designated in the Pharmacopœia of the United States, and that of the London College, we shall briefly describe it.

Astragalus verus. Olivier, *Voy. dans l'Empire Ottoman*, v. 342, pl. 44. This is a small shrub, not more than two or three feet high, with a stem an inch in thickness, and numerous very closely crowded branches, covered with imbricated scales, and spines which are the remains of former petioles. The leaves, which are little more than half an inch long, consist of several pairs of opposite, villous, stiff, pointed leaflets, with a midrib terminating in a sharp yellowish point. The flowers are papilionaceous, small, yellow, axillary, aggregate, and furnished with cottony bractes. This species yields the gum collected in Persia, and thence transmitted southward to India through Bagdad and Bassora, northward to Russia, and westward to Aleppo.

Tragacanth exudes spontaneously during the summer from the stems and branches, hardening as it exudes, and assuming various forms according to the greater or less abundance of the juice.

Properties. It is in tortuous vermicular filaments, rounded or flattened, rolled up or extended, of a whitish or yellowish-white colour, somewhat translucent, resembling horn in appearance. Sometimes the pieces are irregularly oblong or roundish, and of a slightly reddish colour. It is hard and more or less fragile, but difficult of pulverization, unless exposed to a freezing temperature, or thoroughly dried, and powdered in a heated mortar. The powder is very fine and white. Tragacanth has no smell and very little taste. Its sp. gr. is 1·384. Introduced into water it absorbs a certain proportion of that liquid, swells very much, and forms a soft adhesive paste, but does not dissolve. If agitated with an additional quantity of water, this paste forms a uniform mixture; but in the course of one or two days the greater part separates, and is deposited, leaving a portion dissolved in the supernatant fluid. Tragacanth is wholly insoluble in alcohol. It appears to be composed of two different constituents, one soluble in water and resembling gum Arabic, the other swelling in water, but not dissolving. The former is said to differ from gum Arabic in affording no precipitate with silicate of potassa or sesquichloride of iron. (*Pereira's Mat. Med.*) The latter, which, according to Bucholz, constitutes 43 per cent. of tragacanth, is ranked by some among the peculiar proximate principles with the title of *tragacanthin*. It is probably identical with *bassorin*. It has the property of becoming blue with iodine, which is not the case with bassorin; but this property is ascribed to the presence of a small quantity of insoluble starch. According to M. Guerin, 100 parts of tragacanth contain 53·3 parts of arabin or pure gum, 33·1 of bassorin and insoluble starch, and 11·1 of water, and yield when burned 2·5 parts of ashes. To separate the soluble entirely from the insoluble part, requires agitation with separate portions of water, which are to be decanted and filtered; and the process is to be continued till water ceases to dissolve anything.

Berzelius considers tragacanth as a variety of mucilage. (See *Linum.*) Examined by Dr. Kützing, by means of the microscope, it was found to consist of organized cells, having thick walls sometimes of several concentric layers, and filled with starch granules. (See *Am. Journ. of Pharm.*, xxv. 37.)

Medical Properties and Uses. Tragacanth is demulcent, but, on account of its difficult solubility, is not often given internally. The great viscidity which it imparts to water, renders it useful for the suspension of heavy insoluble powders; and it is also employed in pharmacy to impart consistence to troches, for which it answers better than gum Arabic.

Off. Prep. Confectio Opii; Mucilago Tragacanthæ; Pilulæ Ferri Iodidi; Pulvis Tragacanthæ Compositus. W.

TRIOSTEUM. *U. S. Secondary.*

Fever-root.

The root of Triosteum perfoliatum. *U. S.*

TRIOSTEUM. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Caprifoliaceæ.

Gen. Ch. Calyx five-cleft, persistent, nearly the length of the corolla; segments linear, acute. *Corolla* tubular, five-lobed, sub-equal; base, nectariferous, gibbous. *Stigma* somewhat five-lobed, capitate. *Berry* three-celled, three-seeded, crowned with the calyx. *Nuttall.*

Triosteum perfoliatum. Willd. *Sp. Plant.* i. 990; Bigelow, *Am. Med. Bot.* i. 90; Barton, *Med. Bot.* i. 59. This plant is indigenous and perennial. Several stems usually rise from the same root. They are simple, erect, round, hairy, fistulous, herbaceous, and from one to four feet high. The leaves are opposite, large, mostly connate, oval, acuminate, entire, abruptly narrowed at the base, and pubescent on their under surface. The flowers are of a dull-purple colour, axillary, sessile, rarely solitary, sometimes in pairs, generally in triplets or five together in the form of whorls. The germ is inferior, and the style projects beyond the corolla, into the tube of which the stamens are inserted. The berry is oval and of a deep-orange colour, and contains three hard, bony seeds.

Fever-root, fever-wort, or *wild ipecac,* as this plant is variously called, though not very abundant, is found in most parts of the United States, preferring a limestone soil and shady situations. Its flowers appear in June. The whole plant has a bitter taste; but the root is most active, and is the only officinal part.

It is horizontal, long, about three-quarters of an inch in diameter, thicker and tuberculated near the origin of the stem, of a yellowish or brownish colour externally, whitish within, and furnished with fibres which may be considered as branches of the main root. When dry it is brittle and easily pulverized. It has a sickening odour, and a bitter nauseous taste. Both water and alcohol take up its active properties, which are retained in the extract.

Medical Properties and Uses. Fever-root is cathartic, and in large doses emetic. The late Professor Barton observed it also to produce a diuretic effect. The bark of the root is the part which has been usually employed. In the quantity of twenty or thirty grains it ordinarily acts upon the bowels; and may be given alone or in combination with calomel at the commencement of fevers. The extract may be given in half the dose. W.

ULMUS. *Lond.*

Elm Bark.

Ulmus campestris. The interior bark. *Lond.*

Ecorce d'orme, *Fr.;* Ulmenrinde, *Germ.;* Scorza del olma, *Ital.;* Corteza de olmo, *Span.*

ULMUS. *Sex. Syst.* Pentandria Digynia.—*Nat. Ord.* Ulmaceæ.

Gen. Ch. Calyx five-cleft. *Corolla* none. *Capsule* (*samara*) compressed membranaceous. *Willd.*

Ulmus campestris. Willd. *Sp. Plant.* i. 1324; Woodv. *Med. Bot.* p. 710, t. 242. This species of elm is characterized by its doubly serrate leaves, unequal at their base, by its nearly sessile, clustered, pentandrous flowers, and its smooth fruit. It is a large tree, with strong spreading branches, and a rough, cracked bark. It is a native of Europe, where the wood is highly esteemed for certain purposes in the arts.

The inner bark of its young branches, which is the officinal portion, is thin, tough, of a brownish-yellow colour, inodorous, and of a mucilaginous, bitterish, and very slightly astringent taste. It imparts to water its taste and mucilaginous properties. The tincture of iodine indicates the presence of starch, and Davy found somewhat more than two per cent. of tannin. A peculiar vegetable principle called *ulmin* or *ulmic acid*, now believed to be a constituent of most barks, was first discovered in the matter which spontaneously exudes from the bark of the European elm. It is a dark-brown almost black substance, without smell or taste, insoluble in cold water, sparingly soluble in boiling water which it colours yellowish-brown, soluble in alcohol, and readily dissolved by alkaline solutions.

Medical Properties and Uses. The bark of the European elm is demulcent, and very feebly tonic and astringent, and is said also to be diuretic. It has been recommended in cutaneous affections of the leprous character. Dr. Sigmond speaks in strong terms of its efficacy in all the varieties of lepra, in lichenous eruptions, and in tinea capitis, employed both internally and externally. (*Medico-Bot. Trans.*, i. 169.) It is usually given in the form of decoction, and in chronic cases must be long continued to produce beneficial results.

Off. Prep. Decoctum Ulmi. W.

ULMUS. *U. S.*

Slippery Elm Bark.

The inner bark of Ulmus fulva. *U. S.*

Ulmus. See ULMUS. *Lond.*

Ulmus fulva. Michaux, *Flor. Americ.* i. 172. — *Ulmus rubra.* F. Andrew Michaux, *N. Am. Sylv.* iii. 89. The *slippery elm*, called also *red elm*, is a lofty tree, rising fifty or sixty feet in height, with a stem fifteen or twenty inches in diameter. The bark of the trunk is brown, that of the branches rough and whitish. The leaves are oblong-ovate, acuminate, nearly equal at the base, unequally serrate, pubescent and very rough on both sides, four or five inches in length by two or three in breadth, and supported on short footstalks. The buds, a fortnight before their development, are covered with a dense russet down. The flowers, which appear before the leaves, are sessile, and in clusters at the extremity of the young shoots. The bunches of flowers are surrounded by scales, which are downy like the buds. The calyx also is downy. There is no corolla. The stamens are five in number, short, and of a pale-rose colour. The fruit is a membranaceous capsule or samara, enclosing in the middle one round seed, destitute of fringe.

This species of elm is indigenous, growing in all parts of the United States north of Carolina, but most abundantly west of the Alleghany mountains. It flourishes in open, elevated situations, and requires a firm, dry soil. From the *white elm*, *U. Americana*, it is distinguished by its rough branches, its larger, thicker, and rougher leaves, its downy buds, and the character of its flowers and seeds. Its period of flowering is in April. The inner bark is the part used, and is brought to the shops separated from the epidermis.

It is in long, nearly flat pieces, from one to two lines in thickness, of a fibrous texture, a tawny colour which is reddish on the inner surface, a peculiar sweetish, not unpleasant odour, and a highly mucilaginous taste when chewed. By grinding, it is reduced to a light, grayish fawn-coloured powder. It abounds in mucilaginous matter, which it readily imparts to water. The mucilage is precipitated by solutions of acetate and subacetate of lead, but not by alcohol.

Much of the bark recently brought into the market is of inferior quality, imparting comparatively little mucilage to water. It has the characteristic odour of the genuine bark, but is much less fibrous and more brittle, breaking abruptly when bent, instead of being capable, like the better kind, of being folded lengthwise without breaking. To what this inferiority is owing, whether to difference in the species or the age, or to circumstances in the growth of the tree producing it, we are unable to determine.

Dr. C. W. Wright, of Cincinnati, in a communication to the *Western Lancet*, states that slippery elm bark has the property of preserving fatty substances from rancidity; a fact derived originally from the Indians, who prepared bears' fat by melting it with the bark, in the proportion of a drachm of the latter to a pound of the former, keeping them heated together for a few minutes, and then straining off the fat. Dr. Wright tried the same process with butter and lard, and found them to remain perfectly sweet for a long time. (*Am. Journ. of Pharm.*, xxiv. 180.)

Medical Properties and Uses. Slippery elm bark is an excellent demulcent, applicable to all cases in which this class of medicines is employed. It is especially recommended in dysentery, diarrhœa, and diseases of the urinary passages. Like the bark of the common European elm, it has been employed in cutaneous eruptions; but neither in these, nor in any other complaints, does it probably exert any greater powers than such as belong to the demulcents generally. Its mucilage is highly nutritious; and we are told that it has proved sufficient for the support of life in the absence of other food. The instance of a soldier is mentioned, who lived for ten days in the woods on this bark and sassafras; and the Indians are said to resort to it for nutriment in extreme emergencies.

It is usually employed as a drink in the form of infusion. (See *Infusum Ulmi.*) The powder may be used, stirred in hot water, with which it forms a mucilage, more or less thick according to the proportion added. The bark also serves as an emollient application in cases of external inflammation. For this purpose the powder may be formed into a poultice with hot water, or the bark itself may be applied, previously softened by boiling. Dr. McDowell, of Virginia, has recommended the use of slippery elm bark for the dilatation of fistulas and strictures. (*Med. Examiner*, i. 244, from the *West. Journ. of Med. and Phys. Sci.*)

Off. Prep. Infusum Ulmi. W.

UVA PASSA. *U. S.*

Raisins.

The dried fruit of Vitis vinifera. *U. S.*

Off. Syn. UVA. Vitis vinifera. The prepared fruit. *Lond.;* UVÆ PASSÆ. Dried fruit of Vitis vinifera. *Ed., Dub.*

Raisins secs, *Fr.;* Rosinen, *Germ.;* Uve passe, *Ital.;* Pasas, *Span.*

VITIS. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Vitaceæ.

Gen. Ch. Petals cohering at the apex, withering. *Berry* five-seeded, superior. *Willd.*

Vitis vinifera. Willd. *Sp. Plant.* i. 1180; Woodv. *Med. Bot.* p. 144, t. 57. The vine is too well known to require description. This particular species is

distinguished by the character of its leaf, which is lobed, sinuated, and naked or downy. The leaves and tendrils are somewhat astringent, and were formerly used in diarrhœa, hemorrhages, and other morbid discharges. The juice which flows from the stem was also thought to be possessed of medicinal virtues, and the prejudice still lingers among the vulgar in some countries. The unripe fruit has a harsh sour taste, and yields by expression a very acid liquor, called *verjuice*, which was much esteemed by the ancients as a refreshing drink, when diluted with water. It contains malic and tartaric acids, and another called by some chemists *racemic acid*, by Berzelius *paratartaric acid*, from its resemblance to the tartaric, with which it agrees in composition, though differing from it in properties. The grape, when quite ripe, is among the most pleasant and grateful fruits brought upon the table, and is admirably adapted, by its refreshing properties, to febrile complaints. If largely taken, it proves diuretic and gently laxative. The ripe fruit differs from the unripe in containing more sugar and less acid, though never entirely destitute of the latter. The plant is supposed to have been derived originally from Asia; but it has been cultivated in Europe and Northern Africa from the remotest antiquity, and is now spread over all the temperate civilized regions of the globe. The fruit is exceedingly influenced by soil and climate, and the varieties which have resulted from culture or situation are innumerable. Those which yield the raisins of commerce are confined to the basin of the Mediterranean.

Raisins are prepared either by partially cutting the stalks of the bunches before the grapes are perfectly ripe, and allowing them to dry upon the vine; or by picking them in their mature state, and steeping them for a short time previously to desiccation in an alkaline ley. Those cured by the first method are most highly esteemed.

Several varieties of raisins are known in commerce. The best of those brought to this country are the *Malaga* raisins, imported from Spain. They are large and fleshy, of a purplish-brown colour, and sweet agreeable taste. Those produced in Calabria are similar. The *Smyrna* raisins are also large, but of a yellowish-brown colour, slightly musky odour, and less agreeable flavour. They are originally brought from the coast of Syria. The *Corinthian raisins*, or *currants* as they are commonly called in this country, are small, bluish-black, of a fatty appearance, with a vinous odour, and a sweet slightly tartish taste. Their name was derived from the city in the vicinity of which they were formerly cultivated. At present they are procured chiefly from Zante, Cephalonia, and the other Ionian Islands. In the older Pharmacopœias they are distinguished by the title of *uvæ passæ minores*.

Raisins contain a larger proportion of sugar than recent grapes. This principle, indeed, is often so abundant that it effloresces on the surface, or concretes in separate masses within the substance of the raisin. The *sugar of grapes* differs slightly from that of the cane, and is said to be identical with that produced by the action of sulphuric acid upon starch. It is less sweet than common sugar, less soluble in cold water, much less soluble in alcohol, and forms a syrup of less consistence.

Medical Properties and Uses. The chief medical use of raisins is to flavour demulcent beverages. Taken in substance they are gently laxative; but are also flatulent and difficult of digestion, and, when largely eaten, sometimes produce unpleasant effects, especially in children.

Off. Prep. Decoctum Guaiaci; Decoctum Hordei Compositum; Mistura Althææ; Tinctura Cardamomi Composita; Tinctura Quassiæ Comp.; Tinctura Rhei et Sennæ; Tinctura Sennæ Comp. W.

UVA URSI. *U. S., Lond., Ed., Dub.*

Uva Ursi.

The leaves of Arctostaphylos Uva Ursi. *U. S., Lond., Ed., Dub.*

Busserole, Raisin d'ours, *Fr.;* Bärentraube, *Germ.;* Corbezzolo, Uva Ursina, *Ital.;* Gayuba, *Span.*

Arctostaphylos. *Sex. Syst.* Decandria Monogynia.—*Nat. Ord.* Ericaceæ. *Gen. Ch. Drupe* with five distinct, one-seeded stones. *Corolla* urceolate, with a revolute limb. *Stamens* included. *Anthers* with two spurs at the back. (Lindley, *Med. and Æcon. Bot.*, 106.)

Arctostaphylos Uva Ursi. Sprengel, *Syst.* ii. 287; Carson, *Illust. of Med. Bot.* i. 61, pl. 52.—*Arbutus Uva Ursi.* Willd. *Sp. Plant.* ii. 618; Bigelow, *Am. Med. Bot.* i. 66. The *uva ursi*, or *bearberry*, is a low evergreen shrub, with trailing stems, the young branches of which rise obliquely upwards for a few inches. The leaves are scattered upon short petioles, obovate, acute at the base, entire, with a rounded margin, thick, coriaceous, smooth, shining, of a deep-green colour on their upper surface, paler and covered with a network of veins beneath. The flowers, which stand on short reflexed peduncles, are collected in small clusters at the ends of the branches. The calyx is small, five-parted, of a reddish colour, and persistent. The corolla is ovate or urceolate; reddish-white, or white with a red lip, transparent at the base, contracted at the mouth, and divided at the margin into five short reflexed segments. The stamens are ten, with short filaments and bifid anthers; the germ round, with a style longer than the stamens, and a simple stigma. The fruit is a small, round, depressed, smooth, glossy, red berry, containing an insipid mealy pulp, and five cohering seeds.

This humble but hardy shrub inhabits the northern latitudes of Europe, Asia, and America. It is also found in the lofty mountains of Southern Europe, such as the Pyrenees and the Alps; and, on the American continent, extends from Hudson's Bay as far southward as New Jersey, in some parts of which it grows in great abundance. It prefers a barren soil, flourishing on gravelly hills, and elevated sandy plains. The leaves are the only part used in medicine. They are imported from Europe; but are also collected within our own limits; and the market of Philadelphia is supplied to a considerable extent from New Jersey. They should be gathered in autumn, and the green leaves only selected.

In Europe the uva ursi is often adulterated with the leaves of *Vaccinium Vitis Idæa*, which are wholly destitute of its peculiar properties, and may be distinguished by their rounder shape, their revolute edges which are sometimes slightly toothed, and the appearance of their under surface, which is dotted, instead of being reticulated as in the genuine leaf. Leaves of the *Chimaphila umbellata* are sometimes found among the uva ursi as it exists in our markets: They may be readily detected by their greater length, their cuneiform-lanceolate shape, and their serrate edges.

The leaves of the uva ursi are inodorous when fresh, but acquire a smell not unlike that of hay when dried and powdered. Their taste is bitterish, strongly astringent, and ultimately sweetish. They afford a light-brown, greenish-yellow powder. Water extracts their active principles, which are also soluble in officinal alcohol. Among their ingredients are tannic and gallic acids, bitter extractive, resin, gum, fatty matter, a volatile oil, and salts of potassa and lime. The tannic acid is so abundant that the leaves are used for tanning in some parts of Russia. Neither this principle nor gallic acid exists in the leaves of the *Vaccinium Vitis Idæa.* A crystallizable principle was extracted from uva ursi by Mr. J. C. C. Hughes, by the following process. An aqueous extract of the leaves was treated with strong alcohol, and submitted for twenty-four hours to the action of purified

animal charcoal. The tincture was filtered and evaporated, and the residue redissolved in alcohol and treated with animal charcoal as before. After filtration, the liquid was allowed to evaporate spontaneously, and yielded colourless, transparent, needle-shaped crystals, soluble in alcohol, ether, and dilute acids, insoluble in the fixed and volatile oils, neutral to test-paper, and combustible. Its watery solution is precipitated by subacetate of lead and carbonate of potassa, but not by lime-water, or tincture of chloride of iron. One grain of it acted as a powerful diuretic. Mr. Hughes proposed for this substance the name of *ursin*. (*Am. Journ. of Pharm.*, xix. 90.) Kawalier obtained a crystalline substance, named *arbutin*, by precipitating the decoction with acetate of lead, filtering, treating the liquid with sulphuretted hydrogen, again filtering, evaporating to the consistence of syrup, and allowing the resulting product to stand for several days. This gradually assumed the form of a crystalline jelly, which, being placed upon linen so as to allow the mother liquor to drain off, and then pressed, yielded nearly colourless crystals, which were purified by solution in boiling water, and treatment with animal charcoal. Arbutin thus obtained is in long, acicular, colourless crystals, united in tufts, and of a bitter taste. It is soluble in water, alcohol, and ether, unchanged apparently by a heat of 212°, but fusible at a high temperature, without action on vegetable colours, and not precipitated by sesquisalts of iron, or by acetate or subacetate of lead. Its formula is $C_{32}H_{24}O_{21}$. (*Chem. Gaz.*, Feb. 15, 1853, p. 61.)

Medical Properties and Uses. Uva ursi is astringent and tonic, and is thought by some to have a specific direction to the urinary organs, for the complaints of which it is chiefly used. Others deny that it possesses any peculiar tendency of this kind, and ascribe all its effects to its astringent and tonic action. It alters the colour of the urine, and its astringent principle has been detected in that secretion. It probably, therefore, exerts a direct influence on the kidneys and urinary passages. Though known to the ancients, it had passed into almost entire neglect, till its use was revived by De Haen about the middle of the last century. It has acquired some reputation as an antilithic, and has undoubtedly been serviceable in gravel, partly, perhaps, by a direct action on the kidneys, partly by giving tone to the digestive organs, and preventing the accumulation of principles calculated to produce a secretion or precipitation of calculous matter. In chronic nephritis it is also a popular remedy, and is particularly recommended when there is reason to conjecture the existence of ulceration in the kidneys, bladder, or urinary passages. Diabetes, catarrh of the bladder, incontinence of urine, gleet, leucorrhœa, and menorrhagia, are also among the diseases in which it has occasionally proved serviceable; and testimony is not wanting to its beneficial effects in phthisis pulmonalis. Dr. E. G. Harris, of Fayette, Alabama, believes it to have the property of promoting uterine contraction, and has employed it with supposed advantage as a substitute for ergot in tedious labours. (*Med. Exam.*, N. S., ix. 727, from *South. Med. and Surg. Journ.*) The dose of the powder is from a scruple to a drachm, to be repeated three or four times a day; but the form of decoction is usually preferred. (See *Decoctum Uvæ Ursi.*)

Off. Prep. Decoctum Uvæ Ursi; Extractum Uvæ Ursi. W.

VALERIANA. *U. S., Lond., Ed., Dub.*

Valerian.

The root of Valeriana officinalis. *U. S., Ed.* Root of the wild plant. *Lond., Dub.*

Valériane, *Fr.;* Wilde Baldrianwurzel, *Germ.;* Valeriana silvestre, *Ital.;* Valerian silvestre, *Span.*

VALERIANA. *Sex. Syst.* Triandria Monogynia.—*Nat. Ord.* Valerianaceæ.

Gen. Ch. *Calyx* very small, finally enlarged into a feathery pappus. *Corolla* monopetalous, five-lobed, regular, gibbous at the base. *Capsule* one-celled. (*Loudon's Encyc. of Plants.*) *Stamens* exserted, one, two, three, and four. (*Nuttall.*)

Valeriana officinalis. Willd. *Sp. Plant.* i. 177; Woodv. *Med. Bot.* p. 77, t. 32. The *officinal*, or *great wild valerian*, is a large handsome herbaceous plant, with a perennial root, and an erect, round, channeled stem, from two to four feet high, furnished with opposite pinnate leaves, and terminating in flowering branches. The leaves of the stem are attached by short broad sheaths, the radical leaves are larger and stand on long footstalks. In the former the leaflets are lanceolate and partially dentate, in the latter elliptical and deeply serrate. The flowers are small, white or rose-coloured, agreeably odorous, and disposed in terminal corymbs, interspersed with pear-shaped pointed bractes. The number of stamens is three. The fruit is a capsule containing one oblong-ovate, compressed seed.

The plant is a native of Europe, where it grows either in damp woods and meadows, or on dry elevated grounds. As found in these different situations, it presents characters so distinct as to have induced some botanists to make two varieties. Dufresne makes four, of which three prefer marshy situations. The variety which affects a dry soil (*sylvestris*, L. Ph.) is not more than two feet high, and is distinguished by its narrow leaves. It has been generally believed to be superior to the others in medicinal virtue; but, from experiments of A. Buchner, it appears that the dried roots of the variety which grows in low moist grounds are in no respect inferior, and that the general opinion to the contrary is a prejudice. (*Pharm. Cent. Blatt*, June 16, 1852, p. 429.)

The root, which is the officinal portion, is collected in spring before the stem begins to shoot, or in the autumn when the leaves decay. It should be dried quickly, and kept in a dry place. It consists of numerous long, slender, cylindrical fibres, issuing from a tuberculated head or rhizoma. As brought to this country it frequently has portions of the stem attached. The English is superior to that brought from the continent of Europe. Within a few years valerian of very good quality has been produced by the Shakers at Enfield, New Hampshire. (Gardener, *New York Journ. of Med.*, N. S., iv. 190.) From our own observation, we know that the plant grows luxuriantly under culture in this country.

Properties. The colour of the root is externally yellowish or brown, internally white. The powder is yellowish-gray. The odour, which in the fresh root is slight, in the dried is strong and highly characteristic, and, though rather pleasant to many persons, is very disagreeable to others. Cats are said to be strongly attracted by it. The taste is at first sweetish, afterwards bitter and aromatic. Valerian yields its active properties to water and alcohol. Trommsdorff found it to consist of 1·2 parts of volatile oil; 12·5 of a peculiar extractive matter, soluble in water, insoluble in ether and alcohol, and precipitated by metallic solutions; 18·75 of gum; 6·25 of a soft odorous resin; and 63 of lignin. Runge found in it a peculiar fixed acid, which produced with bases white salts, becoming green on exposure to the air. (*Chem. Gaz.*, No. 170, p. 452.) Of these constituents the most important is the volatile oil, in which the virtues of the root chiefly reside. It is of a pale-greenish colour, of the sp. gr. 0·934, with a pungent odour of valerian, and an aromatic taste. It becomes yellow and viscid by exposure. Trommsdorff ascertained that it contains a peculiar volatile acid, upon which the name of *valerianic acid* or *valeric acid* has been conferred. This, when separated from the oil, is a colourless liquid, of an oleaginous consistence, having an odour analogous to that of valerian, and a very strong, sour, disagreeable taste. It is soluble in thirty parts of water, and in all proportions in ether and alcohol. It combines with salifiable bases, forming soluble salts, which retain, in a diminished degree, the odour of the acid. (*Journ. de Pharm.*, xx. 316.) From the experiments of MM. Cozzi and Thirault, it would appear that the acid does not pre-

exist in the root, but results from the oxidation of the volatile oil. (*Ibid.*, 3*e sér.*, xii. 162.) Valerianic acid is obtained by distilling the impure oil from carbonate of magnesia, decomposing by sulphuric acid the valerianate of magnesia which remains, and again distilling. M. Rabourdin, of Orleans, believing that a large proportion of the valerianic acid remains fixed in the root by union with a base, and does not come over by distillation alone, procures it by adding sulphuric acid to the root with a sufficient quantity of water, distilling, separating the oil, saturating the liquor with carbonate of soda, evaporating, adding a slight excess of sulphuric acid, and again distilling. (*Ibid.*, vi. 310.) The following process by Messrs. T. and H. Smith, of Edinburgh, avoids the inconvenience of distilling so bulky a root as valerian, while it answers the same purpose as that of M. Rabourdin. Boil the root for three or four hours with rather more than its bulk of water, in which an ounce of carbonate of soda is dissolved for every pound of the root, replacing the water as it evaporates. Express strongly, and boil the residuum twice with the same quantity of water, expressing each time as before. Mix the liquids, add two fluidrachms of strong sulphuric acid for every pound of the root, and distil till three-fourths of the liquid have passed over. Neutralize this with carbonate of soda, concentrate the liquid, decompose the valerianate of soda contained in it by sulphuric acid, and separate the valerianic acid now set free, either by a separatory, or by distillation. (See *Am. Journ. of Pharm.*, xvii. 253.) A similar process was also proposed by Prof. Procter, of Philadelphia. (*Ibid.*, xvii. 3.) M. J. Lefort proposes to obtain the acid by the rapid oxidation of the volatile oil. His plan is to distil 100 parts of the root with 500 of water, 10 of sulphuric acid, and 6 of bichromate of potassa. In this way he has procured a larger proportion of acid than by any other process. (*Journ. de Pharm.*, 3*e sér.*, x. 194.)*

The roots of the *Valeriana Phu* and *V. dioica* are said to be sometimes mingled with those of the officinal plant; but the adulteration is attended with no serious consequences; as, though much weaker than the genuine valerian, they possess similar properties. The same cannot be said of the roots of several of the *Ranunculaceæ*, which, according to Ebermayer, are sometimes fraudulently substituted in Germany. They may be readily detected by their want of the peculiar odour of the officinal root.

Medical Properties and Uses. Valerian is gently stimulant, with an especial direction to the nervous system, but without narcotic effect. In large doses it produces a sense of heaviness and dull pain in the head, with various other effects indicating nervous disturbance. It is useful in cases of irregular nervous action, when not connected with inflammation, or an excited condition of the system. Among the complaints in which it has been particularly recommended are hysteria, hypochondriasis, epilepsy, hemicrania, and low forms of fever attended with restlessness, morbid vigilance, or other nervous disorder. It has also been used in intermittents, combined with Peruvian bark. At best, however, it is an uncertain remedy. It may be given in powder or infusion. In the latter form, it is said by Professor Joerg, of Leipsic, who has experimented with it, to be less apt to irritate the alimentary canal than when administered in substance. The dose of the powder is from thirty to ninety grains, repeated three or four times a day.

* Recently valerianic acid has been obtained from various sources as a result of chemical reaction. A relation has been discovered between it and fusel oil (*Alcohol Amylicum*, Dub.), similar to that which exists between acetic acid and alcohol. *Amyle* ($C_{10}H_{11}$) is a compound radical, which by uniting with one eq. of oxygen and one of water forms fusel oil ($C_{10}H_{11}O+HO$). This, by the absorption of two eqs. of oxygen and the loss of two eqs. of hydrogen, is converted into hydrated valerianic acid ($C_{10}H_9O_3+HO$). Such a change may be effected by exposing the fusel oil to various oxidizing influences. (See *Alcohol Amylicum* and *Sodæ Valerianas* in the second part of this work.)—*Note to the ninth edition.*

The tincture is also officinal. As the virtues of valerian reside chiefly in the volatile oil, the medicine should not be given in decoction or extract. The distilled water is used on the continent of Europe; and the volatile oil is occasionally substituted with advantage for the root. The dose of the oil is four or five drops.

Off. Prep. Extractum Valerianæ Fluidum; Infusum Valerianæ; Oleum Valerianæ; Tinctura Valerianæ; Tinctura Valerianæ Ammoniata. W.

VERATRUM ALBUM. *U. S.*

White Hellebore.

The rhizoma of Veratrum album. *U. S.*

Off. Syn. VERATRUM. Veratrum album. The rhizoma. *Lond., Ed.*

Ellebore blanc, *Fr.;* Weisse Niesswurzel, *Germ.;* Eleboro bianco, *Ital.;* Veratro blanco, *Span.*

VERATRUM. *Sex. Syst.* Polygamia Monœcia.—*Nat. Ord.* Melanthaceæ.

Gen. Ch. HERMAPHRODITE. *Calyx* none. *Corolla* six-petaled. *Stamens* six. *Pistils* three. *Capsules* three, many-seeded. MALE. *Calyx* none. *Corolla* six-petaled. *Stamens* six. *Pistils* a rudiment. *Willd.*

Botanists who reject the class *Polygamia* of Linnæus, place this genus in the class and order *Hexandria Trigynia*, with the following character. "Polygamous. *Corolla* six-parted, spreading, segments sessile and without glands. *Stamens* inserted upon the receptacle. *Capsules* three, united, many-seeded." *Nuttall.*

Veratrum album. Willd. *Sp. Plant.* iv. 895; Woodv. *Med. Bot.* p. 754, t. 257. This is an herbaceous plant, with a perennial, fleshy, fusiform root or rhizoma, yellowish-white externally, pale yellowish-gray within, and beset with long cylindrical fibres of a grayish colour, which constitute the true root. The stem is three or four feet high, thick, round, erect, and furnished with alternate leaves, which are oval, acute, entire, plaited longitudinally, about ten inches long by five in breadth, of a yellowish-green colour, and embrace the stem at their base. The flowers are greenish, and arranged in a terminal panicle.

The white hellebore is a native of the mountainous regions of continental Europe, and abounds in the Alps and Pyrenees. All parts of the plant are said to be acrid and poisonous; but the root (rhizoma) only is officinal. This is brought to us from Germany in the dried state, in pieces from one to three inches long by an inch or less in mean diameter, cylindrical or in the shape of a truncated cone, internally whitish, externally blackish, wrinkled, and rough with the remains of the fibres which have been cut off near their origin. Sometimes the fibres continue attached to the root. They are numerous, yellowish, and of the size of a crow's quill. White hellebore deteriorates by keeping.

Properties. The fresh root has a disagreeable odour, which is lost by drying. The taste is at first sweetish, afterwards bitterish, acrid, burning, and durable. The powdered root is grayish. Analyzed by Pelletier and Caventou, white hellebore was found to contain an oily matter consisting of olein, stearin, and a volatile acid; *supergallate of veratria*, a yellow colouring matter, starch, gum, lignin, silica, and various salts of lime and potassa. The medicinal properties of the root reside in the veratria, which was first discovered in the seeds of *Veratrum Sabadilla*, and probably exists in other plants belonging to the same family. For an account of this alkaloid, see the article *Veratria*, among the preparations. Simon believed that he had found two new vegetable alkalies in white hellebore, one of which was named *barytina*, from being precipitated, like baryta, from its solution in acetic or phosphoric acid by sulphuric acid or the sulphates; the other *jervina*, from the Spanish name for a poison obtained from the root of white hellebore. (*Pharm. Cent. Blatt*, 1837, p. 191.)

Medical Properties and Uses. White hellebore is a violent emetic and cathartic, capable of producing dangerous and fatal effects when incautiously administered. Even in small doses it has sometimes occasioned severe vomiting, hypercatharsis with bloody stools, and alarming symptoms of general prostration. Like many other acrid substances, it appears, in small doses, to be a general stimulant to the secretions. Applied externally upon a portion of the surface denuded of the cuticle, as upon ulcers, for example, it gives rise to griping pain in the bowels, and sometimes violent purging. When snuffed up the nostrils, it occasions great irritation with violent sneezing, and its use in this way is not free from danger. It was employed by the ancients in dropsy, mania, epilepsy, leprosy, elephantiasis, and other obstinate disorders, not without occasional advantage; but the severity of its operation has led to its general abandonment as an internal remedy. It is sometimes used as an errhine, diluted with some mild powder, in cases of gutta serena and lethargic affections; and, in the shape of decoction, or of ointment prepared by mixing the pulverized root with lard, has been found beneficial as an external application in the itch, and other cutaneous eruptions. From the resemblance of its operation to that of the *eau medicinale d'Husson*, so celebrated for the cure of gout, it was at one time, though erroneously, conjectured to be the chief constituent of that remedy. A mixture of the wine of white hellebore and the wine of opium, in the proportion of three parts of the former to one of the latter, was introduced into use by Mr. Moore, of London, as a substitute for the *eau medicinale*, and was considerably employed in gouty and rheumatic affections.

In whatever way white hellebore is used, it requires cautious management. It has been given in doses varying from one grain to a scruple. Not more than two grains should be administered at first. When employed as an errhine, it should be mixed with five or six parts of pulverized liquorice root, or other inactive powder. Ten or twelve grains of the mixture may be snuffed up the nostrils at one time. Veratria acts in a similar manner with the white hellebore, but is much more powerful. From one-twelfth to one-sixth of a grain may be given in pill or alcoholic solution, and repeated three or four times in the twenty-four hours, till it nauseates or purges. For an account of its practical applications the reader is referred to *Veratria*, among the Preparations, in the second part of this work.

Off. Prep. Unguentum Sulphuris Compositum; Unguentum Veratri Albi; Vinum Veratri Albi. W.

VERATRUM VIRIDE. *U. S.*

American Hellebore.

The rhizoma of Veratrum viride. *U. S.*

Veratrum. See VERATRUM ALBUM.

Veratrum viride. Willd. *Sp. Plant.* iv. 896; Bigelow, *Am. Med. Bot.* ii. 121. The American hellebore, known also by the names of *Indian poke*, *poke root*, and *swamp hellebore*, has a perennial, thick, fleshy root or rhizoma, the upper portion of which is tunicated, the lower solid, and beset with numerous whitish fibres or radicles. The stem is annual, round, striated, pubescent, and solid, from three to six feet in height, furnished with green bright leaves, and terminating in a panicle of greenish-yellow flowers. The leaves gradually decrease in size as they ascend. The lower are from six inches to a foot long, oval, acuminate, plaited, nerved, and pubescent; and embrace the stem at their base, thus affording it a sheath for a considerable portion of its length. Those on the upper part of the stem, at the origin of the flowering branches, are oblong-lanceolate.

The panicle consists of numerous flowers, distributed in racemes with downy peduncles. Each flower is accompanied with a downy pointed bracte, much longer than its pedicel. There is no calyx, and the corolla is divided into six oval acute segments, thickened on the inside at their base, with the three alternate segments longer than the others. The six stamens have recurved filaments, and roundish two-lobed anthers. The germs are three, with recurved styles as long as the stamens. Some of the flowers have only the rudiments of pistils. Those on the upper end of the branchlets are barren, those on the lower portion fruitful. The fruit consists of three cohering capsules, separating at top, opening on the inner side, and containing flat imbricated seeds.

This indigenous species of Veratrum is found from Canada to the Carolinas, inhabiting swamps, wet meadows, and the banks of mountain streamlets. Early in the spring, before the stem rises, it bears a slight resemblance to the *Symplocarpus fœtidus*, with which it is very frequently associated; but the latter sends forth no stem. From May to July is the season for flowering. The root should be collected in autumn, and should not be kept longer than one year, as it deteriorates by time.

The root of the American hellebore has a bitter acrid taste, leaving a permanent impression in the mouth and fauces. In sensible properties it bears a close resemblance to white hellebore; and from this circumstance, as well as from the strong botanical affinity of the two plants, it is highly probable that it contains veratria. The experiments of Mr. Mitchell and Mr. Worthington, of Philadelphia, go to strengthen this probability. (See *Am. Journ. of Pharm.*, ix. 181, and x. 89.)

Medical Properties and Uses. American hellebore has been thought to resemble its European congener in its effects upon the system, though asserted by Dr. Osgood to be wholly destitute of cathartic properties. In addition to its emetic action, which is often violent and long-continued, it is said to increase most of the secretions, and, when freely taken, to exercise a powerful influence over the nervous system, indicated by faintness, somnolency, vertigo, headache, dimness of vision, and dilated pupils. According to Dr. Osgood, it reduces the frequency and force of the pulse, sometimes, when taken in full doses, as low as thirty-five strokes in the minute. It may be safely substituted for the European root in most cases in which the latter is employed; and is highly recommended as a substitute for colchicum by Dr. Tully, of New Haven. Gouty, rheumatic, and neuralgic affections are those to which it appeared best adapted. For an account of its medical properties and applications, the reader is referred to a paper by Dr. Charles Osgood, of Providence, in the *American Journal of the Medical Sciences*, vol. xvi. p. 296. It may be used in substance, tincture, or extract. Dr. Osgood states the dose in which it will generally prove emetic at from four to six grains of the powder, one or two fluidrachms of a tincture made in the proportion of six ounces of the fresh root to a pint of alcohol, and one or two grains of an extract made by inspissating the juice of the root. The medicine, however, should, in most cases, be given in doses insufficient to vomit.

Since the publication of the last edition of this work, various communications have appeared in our Southern medical journals, tending to prove that American hellebore is applicable to the treatment of numerous febrile and inflammatory affections, in which an indication is offered for reducing the frequency of the pulse. The credit of calling public attention to it is due more especially to Dr. W. C. Norwood, of Cokesbury, South Carolina, who has employed it with great success in pulmonary inflammation, typhoid fever, &c., and believes that it affords the means of reducing the frequency of the pulse at will. He employs a saturated tincture made by macerating eight ounces of the dried root in sixteen ounces of alcohol for at least two weeks. Of this he gives to an adult man eight

drops, and repeats the dose every three hours, increasing by one drop at each dose, until the pulse is reduced, or nausea and vomiting are occasioned, when it is to be diminished one-half, and continued so long as may be necessary to prevent a return of the symptoms. (*Charleston Med. Journ. and Rev.*, vii. 768.) Others have found the commencing dose of Dr. Norwood somewhat too large. From its powerful emetic properties, and the prostration resulting from excessive doses, it should always be used with great caution, and its effects carefully observed. Its nauseating and depressing effects are best counteracted by opiates and alcoholic stimulants. W.

VINUM ALBUM. *U. S., Ed.*

White Wine.

Sherry wine. *U. S., Ed.*

Off. Syn. VINUM XERICUM. *Lond.;* VINUM ALBUM HISPANICUM. Sherry wine. *Dub.*

Vin blanc, *Fr.;* Weisser Wein, *Germ.;* Vino bianco, *Ital.;* Vino blanco, *Span.*

VINUM RUBRUM. *U. S.*

Red Wine.

Port wine. *U. S.*

Vin rouge, *Fr.;* Rother Wein, *Germ.;* Vino vermiglio, *Ital.;* Vino rubro, *Span.*

Wine is the fermented juice of the grape, the fruit of Vitis vinifera of botanists, the description of which will be found under another head. (See *Uva Passa.*) The juice of sweet grapes consists of a considerable quantity of grape sugar, a peculiar matter of the nature of ferment or yeast, and a small portion of extractive, tannic acid, bitartrate of potassa, tartrate of lime, common salt, and sulphate of potassa; the whole dissolved or suspended in a large quantity of water. Sour grapes contain, in addition, a peculiar acid isomeric with the tartaric, called *paratartaric acid.* (See *page* 53.) Grape juice, therefore, embraces all the ingredients essential to the production of the vinous fermentation, and requires only the influence of the atmosphere and a proper temperature to convert it into wine. (See *page* 60.)

Preparation. When the grapes are ripe, they are gathered, and trodden under foot in wooden vessels with perforated bottoms, through which the juice, called the *must*, runs into a vat placed beneath. The temperature of the air being about 60°, the fermentation gradually takes place in the must, and becomes fully established after a longer or shorter period. In the mean time, the must becomes sensibly warmer, and emits a large quantity of carbonic acid, which causes the more solid parts to be thrown to the surface in a mass of froth having a hemispherical shape, called the *head.* The liquor from being sweet becomes vinous, and assumes a deep-red colour if the product of red grapes. After a while the fermentation slackens, when it becomes necessary to accelerate it by thoroughly mixing the contents of the vat. When the liquor has acquired a strong vinous taste, and become perfectly clear, the wine is considered formed, and is racked off into casks. But even at this stage of the process, the fermentation continues for several months longer. During the whole of this period, a frothy matter is formed, which for the first few days collects round the bung, but afterwards precipitates along with colouring matter and tartar, forming a deposit which constitutes the wine-lees.

Division and Nomenclature. Wines, according to their colour, are divided

into the red and white; and, according to their taste and other qualities, are either spirituous, sweet, dry, light, sparkling, still, rough, or acidulous. *Red wines* are derived from the must of black grapes, fermented with their husks; *white wines*, from white grapes, or from the juice of black grapes fermented apart from their skins. The other qualities of wines, above enumerated, depend on the relative proportions of the constituents of the must, and on the mode in which the fermentation is conducted. The essential ingredients of the must as a fermentable liquid are water, sugar, and a ferment. If the juice be very saccharine, and contain sufficient ferment to sustain the fermentation, the conversion of the sugar into alcohol will proceed until checked by the production of a certain amount of the latter, and there will be formed a *spirituous* or *generous* wine. If, while the juice is highly saccharine, the ferment be deficient in quantity, the production of alcohol will be less, and the redundancy of sugar proportionably greater, and a *sweet wine* will be formed. When the sugar and ferment are in considerable amount, and in the proper relative proportions for mutual decomposition, the wine will be strong bodied and sound, without any sweetness or acidity, and of the kind called *dry*. A small proportion of sugar can give rise only to a small proportion of alcohol, and consequently the less saccharine grapes will generate a comparatively weak, or *light wine*, which will be sound and stable in its constitution, in case the ferment is not in excess, but otherwise liable to pass into the acetous fermentation and become acescent. In case the wine is bottled before the fermentation is fully completed, the process will proceed slowly in the bottles, and the carbonic acid generated, not having vent, will impregnate the wine, and render it effervescing and *sparkling*. The *rough* or *astringent* wines owe their flavour to a portion of tannic acid derived from the husks of the grape; and the *acidulous* wines to the presence of carbonic acid or an unusual proportion of tartar. Several of the above qualities often co-exist. Thus a wine may be spirituous and sweet, spirituous and rough, sweet and rough, light and sparkling, &c.

Wines are made in many countries, and are known in commerce by various names, according to their source. Thus, *Portugal* produces port and lisbon; *Spain*, sherry, saint lucar, malaga, and tent; *France*, champagne, burgundy, hermitage, vin de grave, sauterne, and claret; *Germany*, hock and moselle; *Hungary*, tokay; *Sicily*, marsala or Sicily madeira, and lissa; the *Cape of Good Hope*, constantia; *Madeira and the Canaries*, madeira and teneriffe.

In the United States the first attempt to manufacture wine, on an extended scale, was made towards the close of the last century, at Spring Mill, near Philadelphia, by Mr. Peter Legaux, agent of the Pennsylvania Vine Company, and proved unsuccessful. The native grape found most suitable, after the foreign had failed on account of the climate, was the *Schuylkill muscadel grape*. The next attempt was made by the Swiss at Vevay, Indiana, with the Schuylkill grape, and was partially successful; a rough red wine being manufactured which met with a ready sale in the neighbouring States. In a few years the manufacture of this wine languished, being superseded by foreign wines. For a considerable period, investigations have been in progress to determine the adaptation of our various native grapes for making wine. The *Catawba grape*, introduced to public notice by Major Adlum, of Washington city, about the year 1825, is a superior wine grape, producing a wine resembling hock. Mr. N. Longworth, of Cincinnati, considers it, undoubtedly, a native grape. The *Herbemont* and *Missouri* are both good wine grapes, the latter producing a wine resembling madeira. The *Scuppernong grape*, indigenous to North Carolina, yields a hard dry wine like hock; and the vine is a very abundant bearer. According to Mr. R. Buchanan, this grape produces from two to three thousand gallons of wine per acre. (*Treatise on the Cultivation of the Grape.* Cincinnati, 1850.) The climate of

Texas is peculiarly favourable to the growth of the grape vine. The *El Paso grape* is found in the vicinity of the falls of the Rio Grande, and the *great mustang* grows luxuriantly in every part of the State, and yields a superior red wine. (See *Patent Office Report* for 1847.)

Properties. Wine, considered as the name of a class, may be characterized as a spirituous liquid, the result of the fermentation of grape-juice, and containing colouring matter, and some other substances, which are either combined or intimately blended with the spirit. All its other qualities vary with the nature of each particular wine. The principal wines used for medicinal purposes are the officinal wines, sherry and port, together with madeira, teneriffe, claret, and champagne.

Sherry (Vinum Album) is of a deep-amber colour, and when good possesses a dry aromatic flavour and fragrancy, without any acidity. It ranks among the stronger white wines, and contains between 19 and 20 per cent. by measure of alcohol of sp. gr. 0·825. The United States and British Pharmacopœias agree in indicating it as the officinal white wine. It is prepared in the vicinity of Xeres in Spain, and hence its English name *sherry*. This wine is supposed to have been the *sack* of Shakspeare, so called from the word *sec* (dry), in allusion to its being a dry wine.

Port (Vinum Rubrum) is of a deep-purple colour, and, in its new state, is a rough, strong, and slightly sweet wine. When kept a certain time in bottles, it deposits a considerable portion of its astringent matter, loses the greater part of its sweetness, acquires more flavour, and retains its strength. If too long kept, it deposits the whole of its astringent and colouring matter, and becomes deteriorated. Considerable quantities of brandy are usually added to it, which causes its heating quality on the palate. It is the strongest of the wines in common use. It was first made officinal in the U. S. Pharmacopœia of 1850.

Madeira is the strongest of the white wines in general use. It is a slightly acid wine, and, when of proper age and in good condition, has a rich, nutty, aromatic flavour. As it occurs in the market, however, it is of very variable quality, on account of the adulterations and mixtures to which it is subjected after importation. The madeira consumed in this country is generally better than that used in England; its adulteration being practised to a less extent with us, and our climate being more favourable to the improvement of the wine.

Teneriffe is a white wine, of a slightly acid taste, and, when of good quality, of a fine aromatic flavour. Its average strength is about the same as that of sherry. It is made from the same grape as madeira, to which it bears a close resemblance.

Claret, called in France *vin de Bordeaux*, from its being produced near that city, in the district of Medoc, is a red wine, and from its moderate strength is ranked as a light wine. It has a deep-purple colour, and, when good, a delicate taste, in which the vinous flavour is blended with slight acidity and astringency. The most esteemed kinds are the clarets called *Château-Margaux*, *Château-Lafite*, and *Château-Latour*. Another celebrated variety is the *Château-Haut Brion* of the Pays de Grave. Claret is the variety of French wine most extensively consumed in the United States.

Adulterations. Wines are very frequently adulterated, and counterfeit mixtures are often palmed upon the public as genuine wine. Free sulphuric acid in red wines cannot be detected by barytic salts; for all wines contain a small quantity of the soluble sulphates. It may be discovered, however, by dropping the suspected red wine on a piece of common glazed paper, containing starch. If the wine be pure, the spot, when dry, will be violet-blue, and the paper unaltered in texture; but if the wine contain even a thousandth part of sulphuric acid, the paper will be spotted rose-red, and prove brittle and friable when slightly rubbed

between the fingers. (*Lassaigne, O. Henri,* and *Bayard.*) Formerly the wine dealers were in the habit of putting litharge into wines that had become acescent. The oxide of lead formed with the acetic acid acetate of lead, which, being sweet, corrected the defect of the wine, but at the same time rendered it poisonous. At the present day, this criminal practice is wholly abandoned. The adulteration is readily detected by sulphuretted hydrogen, which causes a black and flocculent precipitate. Mr. Brande assures us that, among the numerous samples of wine of suspected purity which he had examined, he had not found one containing any poisonous ingredient fraudulently introduced. Lead, in minute quantity, according to this writer, may sometimes be detected in wines; but it is derived invariably from shot in the bottle, or from some analogous source. Rhenish wines, when acid from the presence of free tartaric or acetic acid, may be restored by the addition of neutral tartrate of potassa, which gives rise to the formation of cream of tartar. (*Andrew Ure.*) Spurious mixtures, frequently containing very little of the fermented juice of the grape, and which are sold as particular wines, may not be poisonous; but are, notwithstanding, highly pernicious in their effects upon the stomach, and always produce mischief and disappointment, when depended on as therapeutic agents. The wines most frequently imitated are port and madeira; and cider is the chief ingredient in the spurious mixtures. *English port* is sometimes made of a small portion of real port, mixed with cider, juice of elder berries, and brandy, and rendered astringent with logwood and alum.

Composition. Wines consist mainly of water and alcohol. They contain, also, grape sugar, gum, extractive, colouring matter, tannic, malic, and carbonic acids, bitartrate of potassa (tartar), tartrate of lime, volatile oil, and œnanthic ether. The volatile oil has never been isolated, but is supposed to be the cause of the delicate flavour and odour of wine, called the *bouquet.* According to Dr. F. L. Winckler, the bouquet depends upon the presence of a nitrogenous compound of a volatile organic acid with a volatile base, which has a different smell in different wines. *Œnanthic ether* (*œnanthate of ether, œnanthate of oxide of ethyle*) was discovered by Pelouze and Liebig. It is obtained towards the end of the distillation of wine on the great scale for making brandy. It forms only about one part in ten thousand of the wine. It is a mobile, oily, colourless liquid, having the peculiar unpleasant smell which is perceived in a bottle which has contained wine. Its sp. gr. is 0·862, and boiling point 435°. Its formula is $C_{18}H_{18}O_3 = C_{14}H_{13}O_2$ (œnanthic acid) $+ C_4H_5O$ (ether). Œnanthic ether must not be confounded with the substance upon which the bouquet of wine is supposed to depend. The other ingredients of wine, above enumerated, are not to be supposed present in every wine. Thus, sugar is present in sweet wines, tannic acid in rough wines, and carbonic acid in those that effervesce. The different kinds of wine derive their various qualities from the mode of fermentation, the nature of the grape, and the soil and climate in which it may have grown. The alcohol in pure wine is that which results from the vinous fermentation, and is intimately united with the other ingredients of the liquid; but with almost all the wines of commerce a portion of brandy is mixed, the state of union of which is probably different from that of the natural alcohol of the wine. By the British custom-house regulations ten per cent. of brandy may be added to wines after importation; but to good wines not more than four or five per cent. is added.

The intoxicating ingredient in all wines is the alcohol which they contain; and hence their relative strength depends upon the quantity of this substance entering into their composition. The alcohol, however, naturally in wine, is so blended with its other constituents, as to be in a modified state, which renders it less intoxicating and less injurious than the same quantity of alcohol, separated by distillation and diluted with water. Mr. Brande published in 1811 a very interesting table, giving the per centage by measure of alcohol of the sp. gr. 0·825

in different kinds of wine. Similar tables have since been published by M. Julia-Fontenelle, and by Dr. Christison. An abstract of their results is given in the following table, the proof spirit of Dr. Christison's table (0·920) being reduced, for the sake of comparison, to the standard of 0·825, the density of the spirit adopted by Mr. Brande. The results of Julia-Fontenelle are distinguished by the letter J.; those of Dr. Christison by the letter C. The rest are Mr. Brande's.

Table of the Proportion by Measure of Alcohol (sp. gr. 0·825) contained in 100 parts of different Wines.

Lissa (mean)	25·41	Vidonia	19·25
Raisin wine (mean)	25·12	Alba flora	17·26
Marsala [Sicily madeira] (mean)	25·09	Zante	17·05
Port, strongest	25·83	Malaga	17·26
mean	22·96	White hermitage	17·43
weakest	19·00	Rousillon (mean)	18·13
strongest (C.)	20·49	Claret, strongest	17·11
mean (C.)	18·68	mean	15·10
weakest (C.)	16·80	weakest	12·91
White port (C.)	17·22	ditto (J.)	14·73
Madeira, strongest	24·42	vin ordinaire (C.)	10·42
mean	22.27	Chateau-Latour, 1825, (C.)	9·38
weakest	19·24	first growth, 1811, (C.)	9·32
strongest (C.)	20·35	Malmsey madeira	16·40
Sercial madeira	21·40	Ditto (C.)	15·60
Ditto (C.)	18·50	Lunel	15·52
Sherry, strongest	19·81	Ditto (J.)	18·10
mean	19·17	Sheraaz	15·52
weakest	18·25	Ditto (C.)	15·56
strongest (C.)	19·31	Syracuse	15·28
mean (C.)	18·47	Sauterne	14·22
weakest (C.)	16·96	Burgundy (mean)	14·57
Amontillado (C.)	15·18	Hock (mean)	12·08
Teneriffe	19·79	Nice	14·63
Ditto (C.)	16·61	Barsac	13·86
Colares	19·75	Tent	13·30
Lachryma Christi	19·70	Champagne (mean)	12·61
White constantia	19·75	Ditto (J.)	12·20
Red constantia	18·92	Red hermitage	12·32
Lisbon	18·94	Vin de Grave (mean)	13·37
Ditto (C.)	19·09	Frontignac (Rives Altes)	12·79
Bucellas	18·49	Ditto (J.)	21·80
Red madeira (mean)	20·35	Ditto (C.)	12·29
Cape muschat	18·25	Côte rôtie	12·32
Cape madeira (mean)	20·51	Tokay	9·88
Grape wine	18·11	Rudesheimer, first qual., (C.)	10·14
Calcavella (mean)	18·65	inferior (C.)	8·35
		Hambacher, first quality, (C.)	8·88

The alcoholic strength of wines may be ascertained, with sufficient precision, by the *ebullioscope* of Conaty, or the *dilatometer* of Silbermann; the indications of the former instrument depending upon the determination of the boiling point of the wine; of the latter, upon its dilatation, when heated through a given interval of temperature. For a description of these ingenious instruments, the reader is referred to the *Journ. de Pharmacie*, for Feb. 1849.

Dr. Christison considers it a mistake to suppose that wines become stronger by being kept a long time in cask. His experiments appear to prove the reverse. While, however, the wine is not rendered more alcoholic by age, its flavour is improved, and its apparent strength increased.

Besides the grape, a number of other fruits yield a juice susceptible of the vinous fermentation. The infusion of malt, also, is capable of undergoing this process, and becomes converted into the different kinds of porter and ale. The product in all these cases, though not commonly called a wine, is nevertheless a vinous liquor, and may be classed among the wines properly so called. The following is a list of these vinous liquors, together with the per centage of alcohol which they contain, as ascertained by Mr. Brande:—Currant wine, 20·55; gooseberry wine, 11·84; orange wine, 11·26; elder wine, 8·79; cider, from 5·21 to 9·87; perry, 7·26; mead, 7·32; Burton ale, 8·88; Edinburgh ale, 6·20; brown stout, 6·80; London porter, 4·20; small beer, 1·28. According to L. Hoffmann Burton ale consists, in the 100 parts, of carbonic acid 0·04, absolute alcohol 6·62, extract of malt 14·97, and water 78·37; and pale ale, of carbonic acid 0·07, absolute alcohol 5·57, extract of malt 4·62, and water 89·74.

Medical Properties and Uses. Wine is consumed in most civilized countries; but in a state of health is at least useless, if not absolutely pernicious. The degree of mischief which it produces depends on the character of the wine. Thus the light wines of France are comparatively harmless; while the habitual use of the stronger wines, such as sherry, port, madeira, &c., even though taken in moderation, is always injurious, as having a tendency to induce gout and apoplexy, and other diseases dependent on plethora and over-stimulation. All wines, however, when used habitually in excess, are productive of bad consequences. They weaken the stomach, produce disease of the liver, and give rise to dropsy, gout, apoplexy, tremors, and not unfrequently mania. Nevertheless, wine is an important medicine, productive of the best effects in certain diseases. As an article of the materia medica, it ranks as a stimulant and antispasmodic. In the convalescence from protracted fever, it is frequently the best remedy that can be employed. In certain stages of typhoid fevers, and in extensive ulceration and gangrene, this remedy, either alone, or conjoined with bark and opium, is often our main dependence. In low febrile affections, if it increase the fulness and lessen the frequency of the pulse, mitigate delirium, and produce a tendency to sleep, its further use may be deemed proper; but, on the contrary, if it render the pulse quicker, augment the heat and thirst, produce restlessness, or increase delirium, it should be immediately laid aside as injurious. In some convulsive diseases, as for example tetanus, wine, liberally given, has often proved useful.

Wine, when used medicinally, should be good of its kind; for otherwise it will disagree with the stomach, and prove rather detrimental than useful. The individual wine selected for internal exhibition must be determined by the nature of the disease, and the particular object in view. *Sherry*, when in good condition, is a fine wine, and, being free from all acid, is to be preferred whenever the stomach is delicate, or has a tendency to dyspeptic acidity. Good *madeira* is the most generous of the white wines, particularly adapted to the purpose of resuscitating debilitated constitutions, and of sustaining the sinking energies of the system in old age. The slight acidity, however, of pure madeira causes it to disagree with some stomachs, and renders it an improper wine for gouty persons. *Teneriffe* is a good variety of white wine for medicinal use, being of about a medium strength, and agreeing very well with most stomachs. *Port* is generally used in cases of pure debility, especially when attended with a loose state of the bowels, unaccompanied by inflammation. In such cases it often acts as a powerful tonic as well as stimulant, giving increased activity to all the functions, especially digestion. *Claret* is much less heating, and is often

useful on account of its aperient and diuretic qualities. Champagne is applicable to the sinking stage of low fevers, and is often useful in the debility of the aged.

All the acidulous wines are contra-indicated in the gouty and uric acid diathesis; as they are apt to convert the existing predisposition into disease.

The quantity of wine which may be given with advantage in disease is very variable. In low fevers, it may be administered to the extent of a bottle or more in twenty-four hours, either pure, or in the form of *wine-whey*. This is made by adding to a pint of boiling milk from a gill to half a pint of white wine, straining without pressure to separate the curd, and sweetening the clear whey with loaf sugar. Wine-whey forms a safe and grateful stimulus in typhoid fevers, and in other febrile affections, which, after depletion, may tend to a state of deficient action, and be accompanied with a dry skin. Under these circumstances, it often acts as a diaphoretic, and, when used of moderate strength, without stimulating the system injuriously.

Pharmaceutical Uses. White wine is employed as a menstruum to extract the virtues of several plants, and the preparations thus formed are called *vinous tinctures* or *medicated wines*. Tartar emetic and iron are the only mineral substances prepared in a similar manner. (See *Vinum Antimonii* and *Vinum Ferri*.) For the peculiar powers of wine as a menstruum, see *Vina Medicata*. B.

VIOLA. *U. S. Secondary, Lond., Ed.*

Violet.

The herb of Viola pedata. *U. S.* Viola odorata. The recent petal. *Lond.* The flowers. *Ed.*

Violette odorante, *Fr.;* Wohlriechendes Veilchen, *Germ.;* Violetta, *Ital.;* Violeta, *Span.*

VIOLA. *Sex. Syst.* Pentandria Monogynia.—*Nat. Ord.* Violaceæ.

Gen. Ch. Calyx five-leaved. *Corolla* five-petalled, irregular, horned at the back. *Anthers* cohering. *Capsule* superior, three-valved, one-celled.

This genus includes numerous species, of which, though perhaps all or nearly all are possessed of analogous properties, two only are recognised as officinal, *Viola odorata*, by the London and Edinburgh Colleges, and *Viola pedata*, by our National Pharmacopœia. *Viola ovata*, an indigenous species, has been recommended as a remedy for the bite of the rattle-snake. (See a paper by Dr. Williams in the *Am. Journ. of the Med. Scien.*, xiii. 310.)

Viola odorata. Willd. *Sp. Plant.* i. 1163; Woodv. *Med. Bot.* p. 251, t. 89. This is a small, pretty, creeping plant, the runners of which are furnished with fibrous roots, and send up annually tufts of leaves and flowers. The leaves are heart-shaped, crenate, and supported on long petioles. The flowers are at the summit of delicate, quadrangular, channeled, radical peduncles. The leaves of the calyx are shorter than the petals, which are obovate, obtuse, unequal, and of a bluish-purple or deep-violet colour, except at the claws, which are whitish. The two lateral petals are spreading and bearded towards the base, the inferior furnished with a large spur, and the two upper reflected. In the centre are the stamens with very short filaments, and anthers slightly cohering by an orange-coloured membranous expansion.

The sweet violet is a native of Europe, growing in woods, hedges, and other shady places. It is cultivated in gardens both for its beauty and for medical use; and has been introduced into this country. It is valued chiefly for its flowers, which appear in April and May.

The flowers of this species of violet, besides their beautiful colour, have a peculiar agreeable odour, and a very slightly bitter taste. These properties they yield to boiling water; and their infusion affords a very delicate test for acids

and alkalies, being reddened by the former, and rendered green by the latter. Their odour is destroyed by desiccation; and the degree to which they retain their fine colour depends upon the care used in collecting and drying them. They should be gathered before being fully blown, deprived of their calyx, and rapidly dried, either in a heated room, or by exposing them to a current of very dry air. The flowers of other species are often mingled with them, and, if of the same colour, are equally useful as a chemical test.

In the root, leaves, flowers, and seeds of *Viola odorata*, M. Boulay discovered a peculiar alkaline principle, bearing some resemblance to *emetia*, but possessing distinct properties. He called it *violine;* but *violia* is its proper title, in accordance with the nomenclature adopted in this work. It is white, soluble in alcohol, scarcely soluble in water, and forms salts with the acids. It exists in the plant combined with malic acid, and may be obtained by treating with distilled water the alcoholic extract of the dried root, decomposing by means of magnesia the malate of violia contained in the solution, and extracting the alkali from the precipitated matters by alcohol, which yields it on evaporation. To obtain it entirely pure, a more complicated process is necessary. Orfila has ascertained that it is exceedingly active and even poisonous. It is probably contained in most of the other species of Viola.

Viola pedata. Willd. *Sp. Plant.* i. 1160; Curtis, *Bot. Mag.* 89. This is an indigenous species, without stems, glabrous, with many parted often pedate leaves, the segments of which are linear-lanceolate, obtuse, and nearly entire. The flowers are large and of a beautiful blue colour, often more or less variegated. The divisions of the calyx are linear and acute. The stigma is large, compressed at the sides, obliquely truncate and perforate at the apex. The plant grows in dry sandy hills and fields, and rocky woods, from New England to Carolina, and flowers in May and June.

Medical Properties, &c. of the Violets. The herbaceous parts of different species of violet are mucilaginous, emollient, and slightly laxative; and have been used in pectoral, nephritic, and cutaneous affections. Much was formerly thought of the *Viola tricolor*, or *pansy*, as a remedy in crusta lactea. A decoction in milk of a handful of the fresh herb was taken morning and evening, and a poultice made with the same decoction was applied to the affected part. Cures in numerous instances are said to have been effected by this treatment persevered in for some time. Our own *Viola pedata* is considered a useful expectorant and demulcent in pectoral complaints. (*Bigelow.*)

In Europe, a syrup prepared from the fresh flowers of *Viola odorata* is much employed as an addition to demulcent drinks, and as a laxative for infants. (See *Syrupus Violæ.*) The seeds were formerly considered useful in gravel, but are not now employed. The root, which has a bitter, nauseous, slightly acrid taste, acts in the dose of from thirty grains to a drachm as an emetic and cathartic. It is probable that the same property is possessed by the roots of all the violets, as it is known to be by several species of Ionidium, which belong to the same natural family. The existence in small proportion of the emetic principle, upon which the powers of the root probably depend, in the leaves and flowers, accounts for the expectorant properties long attributed to these parts of the plant.

Off. Prep. Syrupus Violæ. W.

WINTERA. *U. S. Secondary.*

Winter's Bark.

The bark of Drimys Winteri. *U. S.*

Ecorce de Winter, *Fr.;* Wintersche Rinde, *Germ.;* Corteccia Vinterana, *Ital.;* Corteza Winterana, *Span.*

Drimys. *Sex. Syst.* Polyandria Tetragynia.—*Nat. Ord.* Magnoliaceæ, *Juss.*; Winteraceæ, *Lindley.*

Gen. Ch. Calyx with two or three deep divisions. *Corolla* with two or three petals, sometimes more numerous. *Stamens* with the filaments thickened at the summit, and anthers having two separate cells. *Ovaries* from four to eight, changing into the same number of small, many-seeded berries. *A. Richard.*

Drimys Winteri. De Cand. *Prod.* i. 78; Carson, *Illust. of Med. Bot.* i. 11, pl. 5.— *Wintera aromatica.* Willd. *Sp. Plant.* ii. 1239; Woodv. *Med. Bot.* p. 647, t. 226. This is an evergreen tree, varying very much in size, sometimes rising forty or fifty feet in height, sometimes not more than six or eight feet. The bark of the trunk is gray, that of the branches green and smooth. Its leaves are alternate, petiolate, oblong, obtuse, somewhat coriaceous, entirely smooth, green on their upper surface, of a pale-bluish colour beneath, with two caducous stipules at their base. The flowers are small, sometimes solitary, but more frequently in clusters of three or four, upon the summit of a common peduncle about an inch in length, simple, or divided into as many pedicels as there are flowers. The tree is a native of the southern parts of South America, growing along the Straits of Magellan, and extending as far north as Chili. According to Martius it is found also in Brazil. The bark of the tree was brought to England, in the latter part of the sixteenth century, by Captain Winter, who attended Drake in his voyage round the world, and while in the Straits had learned its aromatic and medicinal properties. Since that period it has been occasionally employed in medicine.

It is in quilled pieces, usually a foot in length, and an inch or more in diameter, appearing as if scraped or rubbed on the outside, where the colour is pale-yellowish or reddish-gray, with red elliptical spots. On the inside the colour is that of cinnamon, though sometimes blackish. The pieces are sometimes flat and very large. The bark is two or three lines in thickness, hard and compact, and when broken exhibits on the exterior part of the fracture a grayish colour, which insensibly passes into reddish or yellowish towards the interior. The powder resembles in colour that of Peruvian bark. The odour is aromatic, the taste spicy, pungent, and even burning.

Winter's bark was found by M. Henry to contain resin, volatile oil, colouring matter, tannic acid, several salts of potassa, malate of lime, and oxidized iron. The presence of tannic acid and oxide of iron serves to distinguish it from *canella alba*, with which it has often been confounded.

Medical Properties and Uses. It is a stimulant aromatic tonic, and was employed by Winter as a remedy for scurvy. It may be used for similar purposes with cinnamon or canella alba, but is scarcely known in the medical practice of this country. The dose of the powder is about half a drachm. Another species, the *Drimys Chilensis* of De Candolle, growing in Chili, yields a bark having similar properties. (Carson, *Am. Journ. of Pharm.*, xix. 81.) W.

XANTHORRHIZA. *U. S. Secondary.*

Yellow-root.

The root of Xanthorrhiza apiifolia. *U. S.*

Xanthorrhiza. *Sex. Syst.* Pentandria Polygynia.—*Nat. Ord.* Ranunculaceæ.

Gen. Ch. Calyx none. *Petals* five. *Nectaries* five, pedicelled. *Capsules* five to eight, one-seeded, semibivalve. *Nuttall.*

Xanthorrhiza apiifolia. Willd. *Sp. Plant.* i. 1568; Barton, *Med. Bot.* ii. 203.—*X. tinctoria.* Woodhouse, *N. Y. Med. Repos.* vol. v. This is an indige-

nous shrub, two or three feet in height, with a horizontal root, which sends off numerous suckers. The stem is simple, rather thicker than a goose-quill, with a smooth bark, and bright-yellow wood. The leaves, which stand thickly at the upper part of the stem, are compound, consisting of several ovate-lanceolate, acute, doubly serrate leaflets, sessile upon a long petiole, which embraces the stem at its base. The flowers are small, purple, and disposed in long, drooping, divided racemes, placed immediately below the first leaves. The nectaries are obovate and bilobed, the styles usually about six or eight in number.

The yellow-root grows in the interior of the Southern, and in the Western States. Nuttall says that it is abundant on the banks of the Ohio. It flowers in April. The root is the part directed by the Pharmacopœia; but the bark of the stem possesses the same virtues.

The root is from three inches to a foot in length, about half an inch in thickness, of a yellow colour, and of a simple but extremely bitter taste. It imparts its colour and taste to water. The infusion is not affected by a solution of sulphate of iron. By the late Professor Barton the bark of the root was considered more bitter than its ligneous portion.

Medical Properties and Uses. Xanthorrhiza possesses properties closely analogous to those of columbo, quassia, and the other simple tonic bitters; and may be used for the same purposes, and in the same manner. Dr. Woodhouse employed it in the dose of two scruples, and found it to lie easily upon the stomach. W.

XANTHOXYLUM. *U. S. Secondary.*

Prickly Ash.

The bark of Xanthoxylum fraxineum. *U. S.*

XANTHOXYLUM. *Sex. Syst.* Dicœcia Pentandria.—*Nat. Ord.* Terebintaceæ, *Juss.*; Xanthoxylaceæ, *Lindley.*

Gen. Ch. MALE. *Calyx* five-parted. *Corolla* none. FEMALE. *Calyx* five-parted. *Corolla* none. *Pistils* five. *Capsules* five, one-seeded. *Willd.*

Xanthoxylum fraxineum. Willd. *Sp. Plant.* iv. 757; Bigelow, *Am. Med. Bot.* iii. 156. *X. Americanum.* Miller; Torrey and Gray, *Fl. of N. Am.* i. 214. The prickly ash is a shrub from five to ten feet in height, with alternate branches, which are covered with strong, sharp, scattered prickles. The leaves are alternate and pinnate, consisting of four or five pairs of leaflets, and an odd terminal one, with a common footstalk, which is sometimes prickly on the back, and sometimes unarmed. The leaflets are nearly sessile, ovate, acute, slightly serrate, and somewhat downy on their under surface. The flowers, which are small and greenish, are disposed in sessile umbels near the origin of the young shoots. The plant is polygamous, some shrubs bearing both male and perfect flowers, others only female. The number of stamens is five, of the pistils three or four in the perfect flowers, about five in the pistillate. Each fruitful flower is followed by as many capsules as it had germs. These capsules are stipitate, oval, punctate, of a greenish-red colour, with two valves, and one oval blackish seed.

This species of Xanthoxylum is indigenous, growing in woods and in moist shady places throughout the Northern, Middle, and Western States. The flowers appear in April and May, before the foliage. The leaves and capsules have an aromatic odour recalling that of the oil of lemons. The bark is the officinal portion.

This, as found in the shops, is in quilled pieces, from one or two lines to

nearly an inch in diameter, rather thin, externally of a darkish-gray colour diversified by whitish patches, with the epidermis in many pieces marked by closely set transverse cracks, internally finely striated longitudinally and somewhat shining, and, when derived from the smaller branches, exhibiting occasionally remains of the prickles. The bark is very light, brittle, nearly or quite inodorous, and of a taste which is at first sweetish and slightly aromatic, then bitterish, and ultimately acrid. The acrimony is imparted to boiling water and alcohol, which extract the virtues of the bark. Its constituents, according to Dr. Staples, besides fibrous substance, are volatile oil, a greenish fixed oil, resin, gum, colouring matter, and a peculiar crystallizable principle which he calls *xanthoxylin*, but of which the properties are not designated. (*Journ. of the Phil. Col. of Pharm.*, i. 165.) It is probably identical with the bitter crystalline principle found by MM. Chevallier and Pelletan in the bark of Xanthoxylum Clava Herculis, and named by them *xanthopicrite*.

A specimen of bark has been shown to us, collected on the shores of the Chesapeake Bay, and said to be the product of *Xanthoxylum Clava Herculis*, though probably derived from the trunk of the plant under consideration, as the X. Clava Herculis is a native of the West Indies, and not of the United States, and the *X. fraxineum* was considered by Linnæus as a variety of that species. The specimen referred to resembles the bark above described considerably in its general characters, but differs in consisting of irregular fragments of a bark of larger dimensions, flat, or but slightly rolled, and exhibiting on the outer surface of some of the fragments, large conical, corky eminences, which serve as the bases of the spines, and no doubt give to the trunk of the tree the rough, knotty appearance, which obtained for its congener the name of the Club of Hercules.

Dr. Bigelow states that the *Aralia spinosa*, or angelica tree, which grows in the Southern States, is occasionally confounded with *X. fraxineum*, in consequence partly of being sometimes called, like the latter, *prickly ash*. Its bark, however, in appearance and flavour, is entirely different from the xanthoxylum.

Medical Properties and Uses. Xanthoxylum is stimulant, producing, when swallowed, a sense of heat in the stomach, with more or less general arterial excitement, and a tendency to diaphoresis. It is thought to resemble mezereon and guaiac in its remedial action, and is given in the same complaints. As a remedy in chronic rheumatism, it enjoys considerable reputation in this country. The dose of the powder is from ten grains to half a drachm, to be repeated three or four times a day. A decoction, prepared by boiling an ounce in three pints of water down to a quart, may be given in the quantity of a pint, in divided doses, during the twenty-four hours. The powder has sometimes been employed as a topical irritant; and the bark, used as a masticatory, is a popular remedy for toothache, and has been recommended in palsy of the tongue. W.

ZINCUM. *U. S., Lond., Ed., Dub.*

Zinc.

Speltre; Zinc, *Fr.;* Zink, *Germ.;* Zinco, *Ital., Span.*

Zinc occurs native in two principal states; as a sulphuret, called *blende*, and as a carbonate or silicate, denominated *calamine*. It is found in various parts of the world, but most abundantly in Germany, from which country the United States are principally supplied. The metal is extracted generally from calamine. This is roasted and mixed with charcoal powder, and the mixture heated in iron cylinders placed horizontally over a furnace. When the reduction of the zinc

commences, iron receivers are adapted to the opening of the cylinder to receive the volatilized metal as it condenses. The metal is then melted and run into moulds, and forms *speltre*, or the zinc of commerce. In this state it contains iron, and traces of lead, cadmium, arsenic, copper, sulphur, and charcoal. To purify it from these substances, it must be subjected to a second distillation in a crucible, furnished with a tube passing through its bottom, and open at both ends; its upper extremity reaching a little more than half way up the interior of the crucible, and its lower end terminating above a vessel of water. The impure zinc being placed in the crucible, the cover luted on, and the fire applied, the pure zinc is volatilized, and, passing down the tube by a descending distillation, condenses in the water below.

Properties. Zinc has a bluish-white colour, a peculiar taste, and a perceptible smell when rubbed. Its texture is laminated, and its fracture crystalline. Its malleability and ductility are not very great. When perfectly pure, it may be reduced to thin leaves at ordinary temperatures; but the zinc of commerce requires to be heated to a temperature between 212° and 300° to render it sufficiently laminable to be rolled into sheets. The softness of zinc is peculiar, as is shown by the circumstance that it clogs the file when the attempt is made to reduce it to filings; and hence, if it be desired to have it in the divided form, it is necessary to submit it to fusion, and to triturate it at the moment of solidification. Its sp. gr. is about 6·8, its equivalent number 32·3, and symbol Zn. By experiments instituted to determine the point, Favre makes its equivalent 32·99, and Erdmann, 32·527. Subjected to heat, it fuses at 773°. At full redness it boils, and in close vessels may be distilled over; but in open ones it takes fire, and burns with a dazzling white flame, giving off dense white fumes. It dissolves in most of the acids with disengagement of hydrogen, and precipitates all the metals either in the metallic state, or in that of oxide. It forms but one well-characterized oxide (a protoxide), and but one sulphuret. A peroxide of uncertain composition was obtained by Thenard. The protoxide is officinal, and will be described under another head. (See *Zinci Oxidum.*)

Zinc of good quality dissolves in dilute sulphuric acid, with the exception of a scanty grayish-black residuum. If absolutely pure, it would be wholly dissolved. The solution is colourless, and yields white precipitates with ferrocyanuret of potassium and hydrosulphate of ammonia. Ammonia throws down from this solution a white precipitate, which is wholly dissolved when the alkali is added in excess. If copper be present, the solution will be rendered blue by the ammonia; and if iron be an impurity it will be thrown down by this alkali, but not redissolved by its excess. Arsenic may be detected, unless present in very minute proportion, by dissolving the zinc in pure dilute sulphuric acid in a self-regulating reservoir for hydrogen; when arsenuretted hydrogen will be formed, recognisable by its flame producing a dark stain on a white plate.

Zinc is extensively employed in the arts. It is the best metal that can be used, in conjunction with copper, for galvanic combinations. Combined with tin and mercury, it forms the amalgam for electrical machines. Its solution in dilute sulphuric acid furnishes the readiest method for obtaining hydrogen. With copper it forms *brass*, and, in the form of *sheet zinc*, it is employed to cover the roofs of houses, and for other purposes. It should never be used for culinary vessels, as it is soluble in the weakest acids.

The compounds of zinc are poisonous, but not to the same extent as those of lead. The oxide of zinc, at present used in painting as a substitute for white lead, is capable of producing a colic, resembling that caused by lead, and called *zinc colic*. It attacks workmen, exposed to the dust of the oxide while engaged in packing it in barrels, and yields to the remedies appropriate to the treatment of lead colic. (See *Chem. Gaz.*, Sept. 16, 1850.)

Pharmaceutical Uses. Zinc is never used as a medicine in the metallic state; but is employed in this state to form the officinal preparations, acetate, sulphate, and chloride of zinc. In combination it forms a number of important medicinal preparations, a list of which, with the synonymes, is subjoined.

Zinc is employed medicinally,

I. Oxidized.

Zinci Oxidum, *U. S., Lond., Ed.;* Zinci Oxydum, *Dub.*
Unguentum Zinci Oxidi, *U. S.;* Unguentum Zinci, *Lond., Ed.;* Unguentum Zinci Oxydi, *Dub.*

II. Combined with chlorine.

Zinci Chloridum, *U. S., Lond., Dub.*
Zinci Chloridi Liquor, *Dub.*

III. Oxidized and combined with acids.

Zinci Acetas, *U. S., Dub.*
Zinci Carbonas Præcipitatus, *U. S.;* Zinci Carbonas, *Dub.*
Ceratum Zinci Carbonatis, *U. S.*
Calamina, *U. S.;* Anglicè, *Calamine.*
Calamina Præparata, *U S., Lond., Ed.*
Ceratum Calaminæ, *U. S., Lond., Ed.;* Anglicè, *Turner's cerate.*
Zinci Sulphas, *U. S., Lond., Ed., Dub.*
Liquor Aluminis Compositus, *Lond.*
Zinci Valerianas, *Dub.* B.

ZINGIBER. *U. S., Lond., Ed., Dub.*

Ginger.

The rhizoma of Zingiber officinale. *U. S., Lond., Ed., Dub.*
Gingembre, *Fr.;* Ingwer, *Germ.;* Zenzero, *Ital.;* Gengibre, *Span.*

Zingiber. *Sex. Syst.* Monandria Monogynia.—*Nat. Ord.* Scitamineæ, *R. Brown;* Zingiberaceæ, *Lindley.*

Gen. Ch. Flowers spathaceous. Inner limb of the *corolla* with one lip. *Anther* double, with a simple recurved horn at the end. *Germen* inferior. *Style* enclosed in the furrow formed by the anther. *Loudon's Encyc. of Plants.*

Zingiber officinale. Roscoe, *Trans. Linn. Soc.* viii. 348; Carson, *Illust. of Med. Bot.* ii. 55, pl. 98.—*Amomum Zingiber.* Willd. *Sp. Plant.* i. 6; Woodv. *Med. Bot.* p. 731, t. 250. The ginger plant has a biennial or perennial, creeping, tuberous root or rhizoma, and an annual stem, which rises two or three feet in height, is solid, round, erect, and enclosed in an imbricated membranous sheathing. The leaves are lanceolate, acute, smooth, five or six inches long by about an inch in breadth, and stand alternately on the sheaths of the stem. The flower-stalk rises by the side of the stem from six inches to a foot high, and like it is clothed with oval, acuminate sheaths; but it is without leaves, and terminates in an oval, obtuse, bracteal, imbricated spike. The flowers are of a dingy yellow colour, and appear two or three at a time between the bracteal scales.

The plant is a native of Hindostan, and is cultivated in all parts of India. It is also cultivated in the West Indies, whither it was transplanted from the East, and at Sierra Leone in Africa. The flowers have an aromatic smell, and the stems, when bruised, are slightly fragrant; but the root is the portion in which the virtues of the plant reside. This is fit to be dug up when a year old. In the West Indies, the ginger crop is gathered in January and February, after the stems have withered. After having been properly cleansed, the root is scalded

in boiling water, in order to prevent germination, and is then rapidly dried. Thus prepared, it constitutes the ordinary ginger of commerce, or *black ginger* as it is sometimes called from the darkish colour which it acquires in the process. It is imported into this country chiefly from Calcutta, and is known to the druggists by the name of East India ginger; but recently considerable quantities have been brought from Africa, and some probably reaches us from the West Indies. In Jamaica another variety is prepared by selecting the best roots, depriving them of their epidermis, and drying them separately and carefully in the sun. This is called in the books *white ginger*, and is most highly valued. It reaches us from England, where it is said to undergo some further preparation, by which its appearance is improved. It is usually called in our markets *Jamaica ginger*. The root is also at present imported from the East Indies deprived of the epidermis. Considerable quantities are brought immediately from the West Indies in a recent state, and sold by the confectioners. A preserve is made from ginger by selecting the roots while young and tender, depriving them of their cortical covering, and boiling them in syrup. This is occasionally imported from the East and West Indies. When good it is translucent and tender.

The *recent root* is from one to four inches long, somewhat flattened on its upper and under surface, knotty, obtusely and irregularly branched or lobed, externally of a light-ash colour with circular rugæ, internally fleshy and yellowish-white. It sometimes germinates when kept in the shops.

The *common* or *black ginger* is of the same general shape, but has a dark ash-coloured wrinkled epidermis, which, being removed in some places, exhibits patches of an almost black colour, apparently the result of exposure. Beneath the epidermis is a brownish, resinous, almost horny cortical portion. The interior parenchyma is whitish and somewhat farinaceous. The powder is of a light yellowish-brown colour. This variety is most extensively used throughout the country.

The *Jamaica* or *white ginger* differs in being entirely deprived of epidermis, and white, or yellowish-white on the outside. The pieces are rounder and thinner, in consequence of the loss of substance in their preparation. They afford when pulverized a beautiful yellowish-white powder, which is brought from Liverpool in jars. This variety is firm and resinous, and has more of the sensible qualities of ginger than the black. The uncoated ginger of the East Indies resembles the Jamaica, but is darker. There is reason to believe that a portion at least of the white ginger of commerce has been subjected to a bleaching process, by which not only the exterior, but also the internal parts are rendered whiter than in the unprepared root. Trommsdorff found in a specimen which he examined, evidences of the presence of chlorides, sulphates, and lime; and concluded that the bleaching was effected by chlorine, or by chloride of lime and sulphuric acid. Having macerated some black ginger in water, deprived it of the cortical portion, treated it for twenty-four hours with sulphuric acid diluted with nine times its weight of water, and finally placed it in a mixture of chloride of lime and water, in which it was allowed to remain for two days, he found it, upon being washed and dried, to present an appearance closely resembling that of the finest white ginger, both on the surface and internally. (*Annal. der Pharm.*, xvii. 98.) According to Brande, ginger is often washed in whiting and water; and Pereira states that it is sometimes bleached by exposure to the fumes of burning sulphur.

General Properties. The odour of ginger is aromatic and penetrating, the taste spicy, pungent, hot, and biting. These properties gradually diminish, and are ultimately lost by exposure. The virtues of ginger are extracted by water and alcohol. Its constituents, according to M. Morin, are a volatile oil; a resin-

ous matter, soft, acrid, aromatic, and soluble in ether and alcohol; a sub-resin insoluble in ether; a little osmazome; gum; starch; a vegeto-animal matter; sulphur; acetic acid; acetate of potassa; and lignin. The peculiar flavour of the root appears to depend on the volatile oil, its pungency partly on the resinous or resino-extractive principle. A considerable quantity of very pure white starch may be obtained from it. The volatile oil, examined by A. Papousek, was yellow, of the odour of ginger, and of a hot aromatic taste. Its sp. gr. was 0·893, and boiling point 475° F. Deprived of water by distillation with anhydrous phosphoric acid, it consisted of carbon and hydrogen, with the formula $C_{10}H_8$, and therefore belongs to the camphene series. (See *Chem. Gaz.*, Jan. 1, 1853, p. 12.)

Those pieces of ginger which are very fibrous, light and friable, or worm-eaten, should be rejected.

Medical Properties and Uses. Ginger is a grateful stimulant and carminative, and is often given in dyspepsia, flatulent colic, and the feeble state of the alimentary canal attendant upon atonic gout. It is an excellent addition to bitter infusions and tonic powders, imparting to them an agreeable, warming, and cordial operation upon the stomach. When chewed it produces much irritation of the mouth, and a copious flow of saliva; and when snuffed up the nostrils, in a state of powder, excites violent sneezing. It is sometimes used as a local remedy in relaxation of the uvula, and paralysis of the tongue and fauces. Externally applied it acts as a rubefacient. It may be given in powder or infusion. The dose of the former is from ten grains to a scruple or more. The infusion may be prepared by adding half an ounce of the powder or bruised root to a pint of boiling water, and may be given in the dose of one or two fluidounces.

Off. Prep. Acidum Sulphuricum Aromaticum; Confectio Opii; Confectio Scammonii; Infusum Sennæ; Infusum Zingiberis; Pilula Cambogiæ Composita; Pilulæ Scillæ Compositæ; Pulvis Aromaticus; Pulvis Cinnamomi Compositus; Pulvis Jalapæ Comp.; Pulvis Rhei Comp.; Pulvis Scammonii Comp.; Syrupus Rhamni; Syrupus Zingiberis; Tinctura Cinnamomi Composita; Tinct. Rhei Comp.; Tinct. Zingiberis; Vinum Alöes. W.

PART II.

PREPARATIONS.

The preparation of medicines, which constitutes the art of Pharmacy, comes within the peculiar province of the apothecary. It is for his guidance that the various formulæ of the Pharmacopœia have been arranged, and to him that their directions are especially addressed.*

A few general observations, therefore, of an explanatory nature, calculated to facilitate the progress of the pharmaceutical student, will not be misplaced under the present head. The duty of the apothecary is to obtain a supply of good medicines, to preserve them with care, to prepare them properly for use, and to dispense them. Our remarks will embrace each of these points.

The substances obtained from the mineral and animal kingdoms, and those furnished by the chemical manufacturer, are of a nature to admit of no general precepts as to their proper condition, which would not be suggested by the common sense of the purchaser. He must receive them as offered, and judge of their fitness for his purposes by his knowledge of the peculiar properties of each. The same remark applies to vegetable substances from abroad; but with respect to indigenous plants, the apothecary is frequently called upon to exercise his judgment in relation to their collection and desiccation, and will derive advantage from some brief practical rules upon the subject.

Collecting and Drying of Plants. The proper mode of proceeding varies according to the nature of the part used. The different parts of plants are to be gathered at the period when the peculiar juices of the plant are most abundant in them. In the *roots* of *annual* plants this happens just before the time of flowering; in the roots of *biennials*, after the vegetation of the first year has ceased; and in those of *perennials*, in the spring before vegetation has commenced. They should be washed, and the small fibres, unless they are the part employed, should be separated from the fleshy solid part, which is to be cut in slices previously to being dried. *Bulbs* are to be gathered after the new bulb is perfected, and before it has begun to vegetate, which is at the time the leaves decay. *Barks* whether of the root, trunk, or branches, should be gathered in the autumn or early in the spring. The dead epidermis, and the decayed parts are to be separated. Of some trees, as the slippery elm, it is the inner bark only that is preserved. *Leaves* are to be gathered after their full development, before

* These preliminary observations to the second part of the work were originally prepared by Mr. Daniel B. Smith, President of the Philadelphia College of Pharmacy. They have from time to time been somewhat modified since their first appearance; but never to the same extent as in the present edition. The alterations now made are such as the improvements in Pharmacy have suggested, and were deemed necessary to render the work a proper exponent of the present state of knowledge upon the subject. The authors are happy to acknowledge their obligations, in the revision of this introduction, to Professor William Procter, of the Philadelphia College of Pharmacy.—*Note to the ninth edition.*

the fading of the flower. The leaves of biennial plants do not attain their perfect qualities until the second year. *Flowers* should in general be gathered at the time of their expansion, before or immediately after they have fully opened; and some, as the Rosa Gallica, while in the bud. *Aromatic herbs* are to be gathered when in flower. Leaves, flowers, and herbs are to be gathered in clear dry weather, in the morning, after the dew is exhaled. *Stalks and twigs* are collected in autumn; *seeds* at the period of their full maturity.

Vegetables should be dried as rapidly as is consistent with their perfect preservation. Those collected in the warm months and during dry weather, may, except in a few instances, be dried by spontaneous evaporation in a well-ventilated apartment; and some, as roots and barks, may be exposed to the direct rays of the sun. In spring and autumn, and especially in damp foggy, or rainy weather, the drying room should be artificially heated, and furnished with apertures near the top for the escape of the moist warm air, and others beneath in the direction of the prevailing wind so as to command a current of air. The arrangements for supplying heat, which may consist of a small stove, or a drum connected with a stove in another apartment, should be capable of regulation, so that the temperature may range between 70° and 100° Fahr. at will. The substances to be dried should be supported on wicker or tinned wire hurdles, arranged horizontally above each other, so that the ascending and lateral currents of air may pass over and through every part. *Fibrous roots* may be dried in the sun, or at a heat of from 65° to 80° in the drying room. *Fleshy roots* should be cut in transverse slices not exceeding half an inch in length, and, during the drying process, should be stirred several times to prevent moulding; the heat being at first maintained at about 100°. *Bulbs* must have the outer membranes peeled off: in other respects they are to be treated like fleshy roots. *Barks, woods,* and *twigs* readily dry in thin layers in the open air. *Leaves,* after separation from the stalks, should be loosely strewed over the hurdles, and their position changed twice a day till they become dry. When very succulent they require more care, in order to prevent discoloration. For dry and thin leaves the heat need not exceed 70°; for the succulent, it may be gradually raised to 100°. *Annual plants,* and *tops,* if not too juicy, may be tied loosely in small bundles, and strung on lines stretched across the drying room. *Flowers* must be dried carefully and rapidly so as to preserve their colour. They should be spread loosely on the hurdles and turned several times by stirring. When flowers or leaves owe their virtues to volatile oils, greater care is necessary. *Succulent fruits,* as berries, may be dried when in bunches by suspending them in the drying room.

The following table, taken from the Edinburgh Dispensatory, presents the amounts yielded by 1000 parts of the vegetables respectively mentioned, after being dried.

Roots of Angelica Archangelica	263	Leaves of Digitalis purpurea	180
Aspidium Filix Mas	500	Hyoscyamus niger	135
Inula Helenium	187	Melissa officinalis	220
Valeriana sylvestris	316	Salvia officinalis	220
Bark of the Oak	410	Tops of Mentha piperita	215
Elder	292	Flowers of Anthemis nobilis	338
Elm	375	Borago officinalis	96
Twigs of Solanum Dulcamara	308	Lavandula vera	510
Leaves of Atropa Belladonna	140	Sambucus Ebulus	256
Conium maculatum	185	Petals of Papavar Rhœas	84
Datura Stramonium	110	Rosa rubra	330

Preservation of Medicines. The proper preservation of medicines is an object of the greatest importance to the apothecary. The apartment destined for

a store room should be quite dry, and capable of being ventilated at will, and protected from vermin. As a general rule drugs should be excluded from the light, and not packed away until thoroughly dry. New parcels should not be put in old receptacles until these have been examined, and freed from dust and insects. Barrels and boxes well fitted with movable covers, are suitable for most roots, barks, and woods, and for some herbs, leaves, and seeds. They should be painted externally, and are less liable to harbor insects when varnished inside with a solution of shellac, imbued with aloes, wormwood, or colocynth. *Roots* and *bulbs*, which are to be preserved fresh, should be buried in dry sand. *Aromatic leaves* and those containing alkaloids, *flowers*, most *seeds*, and some *roots*, especially liable to the attacks of insects, should be kept in tin canisters or in light boxes lined with lead, tin, or zinc, or in opaque glass, or earthenware vessels. They should be frequently examined in order to prevent deterioration from insects or moisture. When insects are discovered in a drug, the best means of destroying them, according to Lutrand, is to suspend an open vial containing chloroform in the canister, which is to be closed securely, so that the atmosphere of the vessel may become saturated with the vapour. Cantharides and ergot may be thus treated. Bundles of aromatic herbs, the leaves of which are very friable, as sage, marjoram, &c., should be wrapped loosely in refuse paper, so as to preserve a due proportion between stems, leaves, and flowers. *Gum-resins*, unless in original packages, should be kept in earthen jars or tinned boxes. *Fixed* and *volatile oils* should be kept in canisters or bottles, in a cool dark place, where the average temperature is about 60°. Substances in the form of fecula should be kept in oak barrels, or in canisters, and carefully examined from time to time to detect and remove insects.

Garbling of Drugs. Drugs frequently require to be garbled before they are in a proper state for use. *Senna* is to be separated from the stalks and legumes; *cetraria* from moss, leaves, and sticks; *myrrh* from bdellium, &c.; *gum Senegal* from Bassora gum and a terebinthinate resin; *flaxseed* from clover and garlic seed; *seneka* from ginseng; *spigelia* from the stems and leaves, and both it and *serpentaria* from adhering dirt. Seroons of cinchona should be examined, and the barks assorted before they are put by for use. *Gums* and *gum-resins* should be garbled, and the tears preserved separately.

Weights and Measures. A precise acquaintance with the recognised measures of weight and capacity is essential to the operations of the apothecary. The weights used by him in compounding medicines are the troy pound and its divisions; those by which he buys and sells, the avoirdupois pound and its divisions. The former contains 5760 grains, the latter 7000 grains; so that 11 troy pounds are nearly equivalent to 9 pounds avoirdupois. The troy pound contains 12 ounces of 480 grains; the avoirdupois pound 16 ounces of 437½ grains; eleven of the former being nearly equal to twelve of the latter. The troy ounce is divided, for the use of the apothecary, into 8 drachms of 60 grains each; and the drachm into 3 scruples of 20 grains each. The United States and British Pharmacopœias, that of the Dublin College excepted, recognise the troy weights; and whenever, in this work, any term is used expressive of weight, when not otherwise stated, it is to be understood as being of this denomination. The Dublin Pharmacopœia of 1850 recognises the avoirdupois pound and ounce; dividing the ounce into 8 drachms of 54·68 grains each; and the drachm into 3 scruples of 18·22 grains each.

The measures used by the apothecary, in this country, are the wine pint and the gallon. The wine pint contains 28·875 cubic inches. The weight of a pint of distilled water, at 62° Fahrenheit and 30 inches of the barometer, is 7289·7 grains, or 1 pound 3 ounces 1 drachm 29·7 grains troy, or 1 pound 289·7 grains avoirdupois. The gallon is divided into 8 pints, the pint into 16 fluidounces, the fluidounce into 8 fluidrachms, and the fluidrachm into 60 minims. The weight of a

fluidounce of water is 455½ grains, being 18 grains more than an avoirdupois ounce. A drop is generally though incorrectly considered as equivalent to a minim. Drops vary in size according to the nature of the fluid, and the size and shape of the lip from which they fall. A drop of water nearly equals a minim. A fluidrachm of antimonial wine will make, on an average, about 72 drops, one of laudanum 120 drops, one of alcohol 138 drops, one of ether 150 drops, and one of chloroform more than 200 drops. For a table showing the relative value of minims and drops, see the *Appendix*. The measures recognised by all the British Pharmacopœias are the Imperial gallon of 70,000 grains of distilled water or 277 cubic inches, and its divisions. The gallon is divided into 8 pints of 20 fluidounces each. The fluidounce is divided as that of wine measure, but differs from it in value, containing precisely an ounce avoirdupois or 437·5 grains of distilled water. Measures are employed, both in the United States and British Pharmacopœias, to express the quantity of liquids in nearly all their formulæ.

Liquids are to be dispensed from graduated measures, of which those holding from a fluidounce to a pint are hollow inverted cones; and those holding a fluidrachm, and graduated to every five minims, are cylindrical. For smaller quantities than five minims, a slender tube holding a fluidrachm may be used, having the aliquot parts divided off, and marked with a diamond. Alsop's minimeter, which consists of a slender glass syringe graduated into sixty parts, each equal to a minim, is the most convenient and accurate instrument for measuring fractions of a fluidrachm. Care should be taken to verify these instruments. The following approximate measures are used in prescribing medicines; viz., a wineglassful containing two fluidounces, a tablespoonful containing half a fluidounce, a dessertspoonful two fluidrachms, and a teaspoonful a fluidrachm.

Specific Gravity. The specific gravity of liquids affords one of the best tests of their purity. The instrument commonly used by the apothecary for ascertaining this is *Baumé's hydrometer*. This is a glass bulb loaded at one end, and drawn out at the other into a tube on which the scale is marked. That used for alcohol is graduated by loading it until it sinks to the foot of the stem (which is marked zero) in a solution of one part of common salt in nine parts of water. It is then put into water, and the place to which it sinks marked 10° of the scale, which is constructed from these data. The hydrometer for liquids heavier than water is made by loading it, so that in distilled water it shall sink nearly to the top of the stem. The place to which it sinks in a solution of 15 parts of salt in 85 parts of water is then marked 15°, and the scale divided off. For a table exhibiting the value of these scales in specific gravities, see the *Appendix*. Hydrometers are made specially for syrups, acids, and saline solutions. Those for syrups should have a very short tube, graduated from 20° to 40° of Baumé's scale for heavy liquids. The advantage of a short stem is, that the instrument may be used in small vessels.*

The hydrometers commonly imported are so carelessly made that scarcely any two will agree, and little dependence is to be placed on their accuracy. A more certain method consists in weighing the liquid at a uniform temperature in a bottle, the capacity of which, in grains of distilled water, has been previously ascertained. If a bottle is selected which will hold exactly 1000 grains of water at 60°, the weight in grains of the quantity of any liquid which it will hold, will be the specific gravity of that liquid. Such bottles are sold in the shops. If

* For some very interesting observations in reference to the inaccuracy of the existing tables of specific gravities corresponding to the several degrees of Baumé's hydrometer, to the uncertainty of the hydrometer in use, and to a mode of remedying these inconveniences, the reader is referred to a paper by Mr. Henry Pemberton in the *Am. Journ. of Pharm.* (xxiv. i.); and for a good and accurate method of graduating hydrometers to a communication from Dr. W. H. Pile, in the same Journal (xxiv. 310).

one is not attainable, an ordinary vial may be used, and the specific gravity obtained by dividing the weight of the liquid examined by the weight of the water. The operation is rendered more accurate by fitting a smooth cork to the vial, passing a pin transversely through it so as to rest on the lips of the vial, and then cutting a small vertical groove into the side of the cork so as to admit of the escape of the excess of liquid, when the cork is inserted.

Gay Lussac's centesimal alcoholmeter is a very useful instrument, being graduated so as to indicate the per centage of absolute alcohol in any mixture of pure spirit and water.

The specific gravity of a solid is ascertained by first weighing it in air and then in water, and dividing the former weight by the difference between the two. If lighter than water, it should first be weighed in the air, then in air and in water in connexion with a heavier body, which has itself been previously weighed in air and in water; and the weight of the lighter body in the air, should be divided by the excess of the difference between the weights in air and water of the two conjoined, over that of the weights in air and water of the heavier body alone. If the body be soluble in water, its relative weight to that of some other liquid of known specific gravity should be ascertained, in the manner above directed, and this weight multiplied by the specific gravity of that liquid.

The specific gravity of insoluble powders heavier than water, as calomel, may be obtained by introducing 100 grains into a thousand grain bottle, filling it carefully with distilled water, so as to disengage all the air, ascertaining the weight of the contents in grains, subtracting the number of grains exceeding 1000, from the weight of the powder in air, and dividing the latter by the difference. When the powder is soluble or lighter than water, another liquid, as alcohol, ether, or oil of turpentine may be used, the necessary allowance being made for the difference in specific gravity. Very accurate thousand grain bottles are now made in Philadelphia.

Mechanical Division. One of the simplest methods of preparing medicines is their reduction, by mechanical means, to a state of minute division. This is effected by the operations of slicing, bruising, rasping, filing, triturating, grinding, sifting, levigation, and elutriation. When the result is a fine powder, the process or processes employed are called *pulverization.*

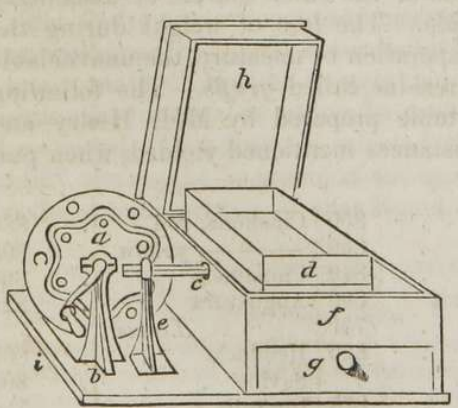
The more important drugs which are sold in the state of powder are pulverized by persons who pursue that occupation for a livelihood. Owing to the readiness with which fraud can be perpetrated in this operation, the apothecary cannot be too careful to place his drugs in honest hands. In sending drugs to the powderer a certain per centage of powder is sometimes required, without regard to the condition of the drugs, as to moisture, extraneous admixture, &c., which per centage often cannot be obtained without the addition of foreign matter. This procedure on the part of the druggist is one of the chief sources of dishonesty in the powderer, and is highly reprehensible. The loss of weight during the processes of pulverization is due to the evaporation of moisture, the unavoidable escape of dusty particles, and the useless residue called *gruffs.* The following statement has been abbreviated from a table prepared by MM. Henry and Guibourt. One thousand parts of the substances mentioned yielded, when pulverized—

Roots.		Florentine orris	850	Cinchona, red	880
Jalap	940	Rhatany	850	———, yellow	900
Rhubarb	920	Calamus	840	Cinnamon	890
Columbo	900	Virginia snake root	800	Angustura	825
Liquorice root	900	Ipecacuanha	750	*Leaves.*	
Valerian	860	Squill (bulb)	820	Hemlock	800
Elecampane	850	*Barks.*		Savine	800
Gentian	850	Cinchona, pale	875	Digitalis	790

Belladonna	785
Senna	720
Henbane	530
Flowers.	
Chamomile	850
Saffron	800
Fruits.	
Mustard	950
Black pepper	900
Nux vomica	850
Colocynth	500
Vegetable Products.	
Aloes	960
Tragacanth	940
Opium	930
Gum Arabic	925
Scammony	915
Catechu	900
Liquorice (extract)	810
Animal Substances.	
Castor	900
Spanish flies	850
Mineral Substances.	
Red oxide of mercury	980
Red sulphuret of mercury	950
Arsenious acid	950
Sulphuret of antimony	950
Tin	825

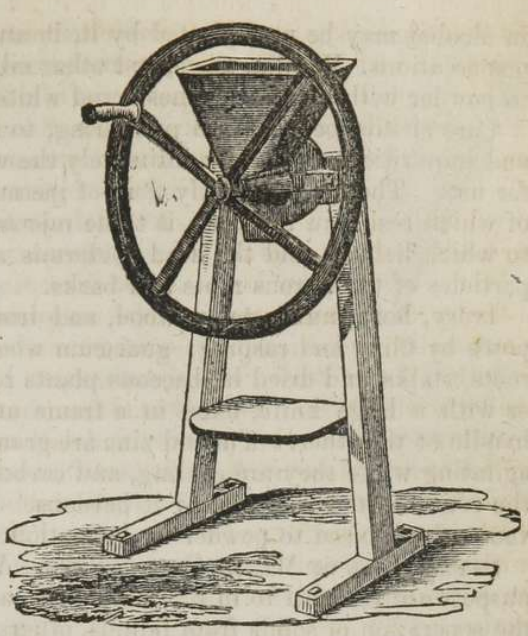
The apothecary often finds it necessary to pulverize drugs in small quantities. For this purpose he should be provided with *mortars* of iron, brass, Wedgwood ware, glass, and marble, sieves of several degrees of fineness, at least one hand mill, one or more cutting knives, a rasp, and a pair of pruning shears.

Contusion should be performed in an iron or brass mortar, the latter being used for astringent substances. The curve of the interior surface of the bottom should be elliptical, and that of the pestle should be of the same kind, but of shorter radius, so that when the pestle stands vertically in the mortar their surfaces may approximate pretty closely for some distance around the point of actual contact. Powdering by contusion is much facilitated by using a large mortar, with the pestle suspended on a spring so as to assist in elevating it. In powdering acrid substances, as well as to prevent loss in those that are dusty, a leathern cover should be attached to the pestle, and held tightly around the edge of the mortar by a circular wooden frame. The operator should guard himself against the fine particles of very acrid substances, like cantharides, euphorbium, &c., by standing with his back to a current of air, and covering his nostrils with a wet cloth. He should be careful not to impede the process by introducing too large a quantity of the material so as to clog the pestle. After the pestle has been in action a certain time, the fine particles accumulate so as to hinder the reduction of the coarser. At this point the sieve should be brought into requisition. *Sieves* for powders are constructed of woven brass wire, and silk cloth (bolting cloth). The best arrangement for the apothecary's use is that known as the box or drum sieve, being cylindrical, with a cover above, and a receptacle below for the powder. After introducing the contents of the mortar, a jerking circular motion should be given to the sieve, without much jarring, so that none but the finest particles shall pass. The coarser portion should then be returned to the mortar to be again acted on. A set of simple sieves, formed by tacking pieces of woven wire, with meshes varying from the twentieth to the fourth of an inch, to square wooden frames, should be provided to prepare drugs for percolation and other modes of solution. When the quantity of material to be sifted is large, recourse may be advantageously had to *Harris's patent sieve*, which has the merits of the drum sieve, with great facility of use. (See *Am. Journ. of Pharm.*, xxv. 31.) A figure of this instrument is given in the margin.



Grinding. The hand mill is exceedingly useful for the coarse comminution of drugs, especially of those which from their acrimony may annoy the operator in the process of contusion. Swift's drug mill (see following page), is one of the most useful and manageable of the kind. It does not answer well for fibrous

drugs like slippery elm and sarsaparilla, unless sliced transversely in short sections.



Trituration is the effect produced where a circular motion, accompanied by pressure, is communicated to the pestle; and is applied most generally to friable substances, or to powders obtained by other means with a view to their further and more regular comminution. The operation is accelerated by alternately increasing and diminishing the circular movements, so as to bring the pestle in contact with all portions of the surface of the mortar. Dover's powder and red oxide of mercury are instances requiring this operation; and in prescriptions for powders, where a variety of substances of variable molecular condition are associated, this process is employed to bring them to a uniform state of division.

Levigation, or *porphyrization* as it was formerly called, is a kind of trituration effected between the flat surfaces of a slab and muller. As the surfaces are equidistant at all parts, a substance subjected to their action has its particles more uniformly divided, than between the curved surfaces of a mortar and pestle. It is usual to moisten the powder with water or alcohol (in which it should be insoluble) so as to bring it to a pasty consistence. The slab and muller are made of glass, porphyry, Wedgwood ware, or marble.

Elutriation bears the same relation to trituration and levigation that sifting does to contusion. It consists in agitating a powder, obtained by those processes, in a large quantity of water, allowing the coarser particles to subside, and pouring off the supernatant liquid, holding the finer particles in suspension, that they may settle separately. The pasty thick mass, left when the clear liquid is decanted, is put into a funnel, and dropped in small portions on a chalk stone so as to form small conical masses. The fineness of the powder depends on its specific gravity, and the length of time which elapses before the liquid from which it subsides is drawn off.

Various means are used to facilitate the operation of powdering. All vegetable substances must be carefully and thoroughly dried. No part of the business of the powderer requires more care than this, especially in relation to those substances which owe their activity to volatile principles. The heat derived from steam, regulated below 100° for aromatic substances, and below 140° for others not injured thereby, is the most appropriate. Resins, gum-resins, and gums must be powdered in cold frosty weather. Tragacanth and nux vomica must be dried in a stove heat, and powdered while hot. The fibrous roots, as liquorice and marshmallow, should be previously cut into thin transverse slices. Agaric is to be powdered by beating it into a paste with water, then drying, and triturating it. Cloves and the aromatic seeds may be ground in a hand mill, and afterwards triturated. Squill and colocynth, the comminution of which is sometimes aided by soaking them in mucilage of tragacanth and then drying, are best powdered in a dry atmosphere, after being thoroughly dried by a stove heat. Camphor requires the addition of a few drops of alcohol. The efflorescent salts may be obtained in the state of fine powder by exsiccation; and those which are insoluble

in alcohol may be precipitated by it, in an impalpable powder, from their aqueous solutions. Vanilla, mace, and other oily aromatic substances, may be rubbed to powder with sugar; magnesia and white lead, by friction on a wire sieve.

Care should be taken, in powdering, to separate previously the inert portions and impurities, and to mix intimately the whole of the powder which is reserved for use. The central woody fibre of ipecacuanha and of other roots, the virtues of which reside in the bark, is to be rejected. The first portions of those barks to which lichens, and the dead epidermis adhere, are inert; as are also the last particles of the fibrous roots and barks.

Ivory, horn, nux vomica, wood, and iron are prepared for pharmaceutic purposes by filing and rasping; guaiacum wood and quassia by turning in a lathe; roots, stalks, and dried herbaceous plants by cutting with a large pair of shears, or with a large knife, fixed in a frame at one end and furnished with a long handle at the other. Tin and zinc are granulated by melting them, and strongly agitating while they are cooling, and carbonate of potassa by stirring with a rod the concentrated solution as it hardens. Earthy insoluble substances are conveniently reduced to powder by levigation.

Separation of Mixed Substances. Various mechanical operations for this purpose are resorted to in practical pharmacy. Some of these have reference to the separation of solids from liquids, others to the separation of one liquid from another.

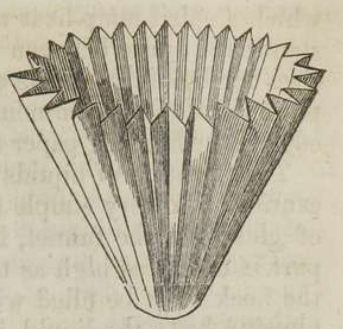
Separation of Solids from Liquids. This includes the processes of decantation, filtration, straining, expression, clarification, &c.

Decantation. Solids may be separated from liquids, when there exists no chemical action between them, by being allowed to subside. The supernatant liquid may then be carefully poured off; or it may be drawn off by a syphon, or separated by filtering. The last operation, or expression by a stronger force, is necessary to separate the whole of the liquid.

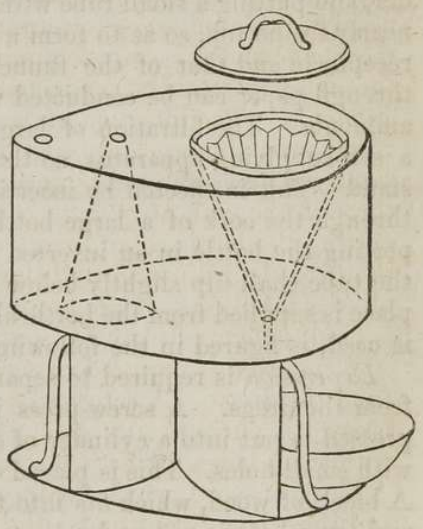
Jars larger at bottom than at the top, and furnished with a lip for pouring, called *precipitating jars*, are sold in the shops, and are proper for decantation, precipitation, and the receiving of filtering liquids. When the decanted liquid is the object of the process, and the powder subsides very slowly, the precipitation may be greatly hastened by the addition of a small quantity of solution of gelatin. Decantation by pouring is facilitated by holding vertically against the lip a glass rod, which attracts and gives a direction to the current, and prevents it from running down the sides of the vessel. The syphon is a tube bent like the letter U having one limb longer than the other. When it is filled with liquid, and the shorter end is inserted in the fluid to be decanted, a current is established towards the longer limb owing to the greater weight of its contents, which continues as long as the shorter limb is kept below the surface of the liquid.

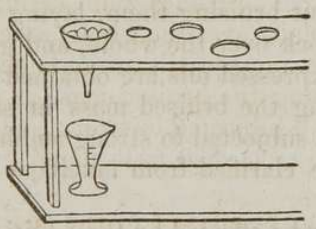
Filtration consists in pouring a mixture of solid and fluid matter on a porous surface, called a filter or strainer, which admits of the passage of the fluid only, and is designed either to clarify the liquid, or to separate the solid from the associated liquid by washing and draining.

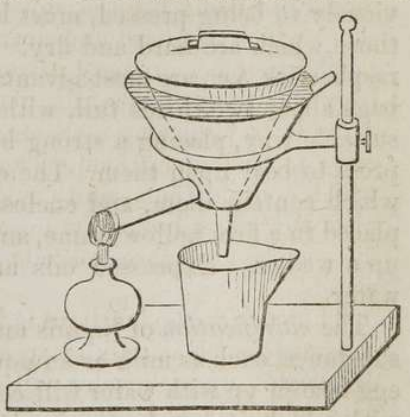
Filters or strainers are made of unsized paper, cotton, linen, and woollen cloth, charcoal, glass, and sand. The apothecary should be provided with several kinds of filtering paper, one of which should be white and free from matter soluble in dilute acids, especially oxides of iron. Paper filters are *plain* or *plaited*. The plain filter is made by folding a square piece of paper twice, so as to bring the four corners together, and then separating one of the layers from the other three so as to form a hollow cone, which is inserted in a funnel. Such filters are best for precipitates; but when rapid filtration is required, the plaited filter, by presenting a much greater extent of surface, and numerous channels for the descent



of the liquid, is to preferred. The paper is folded into 32 triangular surfaces, all the points meeting in the centre, and the edge presenting a zig-zag outline as in the figure. In some cases it may be necessary to place a small cone of the same material outside of the large one to strengthen it. When the liquid is too viscid to pass readily through paper, a cotton or woollen bag of a conical shape may be used. Cotton flannel with a thick nap is well suited for syrups. Acids may be filtered through a layer of fine siliceous sand, supported in the neck of a glass funnel by pieces of glass gradually decreasing in size. Castor oil, syrups, and oxymels may be readily filtered through coarse paper, made entirely of woollen shreds; but the best material for fixed oils is hatters' felt, in the conical form in which it is prepared in the making of hats. This may be attached to a tin ring, and suspended over a suitable vessel. Melted fats, resins, wax, and plasters may be *strained* through muslin stretched over a square frame, or a hoop. Hair cloth or wire gauze is better suited for plasters than muslin. Small sieves of fine bolting cloth serve for straining emulsions, decoctions and infusions; and a temporary strainer for these purposes may be made by fastening a piece of muslin between the upper and lower parts of a common pill box, and then cutting off the ends so as to leave the rim only of the box around the muslin. The filtration of viscid substances is facilitated by heat. Filtration through bone black is practised for muddy or dark coloured liquids. Much inconvenience is often experienced in the filtration of hot saturated saline solutions, by the cooling of the liquid, and consequent crystallization of the salt, in the filter and neck of the funnel. To obviate this, the tin apparatus represented in the above wood cut was contrived by Professor Hare. The vessel is filled with hot water, which is kept at a boiling heat by a spirit lamp placed under the cavity having the shape of an inverted funnel. A glass funnel with a filter is placed in the other cavity, and the liquid passes through rapidly. In filtering alcoholic solutions, it is necessary to protect the liquid from the flame of the lamp, and for this purpose the partition underneath has been added. No apothecary should be without this useful apparatus. The arrangement of Dr. Hare has been simplified by having a funnel with double sides, as in the figure, with a hollow cylindrical projection at the lower part, to







which a spirit lamp heat may be applied, while the funnel is supported on a lamp stand; the space between the sides being filled with water. Frames of various sizes for holding funnels and filters will be found very useful; the wood cut represents the one commonly used. The efflorescence of saline solutions on the edge of the filtering paper may be prevented by dipping it in melted tallow or lard.

The filtration of liquids which are altered by exposure to the air requires much caution. A very simple method of accomplishing it is to insert a slender tube of glass into the funnel, long enough to reach below the neck, while the upper part is nearly as high as the top of the funnel. The space between the tube and the neck must be filled with bits of glass and fine sand so as to form a good filtering bed; the liquid is then poured in, and the top of the funnel covered with a plate of glass. If this be luted on, and the funnel luted into the neck of a bottle, the process will be performed with perfect accuracy. Another way of performing this operation, in relation both to liquors altered by the carbonic acid of the air, and to those which are very volatile, as ethereal and ammoniacal solutions, consists in covering the funnel with a sheet of tin foil, or moist bladder, and putting a small tube within and against the side of the funnel, extending nearly to the top, so as to form a communication between the atmosphere of the receptacle and that of the funnel. By such an arrangement ordinary filtering through paper can be conducted with perfect success with ether or solution of ammonia. The filtration of large quantities of liquids is facilitated by having a self-supplying apparatus, so that the level of liquid in the filter may be constant. This is effected by inserting a tube, with a bore of a quarter of an inch, through the cork of a large bottle containing the liquid to be filtered, and supporting the bottle in an inverted position over the filter, as at page 783, so that the tube shall dip slightly below the surface of the liquid. As this descends its place is supplied from the bottle above. Another arrangement, in which a syphon is used, is figured in the following page.

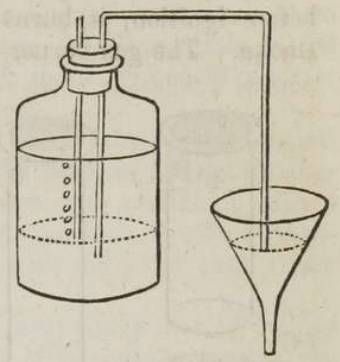
Expression is required to separate the last portions of tinctures and infusions from the dregs. A screw-press is used for this purpose. The substance to be pressed is put into a cylinder of strong sheet tin, the sides of which are pierced with small holes. This is placed on a square tray of tin having a lip for pouring. A block of wood, which fits into the cylinder, like a piston, is placed on the top, and the whole is put under the screw-press, the pressure of which is gradually brought to bear upon it.

This press is to be used for expressing the juices of fresh plants, which, previously to being pressed, must be well beaten in a mortar, water being added to those which are hard and dry. The juices of succulent fruits, as strawberries, raspberries, &c., are most advantageously extracted by filling several strong flannel bags about two-thirds full, without bruising them, laying these in a pile on a suitable tray, placing a strong block over the whole, and gradually bringing the press to bear upon them. The expressed oils are obtained by bruising the seeds which contain them, and enclosing the bruised mass in strong bags, which are placed in a firm hollow frame, and subjected to strong sudden pressure by driving up a wedge. Expressed oils are clarified from mucilage by boiling them with water.

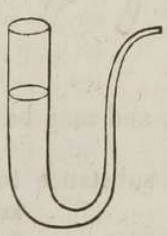
The *clarification* of liquids may be effected by the addition of some coagulable substance, such as milk or an aqueous solution of ichthyocolla. The white of an egg beaten up with water will coagulate with a gentle heat, and clarify any liquid with which it has been mixed. The vegetable acids will clarify many of the expressed juices of plants; and the juice of sour cherries will cause the complete separation of the pectin of currant and raspberry juice, so as to fit them for syrups.

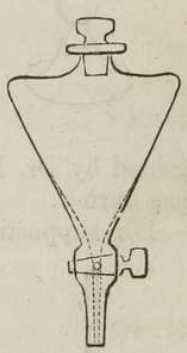
Precipitation is sometimes mechanical, as in the process of *levigating* and *elutriating* chalk, and sometimes chemical, as in the preparation of the precipitated

carbonate of lime by decomposing chloride of calcium. When a precipitant is directed to be added until no further precipitation takes place, the fact may be ascertained by taking a drop of the liquid on a glass plate, and trying it with the precipitant. The formation of a precipitate is often much assisted by agitation, or by heat. The separation of the supernatant liquid from the precipitate is most effectually accomplished by means of a syphon. When the liquid is a saline solution, it is necessary to wash the precipitate until the water exhibits no trace of the salt. In doing this great care must be taken to select the purest and clearest water, and the ultimate drying of the precipitate must be performed in a filter, or on a porous stone.



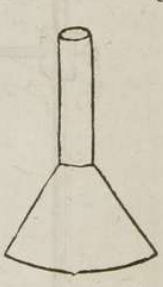
The apparatus figured in the margin is very convenient for procuring a constant and gentle stream of water, in washing precipitates and in clearing crystals of the impurities of their mother-water. It consists of a syphon having legs of equal length, one of which is inserted in an air-tight bottle nearly filled with water, and the other dips into the funnel. A straight open tube is also inserted in the bottle, the lower end of which is about half an inch or an inch above the end of the syphon. It is obvious that the water will run from the syphon no longer than till the water in the funnel is level with the end of the straight tube. The same effect may be produced by using an inverted bottle and tube, as described in the preceding page.





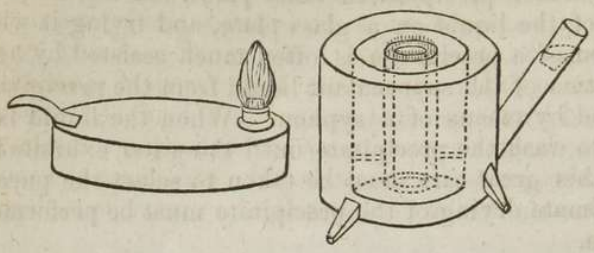
Separation of Liquids. Liquids which have no chemical affinity, and differ in specific gravity, may be separated by allowing them to remain at rest in the separating funnel represented in the annexed figure, and then drawing off the heavier fluid. Another very convenient method of separating fluids is by means of the *separatory* figured in the wood cut in the margin. The last drops of the heavier fluid may be drawn off by means of this instrument.

Application of Heat. The most efficient and economical means of obtaining heat is a subject of great importance to the pharmaceutist, on account of the variety of processes in which it is required.

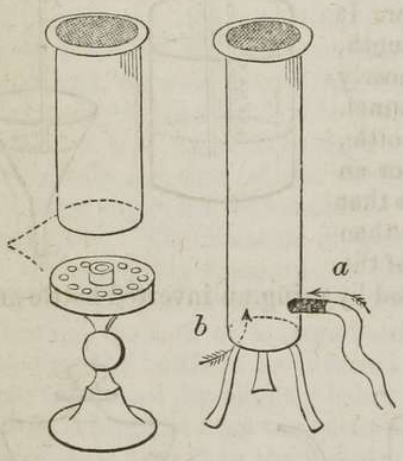


With the small *furnaces*, which are now made of fire clay, of various patterns and sizes, almost all the operations of the laboratory which require heat can be performed. The fuel used is charcoal, although anthracite will burn in those of a larger size, and is to be preferred where a uniform heat is necessary for several hours. The apothecary should be provided with a complete set of these useful utensils, including one with a dome for a reverberatory furnace. By adding a pipe several feet in length to this, and urging the fire with a pair of double bellows, the heat may be raised to that of an air furnace. A small pipe of sheet iron with a cone at the lower end, as in the figure, to fit on the furnace, will be found an excellent means of obtaining an intense heat in those of the smallest size. For operations on a smaller scale, a convenient means of obtaining heat is by alcohol lamps. Alcohol burns without smoke or smell, and is almost as cheap a fuel as oil, to which it is on every other account preferable. The

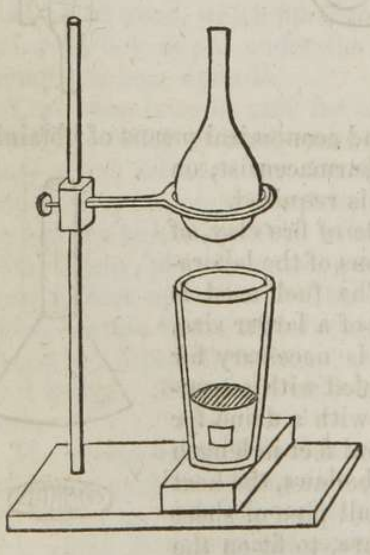
annexed figures represent the usual form of spirit lamps. The larger one will be found very useful in heating spatulas for spreading plasters.

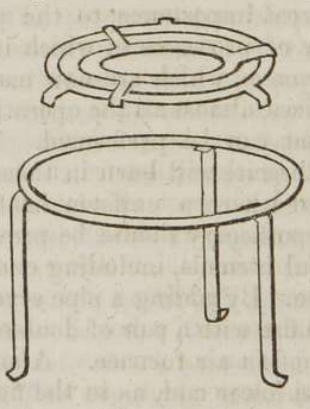


Gas burners afford a yet more eligible and economical means of applying heat than alcohol lamps. When coal gas is mixed with a due proportion of atmospheric air before ignition, it burns with a bluish flame and produces but little if any smoke. The gas burner consists of a cylinder of sheet or tinned iron from 2 to 4 inches in diameter, and 6 or eight inches long, open at the inferior end, while the upper end, which is slightly flared, is covered with a piece of number 70 brass wire gauze, fastened on with wire. This burner is supported vertically over an ordinary gas jet in any convenient position, and the gas on being allowed to issue into it, rises from its superior levity, mixes with the air, and is ignited by means of a taper above the gauze. The heat can be managed by regulating the flow of gas, and by using burners of different sizes. The left of the two figures in the margin exhibits this arrangement. That on the right, in which a tube conveying gas (*a*) enters the cylinder horizontally while the air passes in at *b* below, is an arrangement suggested by Dr. Bridges, and may be adapted to the common bat-wing or fish-tail gas burner.



For supporting the substance to be heated, iron tripods, of various heights and sizes, must be provided. These should be furnished with sets of concentric rings, as in the figure, for vessels of different sizes. A very convenient support is the stand and ring figured in the wood cut, which will answer for a spirit lamp, or for a small furnace made from a black lead crucible, as in the figure.





The temperature required in pharmaceutical processes seldom exceeds a red heat; and the vessels used are *crucibles* of silver, porcelain, Wedgwood ware, black lead, and fire clay (Hessian crucibles). Silver is used for the fusion of potassa, porcelain for nitrate of silver, and black lead and Hessian crucibles for the metals, glass of antimony, sulphuret of potassium, and the ordinary operations which require a great heat. They are each liable to objections; silver fuses too readily; porce-

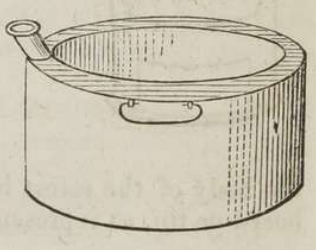
lain and Wedgwood ware do not bear sudden changes of temperature; black lead, which bears these changes, is destroyed by saline substances, and burns in a current of air; and the Hessian crucibles are so porous as to absorb and waste much of the fused substance. The crucibles should be covered with a lid or an inverted crucible, and should be supported at a little distance from the bottom of the grate, and surrounded and covered with ignited coals.

Liquefaction is performed in open earthen, copper, or iron vessels, and care must be taken not to raise the heat so as to char or inflame the substance.

A sand bath is an indispensable part of the pharmaceutic apparatus. It is usually an iron pot, or a shallow vessel of sheet iron capable of holding sand to the depth of four or six inches. It serves to regulate the action of the heat on vessels which do not bear a rapid change of temperature. It is sometimes heated to a red heat as in preparing the mineral acids, though more frequently used for the evaporation of saline solutions and vegetable juices.

Evaporation is one of the most important operations of the pharmaceutical laboratory, and on its proper management depends the value of a large number of preparations. The readiness with which organic matter is modified by direct heat, has caused the invention of various means and apparatus to effect evaporation under the most favourable circumstances, as with the *water bath, steam bath, solution bath, vacuum pans*, etc.

The *water bath* is to be used in all cases where a heat above that of boiling water would be injurious. A convenient one consists of two copper vessels, the upper one of which is well tinned. It is still more convenient to have the water bath constructed as a hollow vessel with one opening at the top for the escape of steam and for the introduction of the water, as in the figure. By inserting a cork in the aperture, the contents of the inner vessel may be poured out as from a dish without spilling the water. It may be made of tinned iron, or preferably of tinned copper. Where a temperature above that of boiling water, and not exceeding 228° is required, the water bath may be filled with a saturated solution of common salt, sulphate of soda, or chloride of calcium, the last mentioned salt communicating a heat as high as 240° when desired.



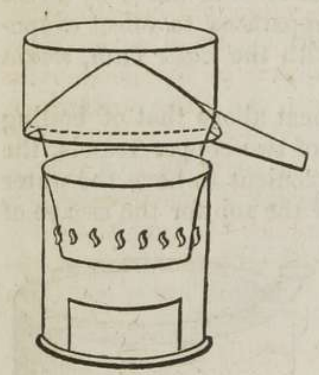
Steam baths are by far the most useful and easily regulated of the arrangements for indirect heating. When steam heat is applied in a double-sided vessel like the water bath, it is called a steam jacket, and must have two openings, one for the ingress of the steam, the other for the exit of the air, and for drawing off the condensed water. When the steam jacket is strongly made, a heat of 300° may be readily commanded. A more economical and easily applied arrangement consists in placing a coil of tube in the vessel containing the liquid to be evaporated, and causing a strong current of steam to circulate through it. For further remarks on apparatus for evaporation, including the vacuum pan, see *Extracts.*

The apothecary should be provided with a set of evaporating vessels, of porcelain, glazed iron, tinned iron, and copper. For metallic solutions vessels of Berlin porcelain are the most useful. In most cases of surface evaporation, where the product is uncrystallizable, the process should be hastened by stirring.

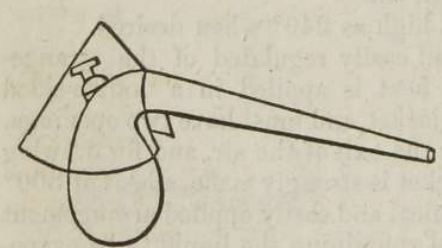
Distillation consists in vaporizing a fluid in one vessel, and conducting the vapour into another vessel, where it is condensed and collected. The process is used for separating a liquid from solid substances which it may hold in solution, or with which it may be mixed; for separating a more volatile liquid, as ether and alcohol, from one less so; for impregnating a liquid with the volatile principles of plants to the exclusion of other principles, as in the preparation of aromatic spirits and waters; and for separating by means of aqueous vapour, the

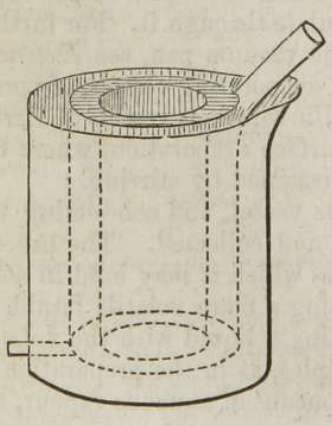
essential oils and volatile proximate principles of the vegetable kingdom. The process for separating one liquid from another is termed *rectification.* When in the last two processes, the distillation is repeated with the same liquid and a fresh quantity of the plant, the operation is called *cohobation.* Distillation is also used for obtaining the volatile products which result from the decomposition by heat of substances of animal or vegetable origin. The oils which are obtained in this manner are called *empyreumatic oils.* Sometimes the result is an acid, as the succinic acid, and sometimes a volatile alkali, as in the destructive distillation of animal substances.

The *common still and worm*, the vessels in general use for *distillation*, are too well known to need description. A convenient still or alembic for small operations, which may be heated by a spirit lamp, is figured in the wood cut. The top of the head is kept filled with cold water, and all escape of vapour is prevented by having an inner ledge to the still, and filling the space in which the head fits with water. The condensation of all the vapour is secured by adapting a worm, or a long tube to the apparatus. The boiler of this still may hold one or two gallons, and it will be found a very useful means of recovering the alcohol in making alcoholic extracts. It may easily be converted into a water bath by fitting on the top of the boiler, a vessel of convenient form. These stills are easily adapted to the common cylindrical anthracite stoves, used for heating, by means of a sheet iron collar, through which the boiler of the still is made to pass, and on which it is supported.



When the common glass retort and receiver are used for the distillation of liquids, care should be taken not to apply the luting until the atmospheric air is expelled, unless the receiver has a tubulure for its escape. The chief objects to be aimed at are to keep the body of the retort hot, and the neck and receiver cool. A hood of pasteboard or tin, as represented in the figure, will much facilitate the former; and the latter will be gained by keeping the neck and receiver wrapped in wet cloths, on which a stream of cold water is kept running. This may be conveniently done by means of a syphon made by dipping one end of a strip of cotton or woollen cloth in a vessel of water, and allowing the other end to hang down upon cloths bound loosely around the receiver and the neck of the retort. The apparatus figured in the margin is one of the best for the condensation of ethereal vapour, as in regaining the ether in the process for making ethereal extracts. It consists of a close hollow cylindrical tin vessel, having a large neck above for the insertion of the neck of a retort or a tube; and a small tube below for the escape of the condensed ether. This vessel sits in a large one open at top, which is kept filled with cold water, constantly renewed by a tube descending to the bottom.





When certain liquids are boiled in glass vessels, sudden jars or succussions are apt to occur,

which are often inconvenient, and sometimes interrupt the process. These may be obviated by giving a metallic coating to the lower portion of the interior surface of the vessel. Mr. Redwood recommends for this purpose the process of Drayton. He introduces into the flask or retort as much ammoniacal solution of silver as may cover the part to be coated, precipitates the silver by the addition of essential oils, and afterwards thoroughly cleanses the vessel by boiling it in successive portions of alcohol, until the silver becomes perfectly bright and all smell of the oil is removed. A coating of platinum may also be obtained, though less perfect, by precipitating a solution of the chloride of that metal by formic acid and afterwards boiling. (See *Am. Journ. of Pharm.* xx. 333.) These succussions are moderated and sometimes prevented by putting in the retort a number of small angular fragments of glass or quartz crystal. The most convenient and effectual apparatus for distillation in small quantities, is the flask and Liebig's condenser, figured in page 793; and with such an arrangement the contents of the flask are less likely to be driven over, so as to mix with the distilled liquid.

When the object of distillation is to preserve the residuum, and this is liable to injury from heat, as is the case with vegetable extracts, the operation is best performed in vacuo. For this purpose the still and recipient are made so as to form an air-tight apparatus, and the latter is furnished with a stop-cock which is kept open until the whole of the atmospheric air is expelled by the vapour. It is then closed, and a vacuum formed and maintained in the recipient by surrounding it with cold water. The distillation is carried on in this manner at a much lower temperature than under ordinary circumstances, and the heat may be applied by a water or steam bath, with greater certainty of obtaining an uninjured product. For a more extended account of vacuum apparatus, see *Extracts.*

Sublimation. The vapours of some volatile solids have the property of condensing into the solid form, either in mass or in a state of minute division. The operation in which this occurs is called *sublimation.* When the product is compact it is called a *sublimate*, when slightly cohering it is called *flowers.* The operation is generally performed in a sand bath; and the apparatus consists of two vessels fitting each other, one being inverted over the other. The shape, size, material, and depth of the vessels, and the degree of heat to be applied are regulated by the nature of the substance operated on. For the details of this process see the articles *corrosive sublimate*, *camphor*, and *benzoic acid.*

Lutes. The most precious material for the chemist is glass, the transparency, insolubility and hardness of which fit it for almost every purpose. It is often necessary to strengthen it by means of lutes which will bear a heat at which glass would soften; and the application of lutes for this purpose, and for securing the junctures of tubes and vessels, is an important part of the pharmaceutic art. Those lutes which are required for coating vessels exposed to a great heat, are made of Stourbridge clay. The clay is made into a paste with water, mixed with chopped straw or cut hemp, and successive coats applied as they become dry. Dr. Hare recommends the fine wool-like turnings of iron for this purpose instead of chopped straw. Earthenware vessels may be rendered impervious to air or vapours by brushing over them a thin paste made of slaked lime and a solution of borax containing an ounce to the half pint. This is allowed to dry, and the vessel is then coated with slaked lime and linseed oil, beaten till the mixture becomes plastic. Earthenware retorts, thus coated, may be safely used more than once, the coating being renewed every time.

Fat lute is applied to the joinings of apparatus to prevent the escape of corrosive vapours. It is made like glaziers' putty, pipe clay being substituted for whiting. It will bear a considerable heat, and great care must be taken that

the part where it is applied be perfectly dry. If it be exposed to heat, slips of moistened bladder must be wrapped around it and secured with twine.

Roman cement and plaster of Paris may be applied in the same manner as fire-clay. When used for securing the joinings of apparatus a coating of oil or wax will render them air-tight.

A very useful lute is formed by beating the white of an egg thoroughly with an equal quantity of water, and mixing it with some slaked lime in the state of fine powder so as to form a thin paste. This must be spread immediately on strips of muslin and applied to the cracks or joinings intended to be luted. It soon hardens, adheres strongly, and will bear a heat approaching to redness without injury. A leak in this lute is readily stopped by the application of a fresh portion. Solution of glue, or any liquid albuminous matter, may be used in place of the white of eggs.

An excellent cement for surfaces of iron consists of one part of sulphur, two of sal ammoniac, and eighty of iron filings, mixed together and slightly moistened. It is rammed or caulked into the joints, and solidifies perfectly in time.

White lead ground in oil is an excellent cement for broken glass. Spread upon linen it forms a good coating for a cracked surface, but dries slowly. Strips of bladder macerated in water, adhere well to glass and are very useful.

A mixture of whiting and paste or gum water, spread upon strips of paper, forms an excellent luting for joinings not exposed to acrid vapours or a great heat.

A useful lute is formed by spreading a solution of glue on strips of cloth, and coating them, after they are applied, with drying oil.

Linseed meal, beaten into a uniform mass with milk, lime water, rye paste, or thin glue, and applied in thick masses, adheres well; and when dry will resist most vapours.

Cap cement is made of six parts of resin, one part of yellow wax, and one of Venetian red. It is a very useful cement for fastening metals or wood to glass, and for rendering joints impervious to water. *Soft cement* is used for the same purposes, and is made of yellow wax, melted with half its weight of turpentine, and coloured with a little Venetian red. It is very useful for rendering the stoppers of bottles perfectly air-tight.

Chemical Operations. Some of the chemical processes, conducted by the apothecary, have been explained in the former part of this Introduction. It remains to notice others in constant or frequent use.

Solution. The act of solution, in which solid substances assume the fluid state through the agency of liquids, is one of the most important operations of practical pharmacy. The process has received a variety of names according to the mode of applying the menstruum and the degree of heat employed; as *maceration*, *infusion*, *digestion*, *decoction*, *displacement* or *percolation*, and *circulatory displacement*.

Two classes of substances are the subject of solution; those which dissolve entirely in the menstruum, as salts, gum, &c., and those which consist of soluble and insoluble matter, as roots, leaves, barks, etc. The former yield *simple solutions;* the latter *infusions*, *decoctions*, *tinctures*, *wines*, etc. Solution is sometimes accompanied by chemical reaction, as when metals are dissolved in acid solutions. Mechanical division facilitates solution by increasing the extent of surface. Heat as a general rule favours solubility. All aqueous solutions of solid bodies are denser than water. A solution is said to be saturated when the dissolved substance ceases to be taken up at common temperatures. A saturated solution of one salt will dissolve other salts, a fact taken advantage of in purifying nitre, and other saline bodies in powder, by percolating them with their own

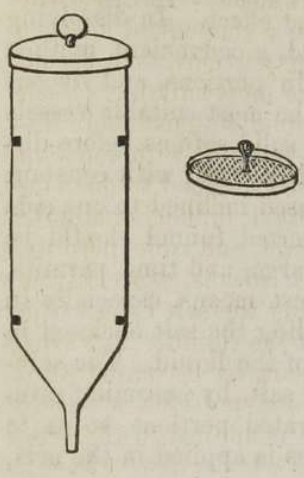
saturated solutions. Rapid solution when unaccompanied by chemical reaction causes a reduction of temperature; hence in such cases, where dense solutions are required, heat should be employed to counteract that effect. In dissolving a substance wholly soluble in the amount of liquid used, a convenient method is to reduce it to powder in a mortar, add the liquid in portions, and decant until the whole is dissolved. Capsules and flasks are the most suitable vessels for performing solution when heat is necessary. If the solid softens before dissolving, as in the case of the extracts, a capsule should be used, with constant stirring. When effervescence occurs a flask should be used inclined to one side to avoid loss; or, if the capsule be employed, an inverted funnel should be placed over it. When the quantity of a substance is large, and time permits, the process called *circulatory displacement* affords the best means, especially in making saline solutions. This is performed by suspending the salt enclosed in a piece of gauze or other porous tissue near the surface of the liquid. The solution proceeds rapidly; as the liquid in contact with the salt, by becoming saturated and heavier, descends to give place to less saturated portions, so as to cause a kind of circulation of the solvent. This process is applied in the arts, and has been suggested in making infusions and tinctures.

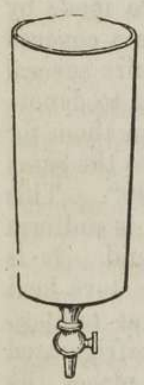
Infusion is the subjecting of a substance containing soluble principles to the action of a menstruum, which is usually water. Hot infusions are made by pouring boiling water on the substance, and allowing it to remain in a covered vessel till cold. Cold infusions are made with cold water, and require several hours to attain their full strength. *Maceration* is the term employed to denote the action of liquids upon medicines, when allowed to remain upon them for some time, at a heat from 60° to 90°. *Digestion* is the name given to the same operation, when conducted at a temperature between 90° and 100°. This process is sometimes effected at higher temperatures, but the heat is uniform during the operation, and always below the boiling point of the liquid. It is commonly performed in glass bottles or flasks, and a common fire or stove heat is employed. When digestion is performed with alcohol and ether at temperatures near their boiling points, the vessel should be connected with a refrigerated worm or other condenser to save the vaporized portion. Soubeiran places the worm above the digesting vessel, so that the condensed fluid runs back at once into the vessel.

Decoction, or boiling, is sometimes employed in extracting the virtues of plants; but is often disadvantageous, as most of the proximate principles of vegetables are altered by it, especially when long-continued. When it is practised, the ebullition should generally be continued for a few minutes only, and the liquid be allowed to cool slowly in a close vessel. For further remarks on infusions and decoctions see the preliminary notices to these classes of preparations.

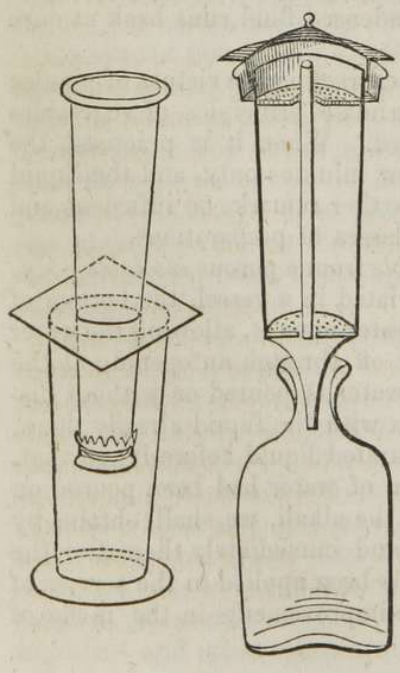
Lixiviation is a process used to separate a *soluble* from a porous *insoluble* body. It consists in placing the substance to be lixiviated in a vessel, the bottom of which is covered with straw, sand, &c., pouring water upon it, allowing the water to remain until saturated, and then drawing it off through an opening at the bottom of the vessel. It is found that if fresh water is poured on without disturbing the mixture in the vessel, it does not mix with the liquid already there, but percolates the solid particles, driving the saturated liquid before it; so that, for example in lixiviating wood ashes, if a gallon of water had been poured on the ashes, and allowed to become saturated with the alkali, we shall obtain, by this mode of proceeding, a gallon of strong ley, and immediately thereafter the water will become almost tasteless. This fact has been applied to the service of the pharmaceutist, and has led to some valuable improvements in the mode of extracting the medicinal qualities of plants.

The operation referred to is called by the French the *method of displacement;* but the terms *percolation* for the process, and *percolator* for the instrument in which it is performed, are more appropriate in our language. The figure in the margin represents *Boullay's filter*, or percolator, constructed on this principle. It consists of a long tin vessel, nearly cylindrical, but narrower at the lower end, which has a funnel shaped termination, for the purpose of being inserted in the neck of a bottle. A metallic plate, or diaphragm, pierced with holes, like a colander, and having a handle in the centre, fits accurately in the lower part of the cylinder. Upon this, previously covered with a thin layer of carded cotton, tow, or a piece of cotton flannel, is placed the substance upon which it is intended to operate, and which should be coarsely powdered or ground in a mill. It must then be saturated with the menstruum, which is done by pouring on the liquid from time to time until it will absorb no more, and then allowing them to remain for a few hours in contact. On the top of the powder is placed another similarly pierced plate, and fresh portions of the menstruum are gradually and successively added, until the process is completed. The first portion, that with which the powder was mixed, flows off very highly concentrated, while the next is much less so, and the successive infusions rapidly become weaker. A stop-cock near the lower end of the instrument, as represented in the second figure, will be convenient for regulating the discharge of the fluid. A single example will show the value of this process. The Messrs. Boullay, by subjecting four ounces of bruised cinchona to percolation with half a pint of water, and then adding four half pints in succession, obtained the following results.



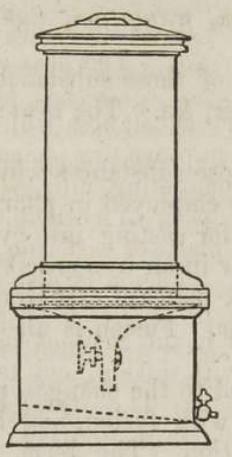


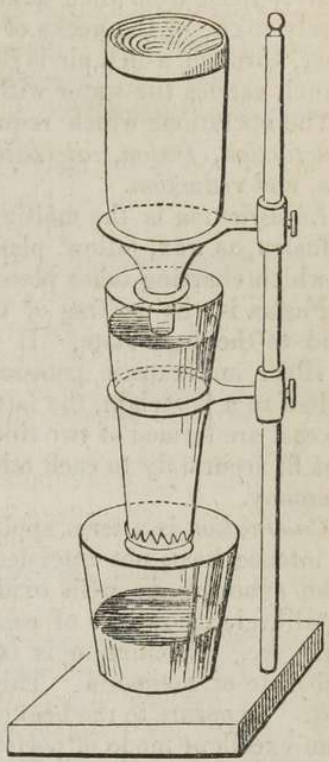
1st	Half pint	yielded	3 drs.	48 grs.	dry extract.
2d	Do.	"	1 dr.	5 grs.	Do.
3d	Do.	"		15 grs.	Do.
4th	Do.	"		9 grs.	Do.
5th	Do.	"		7 grs.	Do.



Cylinders 14 inches long by 2½ in width at the base, 14 inches by 4, and 17 by 6, are convenient sizes for ordinary use. Queensware percolators are now to be procured from the druggists, and are useful for acid or astringent solutions. In a large proportion of the cases of percolation small vessels only are required. The common glass cones, used as lamp glasses, figured in the margin, when inverted, with a piece of close canvass or flannel tied over the smaller end, form convenient percolators; and their transparency enables the operator to assure himself that the powder is properly stratified before adding the menstruum. A tin percolator, formed with a double rim into which the rim of the lid is inserted, (the

interstice being filled with water so as to make an air-tight juncture,) and furnished with an open vertical tube extending from the top through the diaphragm below, is used when volatile liquids, as ether, alcohol, and spirit of ammonia, are used as menstrua. It is figured in the preceding page. When it is wished to operate upon a fine powder, it will be found advisable to increase the height of the column of liquid by making the top of the cylinder air tight, and inserting a tin tube several feet long, which must be kept filled with the liquid. All the substantial advantages of this method may, however, be generally obtained without pressure, by using the filter of Boullay. For operating on very small quantities of a substance, an adapter or the neck of a broken retort may be used, by loosely stopping the lower and smaller end with a piece of cotton.





Soubeiran has adapted to Boullay's filter a receiver of tin, from which the filtered liquor may be drawn off by a stop-cock at the most dependent part. An apparatus of this kind is represented above. One of the most important points in conducting the displacement process is to keep the ingredients constantly saturated, with a stratum of the displacing liquid over them. To avoid the necessity of constant supervision to effect this, the arrangement in the right-hand figure above may be used. An ordinary bottle containing the menstruum, with a tube of a quarter of an inch bore passing through the cork, is inverted over the percolator with the end of the tube dipping in the liquid above the ingredients.

Crystallization. Numerous chemical substances, in becoming solid when their solutions are evaporated, take on certain regular forms. The bodies having such forms are called *crystals*, and the process for obtaining them, *crystallization*. The most usual method is by the evaporation of solutions, either spontaneously, or by the application of heat. The extent to which the evaporation should be carried depends on the solubility of the substance. The proper degree of concentration is attained, when a drop of the solution removed to a cool glass plate deposits well formed crystals. When set aside to crystallize, a solution should not be disturbed until the deposition ceases. The crystals are large in proportion to the slowness of the cooling of the solution, to effect which the vessel is sometimes set in the drying closet, and sometimes left to cool with the sand bath. The deposition of crystals is facilitated by suspending some insoluble substance, as wood, or sheet lead in the solution, or crystals of the same substance, which are thus increased in size. When it is desirable to have small acicular crystals, the solution should be cooled rapidly and stirred constantly meanwhile.

Crystallization is one of the best means of purifying many substances; the im-

purities remaining wholly or chiefly in the residual liquid called *mother water*. Fine silky crystals which retain their mother water by capillary attraction, must be dried by strong expression in a linen bag. The finest silky crystals may be entirely freed from their adhering liquid, by placing them in a funnel which fits closely to one of the necks of a double mouthed bottle, and fitting a tube to the other, through which air is drawn. The current of air, in passing through the funnel, carries the water with it, and dries the crystals perfectly.

The operations which require a heat greater than that used in digesting are *liquefaction*, *fusion*, *calcination*, *ustulation*, *incineration*, *distillation*, *sublimation*, and *reduction*.

Liquefaction is the melting of those substances that become soft previously to fusion, as wax, tallow, plaster, &c. The heat employed is always below that at which charring takes place.

Fusion is the melting of those substances which pass immediately from the solid to the fluid state. It is employed in pharmacy in preparing the nitrate of silver and caustic potassa for casting into cylinders. The former must be melted in a porcelain, the latter in an iron crucible. The moulds in which they are cast are formed of two thick plates of cast iron, with semi-cylindrical grooves that fit accurately to each other. Fusion is also used in preparing the glass of antimony.

Calcination is a term applied to the changes produced in mineral substances by intense heat, not attended with fusion, and leaving a solid residue, and is often synonymous with oxidation. The term *ustulation* is restricted to the metallurgic operations of roasting ores, to drive off the volatile matters, as arsenic, &c. Calcination is often used to express the ustulation or burning of carbonate of magnesia. This is to be performed in an earthen vessel at a red heat. Exposure to the heat of a potter's furnace during the burning of the kiln, is an excellent mode of performing the operation. More commonly the carbonate is burnt in an iron pot, which is objectionable, as the heat soon oxidizes the iron, and the oxide scales off and mixes with the magnesia, which is seldom free from iron when prepared in this way.

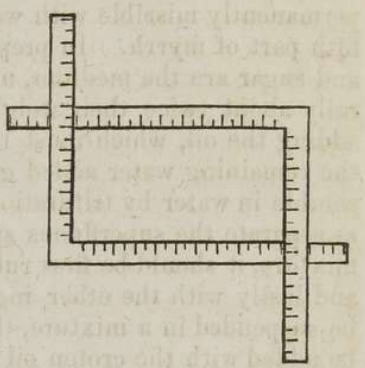
Incineration, as the name expresses, is the operation of burning substances for the sake of their ashes. It is performed in obtaining phosphate of lime—the Cornu Ustum of the London Pharmacopœia. The bones are burnt in an open fire until all the combustible matter is consumed.

Reduction is that operation by which certain binary compounds of the metals are brought to the metallic state, by heating them alone, or with some substance capable of attracting the combined substance and setting the metal at liberty. Arsenious acid is thus reduced by heating it with charcoal, and oxide of iron, in the state of powder, by heating it in a current of hydrogen. When, in the reduction of metallic compounds, some third substance interferes with the process, as silica, a substance capable of combining with this is added called a *flux*.

Dispensing of Medicines. A large portion of the operations of the apothecary is performed in the shop extemporaneously. In dispensing medicines from the counter, he is continually called upon to put his previous knowledge in practice, and often to substitute extemporaneous for the regular officinal formulæ. There is no part of his business which requires, for its proper performance, so much ready knowledge and so accurate a judgment. A few directions suggested by running the eye over the list of preparations of the Pharmacopœia, may be found useful.

It may sometimes be necessary for the apothecary to make extemporaneously an aromatic water, not usually kept in the shops. In this case he is to prepare it by rubbing two drops of essential oil with from four to six grains of carbonate of magnesia for every fluidounce of water, and filtering.

It is sometimes desirable to apply plasters prepared from the narcotic herbs. These may be made extemporaneously by mixing the soft extract of the plant, with about twice its weight of melted adhesive plaster. The most suitable material on which to spread plasters is soft white leather. A margin of half an inch should be allowed to remain around the plaster. The plaster iron or spatula may be heated over the large spirit lamp, figured in page 776. A skilful apothecary will be able to spread the plaster uniformly and evenly, without overheating it so as to corrugate or penetrate the leather. A convenient instrument for determining the size and preserving a straight edge, consists of two squares made of tin and graduated to inches, as in the annexed figure; or pieces of paper may be cut out and pasted on the leather so as to enclose a space of the required dimensions. The plaster should first be melted on a piece of brown paper, and then transferred to the leather, in order to prevent its being applied at too great a heat. For all the officinal plasters the apothecary should have small tin trays open on one side, on which to melt them. If the plaster to be spread is a very large one, it is better to liquefy the material in a capsule, and add it to different parts of the leather as it is wanted, till the whole is covered. For the description of an apparatus for spreading plasters, see *Emplastra.*



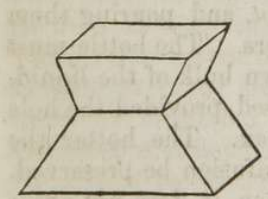
Decoctions and infusions are often ordered in prescriptions in the quantity of a few ounces. A very convenient vessel for preparing them is the common nursery lamp, which consists of a cylindrical vessel, open at one side to receive a spirit lamp, and at the top to receive a teapot or tin boiler. The *infusion mug* of Mr. Alsop of London (see *Infusa*), which consists of a queensware vessel, with a perforated diaphragm of the same material resting on a ledge at one-third of its height from the top, is the best instrument for this purpose. The material to be infused is placed on the diaphragm and the boiling water poured on till it rises over the ingredients. No stirring is necessary, and the process is accomplished rapidly. Infusions and decoctions may be kept during the hot weather, and for many months by straining them *while hot*, and pouring them at once into bottles provided with accurately ground stoppers. The bottle must be entirely filled; the stopper being made to displace its own bulk of the liquid. A common bottle with a perforated cork stopper may be used, provided the hole be instantly closed, and the cork covered with sealing wax. The hotter the liquid and the freer from air bubbles, the better will the infusion be preserved.

Neutral mixture is known to be saturated perfectly, when it does not affect litmus paper either in its blue state, or when reddened by an acid. For preparing the effervescing draught it is advisable to keep in the shop a solution of carbonate of potassa containing an ounce to the pint. The silica which this salt contains precipitates after a few weeks, and leaves a perfectly clear solution; whereas that prepared at the time it is to be used always becomes turbid after being saturated. The carbonic acid, extricated in the preparation of the neutral mixture, combines at first, without effervescence, with the remaining carbonate, and forms a bisalt. This circumstance may lead, unless the solution be tested, to the supposition that the mixture is saturated.

In preparing extemporaneous mixtures by direction of the physician, it is of the first importance to mix the ingredients in the manner best calculated to insure a smooth and readily miscible compound, without any grittiness or imperfectly comminuted portions, when a part of the constituents are insoluble. Kino and

extract of rhatany should be first dissolved in boiling water, when admissible. If an aromatic water is directed, they should be rubbed to powder, mixed with the insoluble ingredients, if any, and the water gradually added, the whole being triturated till smoothly mixed. Emulsions of the gum-resins should be rubbed till all the particles are softened, and then strained, if any extraneous matter is present. Water can be saturated with camphor by means of carbonate of magnesia, and an aqueous mixture of any strength may be made with it, by triturating the camphor with magnesia, and shaking the mixture before using it. Camphor softens the gum-resins, and solid fats and oils, and may be rendered permanently miscible with water, in considerable quantity, by trituration with a fifth part of myrrh. In preparing oily emulsions in which gum Arabic, or gum and sugar are the medium, a sufficient quantity of water must be added (generally about twice their weight) to convert them into a thick mucilage before adding the oil, which must then be thoroughly mixed with the mucilage, and the remaining water added gradually with great care. Ether is rendered more soluble in water by trituration with spermaceti. The mixture should be filtered to separate the superfluous spermaceti. If elaterium is to be incorporated in a mixture, it should be first rubbed with a little alcohol, then with sugar or syrup, and lastly with the other ingredients. When a few drops of croton oil are to be suspended in a mixture, the latter will be more permanent if a little olive oil be added with the croton oil to increase its quantity. Mixtures that contain the resinous tinctures, should also contain syrup, with which the tincture should be first mixed, and the water then added very gradually. If a mixture contains laudanum and a fixed oil, the former should be first mixed with the syrup, and the oil afterwards incorporated, and lastly the water. The mixture will not otherwise be uniform. When a considerable quantity of sugar is added to a mixture it is best to use syrup, employing a fluidrachm of syrup for each drachm of sugar, and making allowance for the water contained in the syrup, which equals half its bulk.

Powders are often mixed together with difficulty, by means of a pestle and mortar, on account of their differing greatly in weight, or of their softness and compressibility, as charcoal and magnesia, or rhubarb and magnesia. In these cases the mixing should be completed with a spatula on a sheet of paper. In dividing powders into doses it is very desirable to fold the packages neatly and of a uniform size. The powder folder represented in the figure is very useful for this purpose. It may be made of mahogany or other hard wood. Instruments of this kind with a movable cheek, so as to be widened or contracted by a screw, and made of brass, are used in some of the shops. When volatile or deliquescent substances, as camphor and carbonate of potassa, are prescribed in several powders, these should be enveloped separately in tin foil or waxed paper; and when the number of doses is more than two they should be enclosed in a paper box.



In ordering pills care must be taken to avoid the use of deliquescent salts, and to deprive those which are efflorescent of their water of crystallization. The mass must be thoroughly incorporated previously to being divided; and this is particularly important when extracts of different degrees of hardness enter into the composition. A section of the mass should be throughout of uniform colour and consistency. Pills are to be rolled and preserved in powdered liquorice root, which ought to be kept for use in a tin box with a perforated lid, like a pepper box. When pills are of too soft a consistence, a little liquorice powder may be incorporated with them to render them more firm. Pills, into the composition of which gum Arabic enters, should be softened with syrup, and not with water,

as the latter renders the mass difficult to roll. For further remarks relative to the formation of masses for pills, see *Pilulæ*.

The proper cleanliness of his vessels is an object of great importance to the apothecary. Open vessels, as mortars and measures, are easily cleansed, and should be wiped dry immediately after being washed. Fats and resins are readily removed by pearlash, or tow and damp ashes, or sand; red precipitate and other metallic substances by a little nitric or muriatic acid; Prussian blue by means of pearlash. Bottles may be cleansed from the depositions which accumulate on their sides and bottom from long use in the shop, by a few shreds of grocers' paper, and a little clean water. They are to be shaken so as to give the paper and water a centrifugal motion, which effectually removes the dirt from the sides. They may be freed from oil by a little strong nitric acid, after the action of which water will thoroughly cleanse them. Long sticks armed with sponge, or dry linen or cotton cloth, should be provided for wiping dry the interior of flasks and bottles.* A wire bent at the end into a sort of hook will be found useful for getting corks out of bottles. Wire instruments with three prongs are made specially for this purpose. In the absence of these, a loop of twine will often be found a convenient means of effecting the same object. When the glass stopper of a bottle is fast, it may often be loosened by gently tapping its sides alternately with the handle of a spatula. Sometimes a drop or two of oil, alcohol, or water, will soften the cementing substance. It will sometimes answer to wrap the stopper in a cloth, insert it in a crevice or hole, in a table or door, and twist the bottle gently and dextrously. Sometimes the stopper may be loosened by quickly expanding the neck in the flame of a lamp, and tapping the stopper before the heat has reached it. The bottle should be constantly turned in the hand during the heating process, to avoid unequal expansion and fracture. In the absence of a flame, a piece of twine turned twice around the neck and drawn back and forward rapidly will soon heat it sufficiently, in most instances. When the stopper of a bottle containing caustic alkali adheres in consequence of the neck not having been wiped thoroughly dry, it is almost impossible to loosen it, and the neck must be cut off.

The apothecary should be provided with spatulas of wood, whalebone, and horn, as well as of steel. It should be an invariable rule to clean every knife and graduated measure immediately after it is used, and to put the dirty mortars apart from those which are clean. Too much particularity and order in all the minute details of the shop cannot be practised. The counters should be cleaned every day, and wiped as often as they become dusty. The scales should be thoroughly cleaned every week, and wiped always after using them for dusty substances; and the prescription *balance* should be kept carefully enclosed in a glass case, and the dishes wiped after each time of using. The beam should occasionally be wiped with a soft cotton or silk cloth. The mortar stand should pass through the floor and cellar, into the ground, so as not to jar the counter during the contusion of substances, and thus injure the balance. Bottles should be replaced as soon after being taken down and used as possible, and should on no account be changed from their accustomed place on the shelf. For the proper preservation of leaves, flowers, aromatic powders, calomel, and other medicines to which light is injurious, the bottles should be coated with tin foil or black varnish.

No apothecary should be unprovided with a set of *troy weights*, as without them

* The odour of volatile oils, and other strong smelling substances, such as musk, may be removed from bottles, mortars, &c., by means of the pulp of bitter almonds or peach kernels, bruised peach leaves, or other substances containing hydrocyanic acid. But fatty matters should first be removed by an alkaline solution, and resins by alcohol. (*Journ. de Chim. Méd.*, 1845, p. 535.) It is asserted that the powder of black mustard has the same effect. (*Ibid.*, 2*e sér.*, iii. 727.)

he will find it difficult to comply with the officinal directions for the preparation of his medicines; and the drawer in which his smaller weights are kept should be clean and free from dust, so that the weights may be accurate. In dispensing medicines, no vial or parcel should be suffered to leave the shop without its appropriate label, and this, in the case of prescriptions, should always be the physician's direction as to the manner of taking it, and not the name of the medicine, unless it be so directed by him. The prescription, or a copy of it, should be retained and numbered, and the same number marked on the parcel or bottle. Everything connected with the shop, and the dispensing and putting up of medicines and parcels, should be characterized by *neatness*, *accuracy*, *system*, and *competent knowledge*.

The apprentice who desires to qualify himself for his business, should carefully study Turner's, Graham's, or Fownes' Elements of Chemistry, Mohr and Redwood's Practical Pharmacy, and Faraday's Treatise on Chemical Manipulation, which may be termed the hand-books of his profession. D. B. S.

General Officinal Directions.

As all the processes of the United States and British Pharmacopœias are either described or fully detailed in the following pages, it is proper that the prefatory explanations of the several Pharmacopœias should be introduced in this place, in order that the reader may be prepared to understand the precise signification of the terms employed.

The Pharmacopœias recognised in this work, excepting that of the Dublin College, unite in the use of the *troy* or *apothecaries'* pound, and its divisions of ounces, drachms, scruples, and grains, for the expression of weights. Upon this subject the United States Pharmacopœia has the following note, to which the attention of apothecaries is particularly invited. "It is highly important that those engaged in preparing or dispensing medicines should be provided with *Troy* weights of all denominations; but, when these are not to be had, the same end may be attained by calculating the Avoirdupois pound at 7000 Troy grains, and the Avoirdupois ounce at 437·5 grains, and making the requisite allowance. Thus 42·5 grains added to the Avoirdupois ounce will make it equal to the Troy ounce, and 1240 grains deducted from the Avoirdupois pound will reduce it to the Troy pound." As the common weights of the country are the avoirdupois weights, and every apothecary is in possession of the lower denominations of the apothecaries' weight, viz. grains, scruples, and drachms, there can be no difficulty in complying with the officinal directions. The Dublin College, in the last edition of their Pharmacopœia, have abandoned the troy weights, and substituted the avoirdupois pound and ounce, in common use, but make a new division of the ounce into drachms and scruples, which are different in value from any denomination of weight hitherto used. Thus their ounce is divided into eight drachms of 54·68 grains each, and the drachm into three scruples of 18·22 grains each. The difference in value of these weights from others of the same denomination, and the fractions of grains contained in them, are likely to lead to much confusion and inconvenience.

Both in the *United States* and *British* Pharmacopœias, the quantity of fluids is generally indicated by the liquid measure, consisting of the gallon and its divisions of pints, fluidounces, fluidrachms, and minims. It is highly necessary that the apothecary should understand that this distinction is rigidly observed in all the details which follow, and that whenever the simple terms pound, ounce, and drachm are employed, they must be considered as belonging to the denomination of troy weight. This caution is the more necessary, as these terms are often confounded with the corresponding divisions of liquid measure, viz. the pint,

fluidounce, and fluidrachm. (See tables of weights and measures in the Appendix.)

All the British Colleges have adopted the Imperial gallon and its divisions instead of the wine gallon which they before employed. In the United States Pharmacopœia the wine gallon is still retained. This discrepancy is very unfortunate, as no one denomination of the imperial measure corresponds exactly with the same denomination of the wine measure; and the formulæ, therefore, of the British Colleges, so far as measures are concerned, when they agree in terms with those of the United States Pharmacopœia, differ from them in reality; while in other cases, though differing in terms, they may be quite or very nearly identical. It is very important that the apothecary should bear this distinction in mind; and, when he has occasion to carry into effect one of the foreign formulæ, that he should make the due allowances. He will find, among the Tables in the Appendix of this work, a statement of the relative value of the several denominations of the Imperial and wine measures, and by consulting this statement will be enabled to convert the former into the latter without difficulty. The measures kept in the shop should be graduated according to the divisions of the wine gallon; as this is recognised by our own officinal standard.

In the *Pharmacopœia of the United States*, and in that of the *Edinburgh College*, when the specific gravity of a body is given, it is considered to be at the temperature of 60°, of Fahrenheit; in the *London Pharmacopœia*, at 62°.

The *United States* and *London Pharmacopœias* explain the term *gentle heat* as signifying a temperature between 90° and 100°. Fahrenheit's scale is referred to by all the officinal standards.

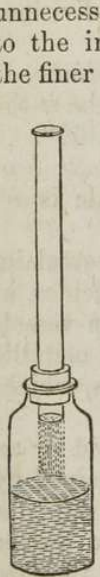
The *London College* directs that, when not otherwise ordered, glass, porcelain, or stoneware vessels shall be used for preparing and preserving medicines, at the same time guarding especially against the employment of earthen vessels glazed with lead. The same College also directs that acid, alkaline, and metallic preparations, and salts of every kind, be kept in stopped glass bottles, which, for certain substances, should be of black or green glass.

Whenever, in the *United States* and *London Pharmacopœias*, an acid or an alkali is directed to be saturated, the point of saturation is to be ascertained by means of litmus or turmeric. For this purpose litmus or turmeric paper is usually employed, the latter being rendered brown by the alkalies, the former being reddened by the acids, and having its blue colour restored by the alkalies. (See *Lacmus* and *Curcuma*.) The *London College* provides that, when the solution of carbonate of soda is employed to saturate an acid, all the carbonic acid be driven off by heat, before the test is applied. It directs, moreover, that in making experiments no other water than the distilled should be used; and that, unless otherwise ordered, white bibulous paper should be employed both for filtering liquids and drying crystals.

The *London College* uses Hessian or Cornish crucibles exclusively. It defines a *water bath* to be an arrangement by which anything, contained in its own vessel, is exposed either to hot water itself, or to the vapour of boiling water; and a *sand bath*, as consisting of sand to be gradually heated, in which anything, contained in its own vessel, is placed.

Percolation, or *Filtration by Displacement.* In relation to this process, the following directions are given in the *United States Pharmacopœia*. "The kind of filtration commonly designated as the *process of displacement*, which is employed in many of the processes of this Pharmacopœia, is to be effected in the following manner, unless otherwise specially directed. A hollow cylindrical instrument, called a *Percolator*, is to be used, somewhat conical towards the inferior extremity, having a funnel-shaped termination so as to admit of being inserted into the mouth of a bottle, and provided internally, near the lower end,

with a transverse partition or diaphragm, pierced with numerous minute holes, or, in the absence of such a partition, obstructed with some insoluble and inert substance, in such a manner that a liquid poured into the cylinder may percolate slowly. [See *page* 782.] The substance to be acted upon, having been reduced to a coarse powder, and mixed with enough of the menstruum to moisten it thoroughly, is, after a maceration of some hours, to be introduced into the instrument, and slightly compressed upon the diaphragm. Any portion of the macerating liquid which may not have been absorbed by the powder, is afterwards to be poured upon the mass in the instrument, and allowed to percolate. Sufficient of the menstruum is then to be gradually added to drive before it, or displace, the liquid contained in the mass; the portion introduced is in like manner to be displaced by another portion; and so on till the required quantity of filtered liquor is obtained. If the liquor which first passes should be turbid, it is to be again introduced into the instrument. Care must be taken that the powder be not, on the one hand, too coarse or loosely pressed, lest it should allow the liquid to pass too quickly, nor, on the other, too fine or compact, lest it should offer an unnecessary resistance. Should the liquor flow too rapidly, it is to be returned to the instrument, which is then to be closed beneath for a time, in order that the finer parts of the powder may subside, and thus cause a slower percolation."



The *Edinburgh College* gives directions for percolation under the head of Tinctures. According to that College, "the solid materials, usually in coarse or moderately fine powder, are moistened with a sufficiency of the solvent to form a thick pulp; in twelve hours, or frequently without any delay, the mass is put into a cylinder of glass, porcelain, or tinned iron, open at both ends, but obstructed at the lower end by a piece of calico or linen, tied tightly over it as a filter (*see figure in the margin*); and the pulp being packed by pressure, varying as to degree with various articles, the remainder of the solvent is poured into the upper part of the cylinder, and allowed gradually to percolate. In order to obtain the portion of the fluid which is kept in the residuum, an additional quantity of the solvent is poured into the cylinder, until the tincture which has passed through, equals in amount the spirit originally prescribed."

The advantages of the process of percolation or displacement are, that the active soluble principles of medicinal substances are in general extracted by it more speedily, thoroughly, and economically than by any other mode; that concentrated solutions of these principles are more easily obtained; and that no portion of the impregnated menstruum need be lost by remaining in the solid mass. It is, however, liable to the objection, that considerable experience and skill are necessary to carry it properly into effect, and that, if improperly performed, it must often result in preparations very different from those contemplated in the formulæ. It should not, therefore, be resorted to in the fulfilment of officinal directions, when any alternative is given, unless by individuals who have acquired the requisite skill by much practice. Hence, both the United States and Edinburgh Pharmacopœias, when directing displacement in any particular case, frequently give another mode of accomplishing the same object, better adapted to inexperience in the operator.

The sources of failure in this process are chiefly an improper degree of comminution in the substance to be acted upon, and an improper condition of the mass after it has been introduced into the instrument. If the material be in too fine a powder, it resists or obstructs the passage of the fluid; if too coarse, it allows the fluid to pass too rapidly, and at the same time opposes its cohesion to the solvent power of the menstruum. If merely bruised, especially if fibrous pieces of some length are intermixed, it causes the fluid to make irregular chan-

nels, and thus to act upon it partially. An improper packing of the material occasions similar inconveniences. If too compact it impedes, if too loose it injuriously facilitates the passage of the solvent, and if not uniform, it produces an irregular flow which necessarily vitiates the result. The liquid, finding an easier passage at one part than another, flows more rapidly in that direction, and thus makes channels by which it may in great measure or wholly escape, with little influence upon the mass. Besides, the uniform progression by which each superadded portion displaces that immediately beneath it is broken, the successive layers become intermingled, and thus one of the peculiar advantages of the process is lost. The following observations may be of some use in assisting the operator to avoid these consequences.

The solid material should in general be in the state of a uniform coarse powder, to which it is most conveniently brought by grinding in a common coffee-mill. If its texture, however, be very hard, firm, and not easily permeable by moisture, as in certain barks, woods, and ligneous roots, it should be rather finely powdered. If, on the contrary, the texture be loose and spongy, and especially if the material be disposed to swell up and form a viscid mass with water, so as to impede percolation, as in the case of gentian and squill, it may be advisable merely to bruise it in a mortar; though care should be taken to do this as equably as possible; and the substances which require this treatment when water is used, may come under the general rule with another solvent, as alcohol or ether.

It is generally advisable, before introducing the material into the instrument, to mix it with a portion of the solvent, and allow it to stand for some time in another vessel. It thus becomes more penetrable and more easily acted on by the menstruum, admits of a more uniform packing, and, if liable to swell with water, undergoes this expansion where it cannot have the effect of checking percolation. The quantity of liquid should be sufficient to form a soft pulp-like mass with the powder. In general, a weight about half that of the solid material will be sufficient, though a much larger quantity may be used, if on any account deemed advisable. The maceration may continue on the average about twelve hours; but a much shorter time will often answer. It has sometimes been recommended to perform this preliminary maceration in the displacement filter, its lower orifice being closed for a time. With some substances this may be done without disadvantage; but in all those instances in which the material is liable to swell considerably with water, and thus to choke the passage, the maceration should take place in another vessel.

The packing of the material in the instrument is that part of the process which most requires experience in the operator, and about which the least precise rules can be given. When mixed with a considerable portion of fluid, it will often subside of itself into the proper state; but generally it requires some shaking or pressure, and the degree of the latter must be in proportion to the looseness of texture in the material; reference, however, being always had to its disposition to swell with water. Certain substances in which this property is found, such as gentian and rhubarb, must not be pressed compactly, when water is the solvent. As the percolation advances, and portions of the substance acted on are dissolved, the mass often becomes too loose, and requires to be again pressed down. Substances which are apt to form with the menstruum an adhesive and impermeable mass, such as the resins and gum-resins, may be advantageously mixed, in the state of coarse powder, with about half their weight of perfectly clean white sand, as suggested by the late Mr. Duhamel. (See *Am. Journ. of Pharm.*, x. 15.) The sand separates the particles of the mass, and allows the menstruum a readier access.

After the moistened material has been properly packed, the upper surface

should be made quite level, and then covered with a circular disk of tin or filtering paper pierced with numerous minute holes; and, if the disk be of paper, it should be kept in its place by pieces of glass rod. The solvent is thus made to enter into the mass equably, and prevented from forming partial passages by bearing upon one or a few points. The liquid is now to be introduced in successive portions, as stated in the officinal directions above given, and in the general account of the process given at page 782.

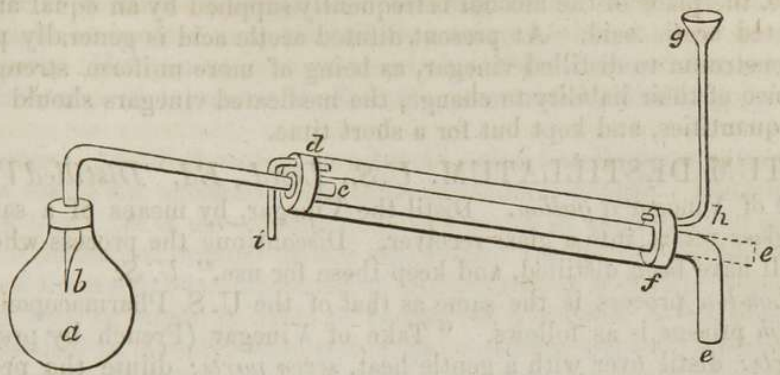
The fluid which first passes is turbid, unless the diaphragm has been covered by a close filtering material. Should it be turbid, it should be returned into the instrument, before the addition of any displacing menstruum; and the same thing should continue to be done, until the liquid comes away perfectly clear. If the percolation be too rapid, pressure may be made upon the upper diaphragm so as to render the mass more compact, or the instrument may be closed below for a time, as stated in the officinal direction. Hence the advantage of having a stop-cock near the lower end for regulating the discharge. In the absence of a stop-cock, a soft cork may be used, with a small groove cut lengthwise for a short distance from its smaller end. By withdrawing the cork until the groove appears, a passage for the fluid can be opened at will. When the percolation is too slow, it may be increased by the pressure of a column of liquid, and this plan may sometimes be advantageously resorted to when the powder is very fine, or large masses of material are operated upon. (See *page* 783.) When the object is to keep up a constant supply of the percolating fluid, it may be accomplished by filling a long-necked bottle or matrass with the fluid, and inverting it over the filtering instrument, with its mouth beneath the surface of the liquid in the latter.

Hot liquids may be used in the process as well as cold, and are sometimes preferable when the substance yields its active principles more largely at an elevated temperature. But there is often an inconvenience in employing hot water; as it dissolves or renders glutinous substances not affected by cold water, which are not requisite, and may even be injurious in the preparation, and which tend to embarrass the process by filling up the interstices of the mass, and thus rendering it less permeable. An instrument has been invented by Mr. C. A. Smith, of Cincinnati, by which the menstruum is made to enter the contents of the percolator in the state of hot vapour, and, being condensed by means of a refrigerating vessel surrounding the percolator, passes out in the liquid form, highly impregnated with the soluble principles of the material operated on. (See *Am. Journ. of Pharm.*, xviii. 98.)

The first portion of filtered liquid is very strongly impregnated, and the portions which subsequently come away, are successively less so. It is sometimes desirable to obtain the whole of the particular solvent employed. This end may be very nearly attained by adding, at the close of the process, enough of another liquid to supply the place of that retained in the mass. It was Boullay's idea that the whole of the liquid contained in the moist material might be thus driven out of it or displaced by the one added, without any admixture of the two. This, however, has been ascertained not to be exactly true; and, however carefully the process may be conducted, some mixture will take place. Hence, it is recommended, when one liquid is added in order to displace another, to introduce first a shallow layer of the same liquid with that contained in the mass. In some instances, the solvent, if consisting of two liquids, is resolved into these in the process. Thus, when myrrh is subjected to percolation with proof spirit, the first liquid which comes away is alcohol holding the oil and resin of the myrrh in solution.

There are very few substances to which the mode of filtration by displacement will not be found applicable, if due attention be paid to the circumstances which require variations in the process.

Distillation. In the preface to the last edition of the *Edinburgh Pharmacopœia*, the following remarks are made in relation to this process. "In the process of distillation, complete success cannot be easily attained, especially on



the small scale, without the substitution of a different apparatus for the retort and receiver commonly used. In all operations, except where inorganic acids are to be distilled, it is greatly preferable to use a globular matrass (*a*), to which is fitted with a cork a tube (*bc*), cut obliquely at its lower end (*b*), curved above at a somewhat acute angle, and fitted at the other end to a refrigeratory. This refrigeratory consists of a long narrow cylinder (*df*) slightly inclined to the horizon, and of a tube (*ce*) which passes along the centre of the cylinder, and is fixed at each end, so that the space between them is air-tight; and by means of a funnel (*gh*) entering at the lower end of this interspace, and an exit tube (*di*) from its upper extremity, a stream of cold water may be kept constantly running, by which refrigeration and the condensation of vapours within the inner tube are far more effectually accomplished than by any other mode that has hitherto been devised." This is *Liebig's distillatory apparatus.* The object of the oblique ending of the tube at *b*, is to prevent any of the fluid which may be driven against it, during the ebullition, from passing along the tube. The inner tube of the refrigeratory should be made of glass or block-tin, the outer may consist of glass, brass, copper, or common tinned iron. The end *e* of the central tube is either straight, or curved downward so that it may be inserted into a bottle, when the liquid distilled is very volatile. By connecting the funnel with a cistern by means of a syphon, and allowing the water to flow out from the bent tube *di* into a bucket or sink, the distillation may be allowed to go on for a long time without supervision. Dr. Christison states that a refrigeratory, with the outer tube a foot long, and an inch and a quarter in diameter, will be sufficient to condense the whole vapour from a matrass holding two pints of alcohol briskly boiling. W.

ACETA.

Vinegars.

Under this title, in the United States Pharmacopœia, are included both Distilled Vinegar and those preparations usually denominated *Medicated Vinegars.* The latter are infusions or solutions of various medicinal substances in vinegar or acetic acid. The advantage of vinegar as a menstruum is that, in consequence of the acetic acid which it contains, it will dissolve substances not readily soluble, or altogether insoluble, in water alone. It is an excellent solvent of the organic alkalies, which it converts into acetates, thereby modifying, in some measure, though not injuriously, the action of the medicines of which they are ingredients. As ordinary vinegar contains principles which promote its decomposition, it should be purified by distillation before being used as a solvent. In-

fusions prepared with it, even in this state, are apt to spoil in a short time; and a portion of alcohol is usually added to contribute to their preservation. A small quantity of acetic ether is said to result from this addition; and, on the continent of Europe, the place of the alcohol is frequently supplied by an equal amount of concentrated acetic acid. At present diluted acetic acid is generally preferred as the menstruum to distilled vinegar, as being of more uniform strength. In consequence of their liability to change, the medicated vinegars should be made in small quantities, and kept but for a short time. W.

ACETUM DESTILLATUM. *U.S.*, *Lond.*, *Ed.* *Distilled Vinegar.*

"Take of Vinegar *a gallon*. Distil the Vinegar, by means of a sand-bath, from a glass retort into a glass receiver. Discontinue the process when seven pints shall have been distilled, and keep these for use." *U. S.*

The *London* process is the same as that of the U. S. Pharmacopœia. The *Edinburgh* process is as follows. "Take of Vinegar (French by preference) *eight parts:* distil over with a gentle heat, *seven parts:* dilute the product, if necessary, with distilled water till the density is 1·005."

Vinegar is a very heterogeneous liquid, containing colouring matter, gum, sugar, alcohol, &c.; and the object of its distillation is to purify it. (See *Acetum.*) The first portion which distils contains alcohol and pyroacetic spirit (acetone), these being the most volatile ingredients; next the acetic acid comes over much purified, but weaker than it exists in the vinegar, on account of its being less volatile than water; and, if the distillation be stopped when the pure vinegar ceases to come over, there will be found in the retort a liquid of a deep-brown colour, very sour and empyreumatic, and containing free tartartic and malic acids, bitartrate of potassa, and other substances. This statement explains why the last portion (one-eighth) is not distilled; the seven-eighths which first come over being alone preserved. The residuary liquid in the retort, if diluted with an equal bulk of hot water, may be made to yield, by a fresh distillation, a quantity of weak acetic acid equal to the residuary liquid, and of about the strength and purity of officinal distilled vinegar.

Wine vinegar furnishes a stronger and more aromatic distilled vinegar than malt or cider vinegar. The London College gives 1·0065 as the density of distilled vinegar. The Edinburgh College, assuming that distilled vinegar will have the sp. gr. of at least 1·005, directs that its density, when above that number, shall be reduced to it. The U. S. Pharmacopœia does not give the density, on account of its being an uncertain criterion of strength. The saturating power is the proper test of the acid present. This is given in the different Pharmacopœias as follows. A fluidounce is saturated by about 35 grains of crystallized bicarbonate of potassa (*U. S.*); an Imperial fluidounce by 57 grains of crystallized carbonate of soda (*Lond.*); and 100 minims by 8 grains of the same carbonate (*Ed.*) The saturating power, thus given, of the different officinal distilled vinegars indicates the following proportions of monohydrated acetic acid per cent., assuming the sp. gr. of the U. S. distilled vinegar to be 1·005;—*U. S.* Pharmacopœia 4·5, *London* 5·4, *Edinburgh* 3·6. Considering the ordinary pharmaceutical uses of distilled vinegar, variations in its strength, limited as they are by the qualities of different vinegars, are not very important. Its purity is the point of importance. If, however, precision be attempted, the saturating power and not the density must be indicated; and directions should be given for bringing a distilled vinegar, which varies from the standard of saturating power, to that standard by the addition either of pure acetic acid, or of distilled water. The reason why density cannot be depended upon, is that the specific gravity is not in proportion to the strength. If the vinegar contain a good deal of alcohol and pyroacetic spirit, the distilled product will be light, but not necessarily weak. This remark applies particularly to distilled wine vinegar.

The U. S. Pharmacopœia directs the distillation of vinegar to be conducted in glass vessels; but it is generally distilled in a copper alembic furnished with a pewter worm. The use of these metals, however, is hazardous, on account of the danger of metallic impregnation. Mr. Brande has suggested that the condenser might be made of very thin silver, a metal not acted on by acetic acid of any strength. If this cannot be procured, the head and worm should be of glass or earthenware. Empyreuma is effectually prevented by distilling by means of steam.

Properties. Distilled vinegar is a limpid, colourless liquid, of a weak acetous taste and smell, less agreeable than those of common vinegar. It is wholly volatilized by heat. It is not a perfectly pure solution of acetic acid in water; but contains a portion of organic matter which rises in the distillation. It is on account of the partial decomposition of this impurity that distilled vinegar, when saturated with an alkali, is liable to become of a reddish or brownish colour. When distilled in metallic vessels, it is apt to contain traces of copper, lead, and tin. Copper is detected, after saturating with ammonia, by the addition of ferrocyanuret of potassium, which produces a brown cloud; lead by iodide of potassium, which occasions a yellow precipitate; and tin by a solution of chloride of gold, which causes a purplish appearance. The two latter metals are discovered also by sulphuretted hydrogen, which occasions a dark-coloured precipitate. The non-action of this gas proves the absence of metals generally. Distilled vinegar should have neither an empyreumatic taste nor a sulphurous smell. As usually prepared, however, it is somewhat empyreumatic. British malt vinegar is allowed by law to contain one-thousandth of sulphuric acid; but, when it is distilled, this acid does not come over. If, however, sulphuric acid should be accidentally present in distilled vinegar, it may be detected by chloride of barium or acetate of lead. If muriatic acid be present, it may be shown by a precipitate being formed with nitrate of silver; and if nitric acid be an impurity, the vinegar will possess the property, by digestion, of dissolving silver, which may be detected afterwards by muriatic acid.

Medical Properties and Uses. The medical properties of distilled vinegar are the same as those of common vinegar (see *Acetum*); but the former, being purer, and not liable to spontaneous decomposition, is preferable for pharmaceutical purposes. Still, it is less pure than the officinal diluted acetic acid, which has been substituted for it in a number of preparations.

Off. Prep. Acetum Colchici; Acetum Opii; Acetum Scillæ; Ammoniæ Acetatis Aqua; Emplastrum Ammoniaci. B.

ACETUM CANTHARIDIS. (*Epispasticum.*) *Lond.* ACETUM CANTHARIDIS. *Ed., Dub.* *Vinegar of Spanish Flies.*

"Take of Spanish Flies, in very fine powder, *two ounces;* Acetic Acid *a pint* [Imperial measure]. Macerate the Spanish Flies with the acid for eight days, occasionally shaking. Finally express and filter." *Lond.*

"Take of Cantharides, in powder, *three ounces;* Acetic Acid *five fluidounces;* Pyroligneous Acid *fifteen fluidounces;* Euphorbium, in coarse powder, *half an ounce.* Mix the acids, add the powders, macerate for seven days, strain and express strongly, and filter the liquor." *Ed.*

"Take of Spanish Flies, in fine powder, *four ounces;* Strong Acetic Acid *four fluidounces;* Acetic Acid of Commerce (sp. gr. 1·044) *sixteen fluidounces.* Mix the Acids, and, having added the Flies, macerate in a close vessel for fourteen days; then strain through flannel with expression, and filter so as to obtain a clear liquor." *Dub.*

This preparation is intended exclusively for external use, as a speedy epispastic. It is said, when lightly applied by a brush, to act as a rubefacient; and, when rubbed freely upon the skin for three minutes, to be followed, in two or

three hours, by full vesication. The pain produced by the application, though more severe, is also more transient than that occasioned by the blistering cerate. From experiments made by Mr. Redwood, it may be inferred that the preparation proves epispastic chiefly if not exclusively in consequence of its acetic acid, and that it contains little of the active principle of the flies. (*Lond. Pharm. Journ. and Trans.*, Oct. 1841.) Prof. Procter finds that, by digestion at a temperature of 212° F., the active principle of the flies is readily taken up by officinal acetic acid, though a portion of the cantharidin is deposited upon cooling. (*Am. Journ. of Pharm.* xxiv. 299.) It would seem, therefore, that the vinegar of Spanish flies would be best prepared with the aid of heat. W.

ACETUM COLCHICI. *U. S., Lond., Ed., Dub. Vinegar of Colchicum.*

"Take of [dried] Colchicum Root, bruised, *two ounces;* Diluted Acetic Acid *two pints.* Macerate the Colchicum Root with the Diluted Acetic Acid, in a close glass vessel, for seven days; then express the liquor, and set it by that the dregs may subside; lastly, pour off the clear liquor.

"Vinegar of Colchicum may also be prepared by macerating the Colchicum Root, in coarse powder, with a pint of Diluted Acetic Acid for two days, then putting the mixture into a percolator, and gradually pouring upon it Diluted Acetic Acid until the quantity of filtered liquor equals two pints.

"In the above processes, Distilled Vinegar may be substituted for Diluted Acetic Acid." *U. S.*

"Take of dried Colchicum Cormus *three drachms and a half;* Diluted Acetic Acid *a pint* [Imperial measure]; Proof Spirit *a fluidounce and a half.* Macerate the Colchicum with the Acid in a covered vessel for three days; then express, and set apart that the dregs may subside; lastly, add the spirit to the filtered liquor." *Lond.*

"Take of Colchicum-bulb, fresh and sliced, *one ounce;* Distilled Vinegar *sixteen fluidounces;* Proof Spirit *one fluidounce.* Macerate the Colchicum in the Vinegar for three days in a covered glass vessel; strain and express strongly; filter the liquors, and add the spirit." *Ed.*

"Take of Colchicum Bulbs, dried and bruised, *one ounce;* Acetic Acid of Commerce (sp. gr. 1·044) *four fluidounces;* Distilled Water *twelve ounces* [*fluidounces*]. In the Acid, diluted with the Water, macerate the Colchicum, in a close vessel for seven days; then strain with expression, and filter." *Dub.*

Of these processes the American and Dublin yield the strongest preparation, and on this account are preferable. They also agree in omitting the spirit, which, in the London and Edinburgh processes, is intended to retard the spontaneous decomposition to which this, like the other medicated vinegars, is liable, but is of little use.

Vinegar is an excellent solvent of the active principle of colchicum; and the organic alkali of the latter loses none of its efficacy by combination with the acetic acid of the former.

Medical Uses. This preparation has been extolled as a diuretic in dropsy, and may be given in gout, rheumatism, and neuralgia; but the wines of colchicum are usually preferred. It is recommended by Scudamore to be given in connexion with magnesia, so as to neutralize the acetic acid of the menstruum. The dose is from thirty drops to two fluidrachms. W.

ACETUM OPII. *U. S., Ed., Dub. Vinegar of Opium. Black Drop.*

"Take of Opium, in coarse powder, *eight ounces;* Nutmeg, in coarse powder, *an ounce and a half;* Saffron *half an ounce;* Sugar *twelve ounces;* Diluted Acetic Acid *a sufficient quantity.* Digest the Opium, Nutmeg, and Saffron with a pint and a half of the Diluted Acetic Acid, on a sand-bath, with a gentle heat,

for forty-eight hours, and strain. Digest the residue with an equal quantity of the Diluted Acetic Acid, in the same manner, for twenty-four hours. Then put the whole into a percolator, and return the filtered liquor, as it passes, until it comes away quite clear. When the filtration has ceased, pour Diluted Acetic Acid gradually upon the materials remaining in the instrument, until the whole quantity of filtered liquor equals three pints. Lastly, add the Sugar, and, by means of a water bath, evaporate to three pints and four fluidounces.

"In the above process, Distilled Vinegar may be substituted for Diluted Acetic Acid." *U. S.*

"Take of Opium *four ounces;* Distilled Vinegar *sixteen fluidounces.* Cut the Opium into small fragments, triturate it into a pulp with a little of the Vinegar, add the rest of the Vinegar, macerate in a closed vessel for seven days, and agitate occasionally. Then strain and express strongly, and filter the liquor." *Ed.*

"Take of Opium, in coarse powder, *one ounce and a half;* Dilute Acetic Acid *one pint* [Imperial measure]. Macerate for seven days in a close vessel, with occasional agitation; then strain with expression, and filter." *Dub.*

The vinegar of opium has been introduced into the Pharmacopœias as an imitation of or substitute for a preparation, which has been long in use under the name of *Lancaster* or *Quaker's black drop*, or simply *black drop*. The formula of the first edition of the U. S. Pharmacopœia was so deficient in precision, and so uncertain in its results, that it was abandoned in the second edition; but, as this objection was obviated in a process by Mr. Charles Ellis, published in the *American Journal of Pharmacy* (vol. ii. page 202), and as the preparation continued to enjoy a considerable degree of professional and popular favour, it was deemed proper to restore it to its officinal rank at the subsequent revision of the Pharmacopœia. The U. S. formula above given is essentially that of Mr. Ellis. It is, we think, preferable to the Edinburgh and Dublin formulæ. In the former of these we cannot but suspect that there is some waste of opium, as it is the same as the old Dublin formula; and Dr. Montgomery, in his observations on the former Dublin Pharmacopœia, states that twenty drops of the preparation are equivalent to thirty of the common tincture of opium, though, in making the latter, somewhat less than one-third the quantity of opium is used. In the present Dublin process, much less opium is employed, and the resulting vinegar, is probably of about the same strength as laudanum. In the last U. S. formula, diluted acetic acid has been substituted for distilled vinegar. The advantages of the black drop over laudanum are, probably, that disturbing principles contained in opium and soluble in alcohol are left behind by the aqueous menstruum employed; while the meconate of morphia is converted by the acetic acid into the acetate. In the original process, published by Dr. Armstrong, who found it among the papers of a relative of the proprietor in England, *verjuice*, or the juice of the wild crab, was employed instead of vinegar. Other vegetable acids also favourably modify the narcotic operation of opium; and lemon juice has been employed in a similar manner with vinegar or verjuice, and perhaps not less advantageously.*

* The following is the formula given in the first edition of the U. S. Pharmacopœia. "Take of Opium *half a pound;* Vinegar *three pints;* Nutmeg, bruised, *one ounce and a half;* Saffron *half an ounce.* Boil them to a proper consistence; then add Sugar *four ounces;* Yeast *one fluidounce.* Digest for seven weeks, then place in the open air until it becomes a syrup; lastly, decant, filter, and bottle it up, adding a little sugar to each bottle." The boiling to a *proper consistence*, the digestion in the open air *until a syrup is formed*, and the addition of a *little sugar* to each bottle, are all indefinite directions which must have led to uncertain results. Independently of this want of precision, the point in which the old process chiefly differs from that at present officinal is, that, in the former, fermentation is induced by the addition of yeast. But fermentation is of very doubtful value in the process; at least its advantages have not been proved.

The vinegar of opium may sometimes be advantageously used when opium itself, or the tincture, in consequence of peculiarity in the disease or in the constitution of the patient, occasions so much headache, nausea, or nervous disorder, as to render its employment inconvenient if not impossible. It exhibits all the anodyne and soporific properties of the narcotic, with less tendency to produce these disagreeable effects, at least in many instances. The U. S. preparation is of about double the strength of laudanum, six and a half minims containing the soluble parts of about one grain of opium, supposing the drug to be completely exhausted by the menstruum. The dose may be stated at from seven to ten drops or minims. W.

ACETUM SCILLÆ. *U. S., Lond., Ed., Dub. Vinegar of Squill.*

"Take of Squill, bruised, *four ounces;* Diluted Acetic Acid *two pints.* Macerate the Squill with the Diluted Acetic Acid, in a close glass vessel, for seven days; then express the liquor, and set it by that the dregs may subside; lastly, pour off the clear liquor.

"Vinegar of Squill may also be prepared by macerating the Squill, in coarse powder, with a pint of Diluted Acetic Acid for two days, then putting the mixture into a percolator, and gradually pouring upon it Diluted Acetic Acid until the quantity of filtered liquor equals two pints.

"In the above processes, Distilled Vinegar may be substituted for Diluted Acetic Acid." *U. S.*

The *London College* directs *two ounces and a half* of recently dried squill, *a pint* (Imperial measure) of diluted acetic acid, *a fluidounce and a half* of proof spirit, and maceration with a gentle heat for three days. The *Edinburgh College* directs *five ounces* of dried squill, *two pints* (Imp. meas.) of distilled vinegar, *three fluidounces* of proof spirit, and maceration for seven days. The *Dublin College* takes *two ounces* of dried squill, *four fluidounces* of acetic acid of commerce (sp. gr. 1·044), and *twelve fluidounces* of distilled water; and macerates for seven days.

In the United States process by percolation, the whole of the diluted acid employed in the maceration, and introduced with the squill into the instrument, should be allowed to enter the mass, before the fresh portion is added. The preparations of the several Pharmacopœias are so nearly the same that, for all practical purposes, they may be considered identical. In the present U. S. and Dublin processes the alcohol has been omitted. Its only object is to retard the decomposition of the vinegar of squill; while its presence is medically injurious by rendering the preparation too stimulating. It is best, therefore, to prepare the vinegar of squill frequently, and in small quantities, so as not to require alcohol for its preservation. In the preparation of the oxymel and syrup of squill, for which purpose the vinegar is chiefly used in this country, it should be employed without alcohol. The vinegar of squill deposits, upon standing, a precipitate which consists, according to Vogel, of citrate of lime and tannic acid.

Medical Uses. This preparation has all the properties of the squill in substance, and is occasionally prescribed as a diuretic and expectorant in various forms of dropsy and of pulmonary disease; but the oxymel and syrup are usually preferred, as they keep better, and are less unpleasant to the taste. The dose is from thirty minims to two fluidrachms; but the latter quantity would be apt to produce vomiting. It should be given in cinnamon water, mint water, or some other aromatic liquid calculated to conceal its taste and obviate nausea.

Off. Prep. Oxymel Scillæ; Syrupus Scillæ. W.

ACIDUM ACETICUM CAMPHORATUM. *Ed., Dub. Camphorated Acetic Acid.*

"Take of Camphor *one ounce* [half an ounce, *Ed.*]; Rectified Spirit *one fluidrachm;* Strong Acetic Acid *ten fluidounces* [Acetic Acid six fluidounces and

a half, *Ed.*]. Reduce the camphor to powder by means of the spirit; then add the Acid, and dissolve." *Dub., Ed.*

The use of the alcohol is simply to facilitate the pulverization of the camphor, and a few drops are sufficient. Acetic acid in its concentrated state readily dissolves camphor. In this preparation, the whole of the camphor is taken up by the acid. In consequence of the powerful chemical agency of the solution, and its extreme volatility, it should be kept in glass bottles accurately fitted with ground stoppers.

Camphorated acetic acid is an exceedingly pungent perfume, which, when snuffed up the nostrils, produces a strongly excitant impression, and may be beneficially resorted to in cases of fainting or nervous debility. It is an officinal substitute for Henry's *aromatic spirit of vinegar.*

At Apothecaries' Hall, in London, an *aromatic vinegar* is prepared by dissolving the oils of cloves, lavender, rosemary, and calamus, in highly concentrated acetic acid. It is used for the same purpose as the officinal camphorated acetic acid, being dropped on sponge and kept in smelling bottles. A similar preparation may be made extemporaneously by adding to a drachm of acetate of potassa, contained in a stoppered bottle, three drops of one or more of the aromatic volatile oils, and twenty drops of sulphuric acid. (*Pereira's Mat. Med.*)

A preparation called *Marseilles vinegar*, or *thieves' vinegar* (*vinaigre des quatres voleurs*), consisting essentially of vinegar impregnated with aromatic substances, was formerly esteemed a prophylactic against the plague and other contagious diseases. It is said to have derived its name and reputation from the circumstance, that four thieves, who, during the plague at Marseilles, had plundered the dead bodies with impunity, confessed, upon the condition of a pardon, that they owed their safety to the use of it. The *aromatic acetic acid* of the former Edinburgh Pharmacopœia was intended as a simplification of this nostrum. It was made by macerating for a week an ounce of rosemary, an ounce of sage, half an ounce of lavender, and half a drachm of cloves, with two pounds of distilled vinegar, then expressing the liquor and filtering. Origanum was afterwards substituted for sage, and thirty fluidounces of acetic acid for the two pounds of distilled vinegar. In the last edition of the Pharmacopœia the preparation was abandoned. In the present state of knowledge, it is hardly necessary to observe that neither the original nostrum, nor its substitute, has any other power of protecting the system against disease than such as may depend on its slightly stimulant properties, and its influence over the imagination. W.

ACIDA.

Acids.

Acids, in chemical classification, are compounds which are capable of uniting in definite proportions with alkalies, earths, and ordinary metallic oxides, with the effect of producing a combination, in which the properties of its constituents are mutually destroyed. Such combinations are said to be neutral, and are denominated salts. Most acids have a sour taste, and possess the power of changing vegetable blues to red; and, though these properties are by no means constant, yet they afford a ready means of detecting acids, applicable in practice to most cases. The above explanation of the nature of an acid is that usually given; but, according to strict definition, acids are compounds having a strong electro-negative energy, and, therefore, possessing a powerful affinity for electro-positive compounds, such as alkalies, earths, and ordinary oxides. It is this antagonism in the electrical condition of these two great classes of chemical compounds that gives rise to their mutual affinity, which is so much the stronger as the contrast

in this respect is greater. In the majority of cases, the electro-negative compound or acid is an oxidized body, but by no means necessarily so. When an acid does not contain oxygen, hydrogen is usually present. These peculiarities in composition have given rise to the division of acids by some writers into *oxacids* and *hydracids*. *Vegetable acids*, for the most part, contain both hydrogen and oxygen.

The number of acids used in medicine is small; but among these are to be found examples of the three kinds above mentioned. B.

ACIDUM ACETICUM DILUTUM. *U. S.*, *Lond.*, *Dub.* *Diluted Acetic Acid.*

"Take of Acetic Acid [sp. gr. 1·041] *a pint;* Distilled Water *seven pints.* Mix them." *U. S.* The sp. gr. of this acid is 1·004, and 100 grains of it saturate 7·5 grains of crystallized bicarbonate of potassa.

"Take of Acetic Acid [sp. gr. 1·048] *twenty-three fluidrachms* [Imp. meas.], Distilled Water *a pint* [Imp. meas.]. To the Acid add enough of the Water to fill accurately the measure of a *pint* [Imp. meas.], and mix." *Lond.* The sp. gr. of this acid is 1·008, and an Imperial fluidounce of it is saturated by 57 grains of crystallized carbonate of soda.

"Take of Acetic Acid of Commerce (sp. gr. 1·044) *one pint;* Distilled Water *seven pints.* Mix." *Dub.* The sp. gr. of this acid is 1·006.

The object of having this preparation is to possess a weak solution of pure acetic acid, which may be substituted for distilled vinegar in all formulæ in which nicety is required. Distilled vinegar contains a portion of organic matter, which is always darkened or precipitated when this acid is saturated with an alkali, an occurrence which does not take place when the diluted acetic acid is employed. The saturating strength of the diluted acids of the U. S. and London Pharmacopœias indicates the same per centage of monohydrated acetic acid as is contained in the corresponding distilled vinegars; namely, 4·5 *U. S.*, and 5·4 *London.* The *Dublin* diluted acid, being intermediate in density, may be assumed to be intermediate in strength. While the London distilled vinegar and diluted acid have precisely the same saturating strength, the former is lighter than the latter in the proportion of 1·0065 to 1·008. This arises from the fact that the acetic acid in distilled vinegar is in part diluted with alcohol and pyroacetic spirit, which are lighter than water.

The acetic acid diluted in making this preparation, is known in commerce as "No. 8." In all cases in which the apothecary is doubtful as to its being of the officinal strength, it will be his duty to ascertain its saturating power, and, if this should vary from the standard, to vary the dilution accordingly.

Off. Prep. Acetum Colchici; Acetum Opii; Acetum Scillæ; Emplastrum Ammoniaci; Extractum Colchici Aceticum; Liquor Ammoniæ Acetatis; Syrupus Allii; Unguentum Plumbi Compositum. B.

ACIDUM BENZOICUM. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Benzoic Acid.*

"Take of Benzoin, in coarse powder, *a pound.* Put the Benzoin into a suitable vessel, and, by means of a sand-bath, with a gradually increasing heat, sublime until vapours cease to rise. Free the sublimed matter from oil by pressure in bibulous paper, and again sublime." *U. S.*

The *London College* has transferred benzoic acid to the Materia Medica list, directing, however, that it shall be prepared by sublimation. The *Edinburgh College* puts a convenient quantity of benzoin into a glass matrass, and operates in the manner directed in the U. S. Pharmacopœia.

"Take of Benzoin *any convenient quantity.* Place it in a small cylindric pot of sheet iron, furnished with a flange at its mouth; and having fitted the pot into a circular hole in a sheet of pasteboard, interpose between the pasteboard and

flange a collar of tow, so as to produce a nearly air-tight junction. Let a cylinder of stiff paper, open at one end, eighteen inches high, and having a diameter at least twice that of the pot, be now placed in an inverted position on the pasteboard, and secured to it by slips of paper and flour paste. A couple of inches of the lower part of the pot being passed through a hole in a plate of sheet tin, which is to be kept from contact with the pasteboard by the interposition of a few corks, let a heat just sufficient to melt the benzoin (that of a gas-lamp answers well) be applied, and continued for at least six hours. Let the product thus obtained, if not quite white, be enveloped in bibulous paper, then subjected to powerful pressure, and again sublimed." *Dub.*

The Pharmacopœias now unite in procuring benzoic acid by sublimation. In the former U. S. process, the benzoin was mixed with an equal weight of sand; but this was omitted in the last edition of the Pharmacopœia, as not only useless, but probably injurious by favouring the production of empyreumatic substances. The acid, which exists in the benzoin combined with resin, is volatilized by the heat, and condensed in the upper part of the apparatus. Unless the temperature is very carefully regulated, a portion of the resin is decomposed, and an oily substance generated, which rises with the acid and gives it a brown colour, from which it cannot be entirely freed by bibulous paper; and this result sometimes takes place even with the greatest caution. The process for subliming benzoic acid may be conducted in a glazed earthen vessel, surmounted by a cone of paper, or by another vessel with a small opening at top, and a band of paper pasted round the place of junction. After the heat has been applied for an hour, the process should be suspended till the condensed acid is removed from the upper vessel or paper cone, when it may be renewed, and the acid again removed, and thus alternately till coloured vapours rise. Mohr, after many experiments, recommends the following plan as unobjectionable. In a round cast-iron vessel, eight or nine inches in diameter and two inches deep, a pound or less of coarsely powdered benzoin is placed, and uniformly strewed over the bottom. The top of the vessel is closed by a sheet of bibulous paper, which is secured to the sides by paste. A cylinder of thick paper in the form of a hat, just large enough to fit closely around the sides of the pot, is then placed over it, and in like manner secured by paste. A moderate heat is now applied by means of a sand-bath, and continued for three or four hours. The vapours pass through the bibulous paper, which absorbs the empyreumatic oil, and are condensed within the hat in brilliant white flowers, having an agreeable odour of benzoin. (*Annal. der Pharm.*, xxix. 178.) The remaining acid of the benzoin may be extracted, if deemed advisable, by treating the residue of the balsam with lime or carbonate of soda. From the mode of preparing benzoic acid by sublimation, it was formerly called *flowers of benzoin.*

Another mode of separating the acid from benzoin is by combining it with a salifiable base, and precipitating with an acid. Such is the process of Scheele. It consists in boiling the powdered benzoin with hydrate of lime and water, filtering the solution of benzoate of lime thus obtained, and precipitating the benzoic acid with muriatic acid. Carbonate of soda or of potassa may be substituted for the lime, and sulphuric for the muriatic acid; and the precipitated benzoic acid may be purified by dissolving it in boiling water, which will deposit it upon cooling. Stenhouse unites the process of Scheele with one proposed by Liebig. After concentrating the solution of benzoate of lime, procured by boiling equal parts of benzoin and hydrate of lime with water, he adds a strong solution of chloride of lime, and subsequently a slight excess of muriatic acid, and boils till the chlorine is dissipated. The bleaching effect of the chlorine on the crystals of benzoic acid is thus obtained. The acid, however, requires to be still further purified by repeated crystallization from small portions of boiling water.

A little animal charcoal may be employed to render the crystals quite colourless. These processes afford a purer product than that obtained by sublimation, but not preferable in a medicinal point of view; as the small quantity of oil present in the sublimed acid adds to its stimulant properties, and at the same time renders it pleasant to the smell.

Several other modes of extracting the acid have been recommended. The following is the process of Stolze. One part of the balsam is dissolved in three parts of alcohol, the solution filtered and introduced into a retort, and the acid saturated by carbonate of soda dissolved in a mixture of eight parts of water and three of alcohol. The alcohol is distilled off; and the benzoate of soda contained in the residuary liquid is decomposed by sulphuric acid, which precipitates the benzoic acid. This is purified by solution in boiling water, which lets fall the acid when it cools. By this process Stolze obtained 18 per cent. of acid from benzoin containing 19·425 per cent. By the process of Scheele he obtained 13·5 per cent.; by the agency of carbonate of soda, 12 per cent.; by sublimation only 7·6 per cent. Nevertheless, Mr. Brande says that the last process is on the whole the most economical. According to this author, good benzoin affords by sublimation from 10 to 15 per cent. of the acid contaminated with empyreumatic oil, and about 9 per cent. of the purified acid. Professor Scharling has prepared benzoic acid by means of heated steam, and obtained 8 per cent. (*Am. Journ. of Pharm.*, xxiv. 236.)

Properties. Sublimed benzoic acid is in white, soft, feathery crystals, of a silky lustre, and not pulverulent. From solution the acid crystallizes in transparent prisms. When quite pure it is inodorous; but, prepared by sublimation from the balsam, it has a peculiar agreeable aromatic odour, dependent on the presence of an oil, which may be separated by dissolving the acid in alcohol, and precipitating it with water. Its taste is warm, acrid, and acidulous. It is unalterable in the air, but at 230° melts, and at a somewhat higher temperature rises in suffocating vapours. It is inflammable, burning without residue. It is soluble in 200 parts of cold water (*Annals of Pharmacy*, i. 206), and in about twenty-four parts of boiling water, which deposits it upon cooling. It is soluble in alcohol, and in concentrated sulphuric and nitric acids, from which it is precipitated by water. The fixed oils also dissolve it. It is entirely dissolved by solutions of potassa, soda, ammonia, and lime, from which it is precipitated by muriatic acid. Its solution reddens litmus paper, and it forms salts with salifiable bases; but its acid properties are not powerful. Benzoic acid consists of *benzyle* and oxygen, and in the uncombined state usually contains water. The anhydrous acid has, however, been isolated by Gerhardt. (*Chem. Gaz.* x. 237.) Benzyle consists of fourteen eqs. of carbon 84, five of hydrogen 5, and two of oxygen 16=105. The crystallized acid contains one eq. of benzyle 105, one of oxygen 8, and one of water 9=122. It cannot be deprived of its water by heat, but sometimes loses it in combination. Benzoic acid is a characteristic constituent of the balsams, and has been found in various other vegetable, and some animal products.*

Medical Properties and Uses. Benzoic acid is irritant to the alimentary mucous membrane, and stimulant to the system, and has been thought to be expectorant; but it is seldom used internally except as a constituent of one or two officinal preparations. It was proposed by Dr. Alexander Ure as a remedy for uric acid deposits in the urine, and for the chalk-like concretions, consisting of

* *Benzyle*, which was at first hypothetical, has been isolated. When benzoate of copper is cautiously distilled without water, it yields a product which crystallizes on cooling. This substance has the smell of geranium, melts at 158° F., and has a composition represented by the formula $C_{14}H_5O_2$. When heated with hydrate of potassa, it is converted into benzoic acid, with the escape of hydrogen. It is, therefore, benzyle. It was discovered by Ettling, and afterwards investigated by Stenhouse. (*Fowne's Chemistry*, Am. Ed., 1853, p. 401.)

urate of soda, in the joints of gouty individuals. He supposed it to operate by converting the uric into hippuric acid, and consequently the insoluble urates into soluble hippurates. It appears, however, from the observations of Dr. Garrod and Mr. Keller, that such a transformation of uric acid does not take place, but that the benzoic acid is itself converted into hippuric acid, which is always found in the urine, when the former acid is taken freely. The quantity of uric acid in the urine remains undiminished. In consequence of the acid state of urine produced by benzoic acid, it has been found useful in the phosphatic variety of gravel; though its beneficial influence, being purely chemical, continues only during its use. (*Journ. de Pharm.*, 3*e sér.*, ii. 327, iii. 41, iv. 397.) It is said to have cured nocturnal incontinence of urine. Mr. White Cooper has employed it with supposed advantage in a case of rheumatic sclerotitis. (See *Am. Journ. of Med. Sci.*, N. S., xxv. 518.) A convenient mode of exhibition is to give the acid with four parts of phosphate of soda, or one part and a half of biborate of soda, which enable it to be readily dissolved by water. The dose is from 10 to 30 grains. It is an ingredient in some cosmetic washes, and has been employed by way of fumigation as a remedy in affections of the skin.

Off. Prep. Tinctura Opii Ammoniata; Tinctura Opii Camphorata; Unguentum Sulphuris Compositum. W.

ACIDUM GALLICUM. *U. S.*, *Lond.*, *Dub.* *Gallic Acid.*

"Take of Galls, in powder, *three pounds;* Distilled Water, Animal Charcoal, each, a *sufficient quantity.* Mix the Galls with sufficient Distilled Water to form a thin paste, and expose the mixture to the air, in a shallow glass or porcelain vessel, in a warm place, for a month, occasionally stirring it with a glass rod, and adding from time to time sufficient Distilled Water to preserve the semi-fluid consistence. Then submit the paste to expression, and, rejecting the expressed liquor, boil the residue in a gallon of Distilled Water for a few minutes, and filter while hot through Animal Charcoal. Set the hot liquor aside that crystals may form, which may be dried on bibulous paper. If the crystals be not sufficiently free from colour, they may be purified by dissolving them in boiling Distilled Water, filtering through a fresh portion of Animal Charcoal, and crystallizing." *U. S.*

The *London College* places Gallic Acid in its Materia Medica catalogue, directing simply that it be in crystals, and prepared from galls.

The *Dublin College* gives two processes, of which the first is essentially the same as that of the U. S. Pharmacopœia. It differs in requiring an exposure of six weeks instead of a month, in not expressing the paste before boiling in water, and in expressing the impure acid deposited from the filtered decoction, before redissolving it in boiling water. The second process is as follows.

"Take of powdered Galls *one pound* [avoirdupois]; Oil of Vitriol of Commerce *twenty-six fluidounces;* Water *five pints* [Imp. meas.] and *fourteen* [*fluid*] *ounces.* Steep the galls for twenty-four hours in one part of the water, then transfer them to a glass or porcelain percolator, and pour on a pint and a half of the water in successive portions. Dilute five ounces of the oil of vitriol with an equal bulk of water, and, when the mixture has cooled, add it to the infusion obtained by percolation, stirring well, so as to bring them into perfect contact. Let the viscid precipitate which forms be separated by a filter, and to the solution which passes through add five ounces more of the oil of vitriol, which will yield an additional precipitate. This being added to that previously obtained, let both be enveloped in calico, and subjected to powerful pressure. Dissolve the residue in the rest of the oil of vitriol, this latter being first diluted with what remains of the water; boil the solution for twenty minutes, then allow it to cool, and set it by for a week. Let the deposit which has formed at the end of this period be pressed, dried, and then dissolved in three times its weight of

boiling water, clearing the solution, if necessary, by filtration, and, when it has cooled down to 80°, decant the liquid from the crystalline sediment which has formed, and wash the latter with three ounces of ice-cold water. Finally, let it be transferred to blotting paper, and when deprived by this of adhering liquid, let it be dried perfectly at a temperature not exceeding 212°. The gallic acid obtained may be rendered nearly white by dissolving it in twenty times its weight of boiling distilled water, and causing the solution to traverse a stratum of prepared animal charcoal spread upon a calico filter. When the liquid passes through colourless it should be evaporated to one-sixth of its volume, and then suffered to cool in order to the separation of the crystallized acid." *Dub.*

The U. S. process is founded upon the fact that, when galls in decoction or in the state of moistened powder, are exposed to the air, their tannic acid is gradually converted into gallic acid, with the absorption, as generally believed, of oxygen, and the escape of an equivalent quantity of carbonic acid. The gallic acid, being freely soluble in boiling but very sparingly in cold water, is extracted from the altered galls by decoction, and is deposited as the water cools. A repetition of the solution and deposition renders the acid more pure; but it cannot be obtained wholly free from colour unless by the aid of animal charcoal. In the U. S. Pharmacopœia it was neglected, no doubt through inadvertence, to direct *purified* animal charcoal. There are few processes in which it is more necessary that this decolorizing agent should be purified. The presence of the slightest quantity of sesquioxide of iron interferes with the bleaching of the acid; and it is even advisable to examine the filtering paper employed, lest it may contain sufficient of this substance to vitiate the results of the process. The first crop of crystals in the U. S. process retains a very large proportion of water; and it will be found convenient to subject them to strong expression between folds of bibulous paper.

Dr. C. Wetherill, believing that gallic acid differs from the tannic simply in containing water, conceived the idea of preparing the former from the latter by the fixation of water. This he effected through the agency of sulphuric acid. Having mixed 13 drachms of tannic acid with 22 fluidounces of sulphuric acid and four times that bulk of water, he heated the mixture to the boiling point, and then allowed it to stand. In a few days an abundant precipitate of white gallic acid took place, amounting to 87·4 per cent. of the tannic acid. (See *Am. Journ. of Pharm.*, xx. 112.) Upon the same principle is based the second process of the Dublin College. Dr. Christison, in his Dispensatory, states that the process was originally suggested by Liebig.

Some new and interesting views have been advanced in relation to the formation of gallic acid from the tannin of galls. The elder Robiquet first suggested that galls contain a principle capable of converting tannic into gallic acid, with the presence of water, and in the absence of atmospheric air. M. Larocque proved that this principle acts as a ferment, and that the change referred to is the result of a *gallic acid fermentation* in the galls. M. Edmund Robiquet has shown that galls contain *pectose* and *pectase*, the former of which, according to the experiments of M. Fremy, is the principle out of which pectin is formed in plants, and the latter a peculiar ferment which effects the transformation. It appears that in galls the pectase, aided by a proper temperature and the presence of water, changes not only pectase into pectin, but also tannic into gallic acid. Strecker had previously advanced the opinion that tannic acid is a combination of gallic acid and sugar, the latter of which is destroyed in the process for procuring gallic acid, which is thus simply set free from the combination. It would seem, if this view is correct, that the pectase acts upon the saccharine matter of the tannic acid, causing its conversion into carbonic acid and alcohol, and liberating the gallic acid, and that the process is in fact an example of the vinous fermentation. M. E. Robiquet admits the occasional transformation of tannic

acid into gallic acid and sugar, but does not believe that the sugar pre-exists as such in the tannin; and this point yet remains to be determined. (*Journ. de Pharm.*, 3e *ser.*, xxiii. 241.) Wittstein, in endeavouring to obtain gallic acid from *Chinese galls* (see *page* 357) by forming them into a paste with water, found that but a very small proportion of the acid was generated at the end of six weeks. Thinking that this might have resulted from the want of the ferment in the Chinese galls, he added to these one-eighth of their weight of common galls, and at the end of three weeks obtained an amount of gallic acid nearly equal to one-half the weight of the galls employed. The same result, though more slowly, followed the addition of yeast to the Chinese galls. Wittstein obtained both carbonic acid and alcohol as products of this operation, thus favouring the views of Strecker as to the constitution of tannic acid. (See *Am. Journ. of Pharm.*, xxv. 258.)

Properties. Gallic acid is in delicate, silky, acicular crystals, which, as ordinarily found in the shops, are slightly brownish, but when quite pure are colourless. It is inodorous, and of a sourish astringent taste. It is soluble, according to Braconnot, in 100 parts of cold and 3 of boiling water, is very soluble in alcohol, and but slightly so in ether. It reddens litmus, and produces a deep bluish-black colour with solutions of the salts of the sesquioxide of iron, which disappears when the solution is heated. It does not precipitate gelatin, or a solution of sulphate of protoxide of iron. On exposure to the air, its solution undergoes spontaneous decomposition. The formula of gallic acid is $C_7H_3O_5$, and its combining number 85. Heated to 420° it gives out carbonic acid, and is converted into *pyrogallic acid.** Thrown on red-hot iron it is entirely dissipated.

Medical Properties. Forming an ingredient in all astringent products containing gallo-tannic acid, it was at one time supposed to be the active principle of the vegetable astringents. This reputation it afterwards lost when the properties of tannic acid became well known. But it has recently again come into notice, and is now thought by many to be a very valuable astringent, having the property of arresting hemorrhages when taken internally, especially those from the uterus and urinary passages. In all cases of hemorrhage in which the bleeding vessels must be reached through the route of the circulation, it is believed by some to be more efficient even than tannic acid, as its chemical affinities do not afford the same impediment to its absorption as those of the latter acid. But in hemorrhage from the alimentary mucous membrane or from any other part with which tannic acid can be brought into direct contact, this astringent is by far the most effectual. Gallic acid is said not to constipate the bowels. The dose is from five to fifteen grains three or four times a day, and may be given in the form of pill or powder. W.

ACIDUM HYDROCYANICUM DILUTUM. *U. S.*, *Lond.*, *Dub.* Acidum Hydrocyanicum. *Ed.* *Diluted Hydrocyanic Acid. Prussic Acid. Cyanohydric Acid.*

"Take of Ferrocyanuret of Potassium *two ounces;* Sulphuric acid *an ounce and a half;* Distilled Water *a sufficient quantity.* Mix the acid with four fluid-ounces of Distilled Water, and pour the mixture, when cool, into a glass retort. To this add the Ferrocyanuret of Potassium, previously dissolved in ten fluid-

* In consequence of the great sensitiveness of *pyrogallic acid* to light, in connexion with certain metallic salts, it has come into use as an agent in *photography*. According to Löwig, it is best prepared by heating gallic acid, previously dried at 212° F., in a glass retort, by means of a chloride of zinc bath, to 410° F., when pure pyrogallic acid sublimes. It is white, foliated, inodorous, very bitter, soluble in three and a half parts of water, readily dissolved by alcohol and ether, fusible at 239° F., and sublimable at 410° F., in irritating vapours. Chlorine, iodine, and acids which readily yield oxygen decompose it instantaneously.—*Note to the tenth edition.*

ounces of Distilled Water. Pour eight fluidounces of Distilled Water into a cooled receiver, and, having attached this to the retort, distil, by means of a sand-bath, with a moderate heat, six fluidounces. Lastly, add to the product five fluidounces of Distilled Water, or as much as may be sufficient to render the Diluted Hydrocyanic Acid of such strength, that 12·7 grains of nitrate of silver, dissolved in distilled water, may be accurately saturated by 100 grains of the Acid.

"Diluted Hydrocyanic acid may also be prepared, when wanted for immediate use, in the following manner.

"Take of Cyanuret of Silver *fifty grains and a half;* Muriatic Acid *forty-one grains;* Distilled Water *a fluidounce.* Mix the Muriatic Acid with the Distilled Water, add the Cyanuret of Silver, and shake the whole in a well-stopped vial. When the insoluble matter has subsided, pour off the clear liquor and keep it for use. Diluted Hydrocyanic Acid should be kept in closely stopped bottles from which the light is excluded." *U. S.*

The process of the *London College* for diluted hydrocyanic acid is the same as that of the U. S. Pharmacopœia; the latter having been adopted from the former. The following is the *Edinburgh* formula, Imperial measure being used.

"Take of Ferrocyanide of Potassium *three ounces;* Sulphuric Acid *two fluidounces;* Water *sixteen fluidounces.* Dissolve the salt in eleven fluidounces of the Water, and put the solution in a matrass with a little sand: add the Acid, previously diluted with five fluidounces of the Water and allowed to cool: connect the matrass with a proper refrigeratory: distil with a gentle heat, by means of a sand-bath or naked gas-flame, till fourteen fluidounces pass over, or till the residuum begins to froth up. Dilute the product with distilled water till it measures sixteen fluidounces." *Ed.*

The *Dublin College*, in its Pharmacopœia of 1850, has abandoned the employment of cyanuret of mercury and muriatic acid as the source of this acid, and adopted the use of ferrocyanuret of potassium and sulphuric acid, in imitation of the other British Pharmacopœias. The process adopted is virtually the same as those just given, and, therefore, need not be quoted.

Hydrocyanic acid was admitted into the French Codex in 1818, into the United States Pharmacopœia in 1820, into the Dublin in 1826, into the London in 1836, and into the Edinburgh in 1839. It is now made by one chief process; namely, from the ferrocyanuret of potassium by the action of sulphuric acid. It is also obtained by an extemporaneous process, when wanted for immediate use, in the U. S. Pharmacopœia, by decomposing the cyanuret of silver. When ferrocyanuret of potassium is decomposed by sulphuric acid, the residue in the retort is bisulphate of potassa, mixed with a compound of two eqs. of cyanuret of iron and one of cyanuret of potassium (*Everitt's salt*). Two eqs. of ferrocyanuret $2(FeCy+2KCy)$, react with six eqs. of hydrated sulphuric acid $6(SO_3+HO)$, and produce three eqs. of hydrated bisulphate of potassa $3(KO,2SO_3+HO)$, together with one eq. of Everitt's salt $2FeCy+KCy$, which remain in the retort, and three eqs. of hydrocyanic acid $3HCy$, which distil over. Everitt's salt, so named from its discoverer, called *biferrocyanuret of potassium* by Dr. Pereira, is yellow according to Mr. Everitt; but Dr. Pereira, who prepared it with the greatest care, always found it white. Its constitution $(2FeCy+KCy)$ is precisely the converse of that of ferrocyanuret of potassium $(FeCy+2KCy)$.

According to Mr. Phillips, the proportion of sulphuric acid, directed by the Edinburgh College, is so large that there is great risk of the production of formic acid. (*Observations on the Ed. Pharm., &c.*) The acid, instead of exceeding the weight of the ferrocyanuret, should only form three-fourths of its weight. In relation to the most convenient method of bringing the hydrocyanic acid to the standard strength, and to some other points in its preparation by the officinal formula, the reader is referred to a paper by Prof. Procter, contained in the *Amer. Journ. of Pharmacy*, xix. 259.

The rationale of the U. S. process for obtaining hydrocyanic acid extemporaneously is exceedingly simple. The reacting materials are single equivalents respectively of cyanuret of silver and muriatic acid. These, by double decomposition, generate hydrocyanic acid which dissolves in the water, and chloride of silver which subsides, and from which the acid is poured off when clear. (See *Argenti Cyanuretum.*) The extemporaneous process is useful to country practitioners; because the acid will not generally keep. A portion of hydrocyanic acid, if procured by a practitioner, may spoil on his hands, before he has occasion to use it; but if he supplies himself with cyanuret of silver, he may readily at any moment prepare a small portion of the acid, by following the directions of the formula.

The French Codex of 1837 gives the following process for hydrocyanic acid, in place of the three formerly contained in that work. Take of bicyanuret of mercury thirty parts; muriatic acid (sp. gr. 1·17) twenty parts. Reduce the bicyanuret to powder, and introduce it into a small tubulated glass retort, placed over a furnace. Adapt to its neck a tube about 13 inches long, and half an inch in diameter, and filled one-half with pieces of marble, and the remainder with chloride of calcium. To this tube, arranged nearly horizontally, adapt a smaller one, bent at a right angle, and plunging into a graduated tube, surrounded with a mixture of common salt and pounded ice. The apparatus being thus arranged, and the junctures well luted, add the muriatic acid; and, having allowed the action to take place for a few moments in the cold, apply the heat gradually. When the action is over, drive forward any acid which may have condensed in the large tube, by means of a live coal brought near to it, and passed along its whole length. The quantity of acid found in the graduated tube is mixed with either six times its bulk, or eight and a half times its weight of distilled water.

The above process is Gay-Lussac's, and, therefore, the same in principle as the former Dublin. In the first part of it, Gay-Lussac's strong acid is obtained in the graduated tube, and this is afterwards diluted to a given extent with water. The object of the marble and chloride of calcium is to detain, the former muriatic acid, the latter water.

Another process for obtaining medicinal hydrocyanic acid, proposed by Dr. Clarke, and adopted by Mr. Laming, is by the reaction of tartaric acid on cyanuret of potassium in solution. Laming's formula is as follows. Dissolve twenty-two grains of the cyanuret in six fluidrachms of distilled water, and add fifty grains of crystallized tartaric acid, dissolved in three fluidrachms of rectified spirit. Crystallized bitartrate of potassa precipitates, and each fluidrachm of the clear decanted liquor contains one grain of pure hydrocyanic acid. The reaction in this process takes place between two eqs. of tartaric acid, one of cyanuret of potassium, and one of water. The water is decomposed, and the tartaric acid, potassium, and oxygen unite to form the bitartrate, and the cyanogen and hydrogen to form the hydrocyanic acid. Dr. Pereira considers this process to have several advantages, but very properly objects to it on account of the trouble and expense of obtaining the cyanuret of potassium pure, and its liability to undergo spontaneous decomposition. (See *Potassii Cyanuretum.*)

Liebig recommends the decomposition of cyanuret of potassium with hydrated sulphuric acid. In this case the products of the double decomposition are sulphate of potassa and hydrocyanic acid. Any cyanate of potassa present as an impurity is at the same time decomposed, and the ammonia resulting from the cyanic acid unites with the sulphuric acid, so as to form a supersulphate. The mode of proceeding is to distil one part of the cyanuret, dissolved in two parts of water, with one part of sulphuric acid, diluted with three parts of water. The hydrocyanic acid obtained is much stronger than the medicinal acid; but it may be reduced to any desired standard by the addition of the proper proportion of distilled water.

The processes, thus far given, are intended to furnish a *dilute* hydrocyanic acid for medicinal purposes. The methods of obtaining the *anhydrous* or pure acid are different. Vauquelin's process for the pure acid is to pass a current of hydrosulphuric acid gas over the bicyanuret of mercury contained in a glass tube, connected with a receiver kept cold by a freezing mixture of ice and salt. The first third only of the tube is filled with the bicyanuret; the remaining two-thirds being occupied, half with carbonate of lead, and half with chloride of calcium; the carbonate being intended to detain the hydrosulphuric acid gas, the chloride to separate water. Another process for the anhydrous acid is that of Gautier, the details of which are thus given by Berzelius. The ferrocyanuret of potassium is fused without access of air, whereby it is converted into a mixture of cyanuret of potassium and carburet of iron. The mass obtained, after having been pulverized and placed in a flask, is slightly moistened with water, and acted on with muriatic acid, added by small portions at a time. By a double decomposition between the cyanuret and muriatic acid, chloride of potassium and hydrocyanic acid are formed. The flask is then plunged into hot water, which causes the hydrocyanic acid to be disengaged in the form of vapour. This is passed through a tube containing chloride of calcium, and finally received in a small flask kept cool by a freezing mixture.

The process of Wöhler for the anhydrous acid is substantially the same as that of Liebig. The cyanuret of potassium selected is a black cyanuret, formed by fusing together 8 parts of dry ferrocyanuret, 3 of ignited cream of tartar, and 1 of charcoal in fine powder in a covered crucible. This is better than Liebig's cyanuret, which contains a large amount of cyanate of potassa. The cyanuret, while still warm, is exhausted by 6 parts of water, and the clear solution, placed in a retort, is decomposed by cold dilute sulphuric acid, gradually added. The hydrocyanic acid is condensed first in a U-shaped tube, containing chloride of calcium, and surrounded with ice-cold water, and afterwards in a small bottle, connected with the U-shaped condenser by a narrow tube, and immersed up to the neck in a mixture of ice and salt. After the acid has been condensed and dehydrated in the U-tube, the cold water surrounding it is withdrawn by a siphon, and replaced by water at a temperature between 85° and 90° Fahr., whereby the anhydrous acid is made to distil over into the small bottle.

Properties of the Medicinal Acid. Diluted hydrocyanic acid, of the proper medicinal strength, is a transparent, colourless, volatile liquid, possessing a taste at first cooling, afterwards somewhat irritating, and a peculiar smell. It imparts a slight and evanescent red colour to litmus. If it reddens litmus strongly and permanently, the fact shows the presence of some acid impurity. It is not reddened by the iodo-cyanuret of potassium and mercury. The non-action of this test shows the absence of contaminating acids, which, if present, would decompose the test, and give rise to the red iodide of mercury. It is liable to undergo decomposition if exposed to the light, but is easily kept if the bottle containing it is covered with black paint, or black paper. Its most usual impurities are sulphuric and muriatic acids; the former of which may be detected by chloride of barium, which will produce a precipitate of sulphate of baryta; and the latter, by precipitating with nitrate of silver, when so much of the precipitate as may be chloride of silver will be insoluble in boiling nitric acid, while the cyanuret of silver is readily soluble. The presence of these acids in slight amount is injurious, only in so far as they render the strength of the acid uncertain. Indeed, Mr. Barry, of London, adds a small proportion of muriatic acid to all his medicinal hydrocyanic acid, in order to preserve it. (*Pereira.*) But the presence of a mineral acid is not necessary for its preservation; for Dr. Christison has known medicinal hydrocyanic acid from ferrocyanuret of potassium to keep perfectly well, although nitrate of baryta, added to it, did not produce the slightest muddiness. If lead be present, it may be detected by hydrosulphuric

acid gas, which will cause a blackish precipitate. Hydrocyanic acid is incompatible in prescriptions with nitrate of silver, the salts of iron and copper, and most of the salts of mercury.

The medicinal acid is of different strengths, as ordered by the different pharmaceutical authorities. Formerly its strength was indicated by its specific gravity, which is lower in proportion as it is stronger; but this unprecise mode of estimate has been generally abandoned. The Pharmacopœias now, with the exception of the Dublin, rely on the saturating power as an index of strength. According to the *United States* formula, 100 grains of the acid must accurately saturate 12·7 (12.59, *Lond.*) grains of nitrate of silver, dissolved in distilled water, and produce a precipitate (cyanuret of silver), which, when washed and dried at a temperature not exceeding 212°, shall weigh 10 grains, and be wholly soluble in boiling nitric acid. An acid of this strength contains 2 per cent. of the pure anhydrous acid. The test of entire solubility in boiling nitric acid, applied to the precipitate obtained by nitrate of silver, is intended to verify its nature; for, if the hydrocyanic acid contain muriatic acid, part of this precipitate would be chloride of silver, not soluble in the boiling acid. The *Edinburgh* acid is directed to contain about 3·22 per cent. of anhydrous acid. The mode laid down by the College for testing its strength by nitrate of silver, admits of a variation in this particular; the stronger allowable acid being one-tenth stronger than the weaker. The *Dublin* acid is directed to have the sp. gr. 0·997, and probably contains a little over 2 per cent. of the anhydrous acid. Its saturating strength is not given. Scheele's medicinal hydrocyanic acid contains five per cent. of anhydrous acid; and, therefore, two minims of it are equal to five of the U. S. acid. The use of Scheele's acid should be discouraged as unnecessary, and as leading to mistakes.

MM. Fordos and Gélis have proposed as a test of the strength of the preparations containing cyanogen, an alcoholic solution of iodine of known strength; as, for example, three grains to the fluidounce. The test solution is added, drop by drop, to the cyanogen compound, until a permanent yellowish tinge is produced. The iodine unites with the cyanogen in the ratio of their equivalents; and hence the cyanogen present is easily calculated from the iodine expended. This test is commended for its accuracy by Mr. James Roberton, of Manchester. (See *Am. Journ. of Pharm.*, Nov. 1853, p. 551.)

Properties of the Anhydrous Acid. Hydrocyanic acid, perfectly free from water, is a colourless, transparent, inflammable liquid, of extreme volatility, boiling at 80°, and congealing at 5°. Its sp. gr. as a liquid is 0·6969, at the temperature of 64°; and as a vapour 0·9423. Its taste is at first cooling, then burning, with an after-taste in the throat like that of bitter almonds; but, from its extremely poisonous nature, it must be tasted with the utmost caution. Its odour is so strong as to produce immediate headache and giddiness; and its vapour so deleterious that it cannot be inhaled without the greatest danger. Both water and alcohol dissolve it readily. It is much more prone to undergo decomposition than the dilute acid. In the course of a few hours it sometimes begins to assume a reddish-brown colour, which becomes gradually deeper, till at length the acid is converted into a black liquid, which exhales a strong smell of ammonia. It is a very weak acid in its chemical relations, and reddens litmus but slightly. It does not form solid compounds with metallic oxides, but a cyanuret of the metal, the elements of water being exhaled. According to Sobero, hydrocyanic acid is generated, in sensible quantities, by the action of weak nitric acid on the volatile oils and resins. Though a product of art, it exists in some plants. It is, however, a matter of doubt, in many cases in which it is extracted from vegetables, whether it is an educt or a product. (See *Amygdala Amara.*)

Composition, &c. Hydrocyanic acid consists of one eq. of cyanogen 26, and one of hydrogen 1=27; or, in volumes, of one volume of cyanogen and one

volume of hydrogen without condensation. *Cyanogen* is a colourless gas, of a strong and penetrating smell, inflammable, and burning with a beautiful bluish-purple flame. Its sp. gr. is 1·8157. It was discovered in 1815 by Gay-Lussac, who considered it a compound radical, which, when acidified by hydrogen, becomes hydrocyanic acid. It consists of two eqs. of carbon 12, and one of nitrogen 14=26; or, in volumes, of two of carbon vapour, and one of nitrogen, condensed into one. The ultimate constituents of hydrocyanic acid are, therefore, two eqs. of carbon, one of nitrogen, and one of hydrogen.

Hydrocyanic acid, in a dilute state, was discovered in 1780 by Scheele, who correctly stated its constituents to be nitrogen, carbon, and hydrogen; but the peculiar way in which they are combined was first pointed out by Gay-Lussac, by whom also the anhydrous acid was first obtained.

Medical and Toxicological Properties. Hydrocyanic acid is one of the most deadly poisons known, proving, in many cases, almost instantaneously fatal. According to Dr. Christison, a grain and a half of the anhydrous acid is capable of producing death in the human subject. In the opinion of Dr. Meyer, it acts by paralysing the heart, being conveyed into the blood, and operating directly on that organ. One or two drops of the pure acid are sufficient to kill a vigorous dog in a few seconds. Notwithstanding its tremendous energy as a poison, it has been ventured upon in a dilute state as an anodyne and antispasmodic. Though occasionally resorted to as a remedy previously to 1817, yet it did not attract much attention until that year, when Magendie published his observations on its use in diseases of the chest, and recommended its employment to the profession. When given in medicinal doses gradually increased, it produces the following symptoms in different cases:—peculiar bitter taste; increased secretion of saliva; irritation in the throat; nausea; disordered respiration; pain in the head; giddiness; faintness; obscure vision; and tendency to sleep. The pulse is sometimes quickened, at other times reduced in frequency. Occasionally salivation and ulceration of the mouth are produced. It has been highly recommended and extensively used in complaints of the respiratory organs, and is supposed to exert a control over pulmonary inflammation, after the excitement has been diminished by bloodletting; and there is no doubt that, in some instances, it may be beneficial under such circumstances. Dr. Joseph Johnson, of Charleston, S. C., has found it useful in pneumonia. (*Charleston Med. Journ.*, Sept. 1853, p. 643.) In phthisis it may be resorted to with advantage as a palliative for the cough. In various other affections of the chest, attended with dyspnœa or cough, such as asthma, hooping-cough, and chronic catarrh, it has often been decidedly beneficial, by allaying irritation or relaxing spasm. In hypertrophy of the heart, and aneurism of the aorta, it has also been used with advantage. In various affections of the stomach, characterized by pain and spasm, and sometimes attended with vomiting, but unconnected with inflammation, it has proved beneficial in the hands of several practitioners. It has also been administered as an anodyne in several painful affections, as cancer, tic douloureux, &c., but with doubtful advantage. Sometimes it is used externally, diluted with water, as a wash in cutaneous diseases. The late Dr. A. T. Thomson, from personal observation, insisted particularly on its efficacy in allaying the itching in impetiginous affections.

The dose of the medicinal hydrocyanic acid of the U. S. Pharmacopœia, is from two to six drops, dissolved in distilled water, or mixed with gum water or syrup. It requires to be administered with the greatest caution, on account of the minuteness of the dose, and the great variableness in strength of the acid as found in the shops. The proper plan, therefore, is to begin with a small dose, two drops, for example, and gradually to increase the quantity until some obvious impression is produced. If giddiness, weight at the top of the head, sense of tightness at the stomach, or faintness come on, its use should be discontinued.

In all cases in which a fresh portion of medicine is used, the dose should be lowered to the minimum quantity, lest the new sample should prove stronger than that previously employed. When resorted to as a lotion, from thirty minims to a fluidrachm may be dissolved in a fluidounce of distilled water.

Hydrocyanic acid is so rapidly fatal as a poison that physicians have seldom an opportunity to treat its effects. When not immediately fatal, the symptoms produced are sudden loss of sense, trismus, difficult and rattling respiration, coldness of the extremities, smell of the acid proceeding from the mouth, though this is sometimes absent, smallness of the pulse, swelling of the neck, dilatation, immobility, and sometimes contraction of the pupils, convulsions, &c. The antidotes and remedies most to be relied on, are chlorine, ammonia, cold affusion, and artificial respiration. Chlorine in the form of chlorine water, or weak solutions of chlorinated lime or soda, may be exhibited internally, or applied externally. When chlorine is not at hand, water of ammonia, largely diluted, may be given, and the vapour arising from it cautiously inhaled. A case is related in the *Dublin Med. Journal*, for Nov., 1835, of poisoning by this acid, in which the diluted aromatic spirit of ammonia applied to the mouth, and the solid carbonate assiduously applied to the nostrils, produced speedy and beneficial effects. Cold affusion was first proposed in 1828 by Herbst, of Göttingen, and its utility was subsequently confirmed by Orfila. Its efficacy is strongly supported by experiments performed in 1839 by Dr. Robinson and M. Lonyet, who quickly resuscitated rabbits, apparently dead from hydrocyanic acid, by pouring on their head and spine a stream of water artificially refrigerated. A case of poisoning reported by Dr. Christison in Feb. 1850, in which the patient recovered, strongly supports the value as a remedy of a stream of cold water, poured upon the head from a moderate height. Messrs. T. & H. Smith, of Edinburgh, have recommended as an antidote a mixture of the sulphates of the protoxide and sesquioxide of iron, swallowed after a solution of carbonate of potassa. So soon as the antidote comes in contact with hydrocyanic acid, sulphate of potassa is formed, and the poison is converted into Prussian blue. This antidote is proposed by the Messrs. Smith for the medicinal acid only. It may be prepared extemporaneously, according to the same chemists, by adding ten grains of sulphate of protoxide of iron and a drachm of the tincture of chloride of iron to a fluidounce of water, contained in one vial, and twenty grains of carbonate of potassa to a fluidounce or two of water in another vial. The patient is made to swallow the solution of carbonate of potassa, and immediately afterwards the mixed ferruginous solution. The quantity of antidote, here mentioned, is estimated to be sufficient to render insoluble nearly two grains of the anhydrous acid.

After death from suspected poison, it is sometimes necessary to ascertain whether the event was caused by this acid. If death has taken place a long time, it would be needless to search for so volatile a poison; but it has been recognised in one instance seven days after death. The best test is that proposed by Liebig in January 1847, consisting in the conversion of the hydrocyanic acid into sulphocyanate of ammonia, which salt is then tested with a sesquioxide salt of iron. Two drops of the acid, so dilute as not to afford the least blue tint with the salts of iron, upon being mixed with a drop of bihydrosulphate of ammonia, and heated upon a watch-glass until the mixture is colourless, yields a solution of sulphocyanate of ammonia, which becomes of a deep blood-red colour upon the addition of the sulphate of sesquioxide of iron, in consequence of the formation of the sulphocyanuret of iron. (*Chem. Gaz.*, April 1, 1847, from Liebig's *Annalen.*) This test is praised by Mr. A. S. Taylor, who found it to act characteristically on two grains of dilute hydrocyanic acid, containing only 1-3930th of a grain of anhydrous acid. To render the test thus delicate, Mr. Taylor deems it necessary to evaporate the liquid gently to dryness, after the addition of the bihydrosulphate of ammonia, in order to bring the sulphocyanate

to the solid state, before adding the iron test, a fractional part of a drop of which will commonly suffice to produce the characteristic colour. In case the acid is mixed with organic matters, Mr. Taylor proposes a modification of Liebig's test as follows. Place the contaminated acid in a watch-glass, and invert over it another, holding in its centre a drop of the bihydrosulphate of ammonia. In from half a minute to ten minutes, without the application of heat, the bihydrosulphate will be converted into the sulphocyanate of ammonia; and upon removing the upper glass, and evaporating its contents to dryness, the addition of the iron test will produce the blood-red colour. B.

ACIDUM MURIATICUM DILUTUM. *U. S., Ed., Dub.* ACIDUM HYDROCHLORICUM DILUTUM. *Lond. Diluted Muriatic Acid.*

"Take of Muriatic Acid *four fluidounces;* Distilled Water *twelve fluidounces.* Mix them in a glass vessel. The specific gravity of Diluted Muriatic Acid is 1·046." *U. S.*

The *London* and *Edinburgh* directions are the same as those of the U. S. Pharmacopœia. The London College gives the sp. gr. of the acid at 1·043, and states that a fluidounce of it is saturated by 168 grains of crystallized carbonate of soda. The U. S. and London diluted acids are identical; but the Edinburgh diluted acid is somewhat stronger (1·050), in consequence of the pure muriatic acid of that College having a density of 1·17, instead of 1·16 (*U. S., Lond.*). The *Dublin College* mixes *four fluidounces* of pure muriatic acid with *thirteen* [*fluid*]*ounces* of distilled water, and states the density of the acid to be 1·045.

It is convenient to have an officinal diluted muriatic acid, and, at present, all the Pharmacopœias give a formula for it. The acids of the different Pharmacopœias virtually agree in strength; the variations being practically insignificant. For an account of the medicinal properties of muriatic acid, see *Acidum Muriaticum.* The dose of the diluted acid is from twenty to sixty drops, mixed with water or other convenient vehicle. The Dublin College employs this acid, as a chemical agent, in the preparation of *Calcis Phosphas Præcipitatum.* B.

ACIDUM NITRICUM DILUTUM. *U. S., Lond., Ed., Dub. Diluted Nitric Acid.*

"Take of Nitric Acid [sp. gr. 1·42] *a fluidounce;* Distilled Water *six fluidounces.* Mix them in a glass vessel. The specific gravity of Diluted Nitric Acid is 1·07; and 100 grains of it saturate 20 grains of crystallized bicarbonate of potassa." *U. S.*

"Take of Nitric Acid [sp. gr. 1·42] *three fluidounces;* Distilled Water *seventeen fluidounces.* Mix. The sp. gr. is 1·082. A fluidounce of the Acid is saturated by 154 grains of crystallized carbonate of soda." *Lond.*

"Mix together *one fluidounce* of Pure Nitric Acid (D. 1·500), and *nine fluidounces* of Distilled Water. If the Commercial Nitric Acid of D. 1·390 be used, *one fluidounce and five fluidrachms and a half* are required. The density of this diluted acid is 1·077." *Ed.*

"Take of Pure Nitric Acid [sp. gr. 1·5] *four fluidounces;* Distilled Water *twenty-nine* [*fluid*]*ounces.* Mix. The sp. gr. of this Acid is 1·092." *Dub.*

All the Pharmacopœias embrace Diluted Nitric Acid, for convenience in prescribing. The acids of the U. S., London, and Edinburgh Pharmacopœias are nearly of the same strength, being, for equal volumes with the strong acid, a little more than one-tenth its strength. The acid of the Dublin College is somewhat stronger.

The medicinal properties of the diluted acid are the same as those of the strong acid. (See *Acidum Nitricum.*) The dose is from twenty to forty drops three times a day, sufficiently reduced with water at the time of taking it. A diluted nitric acid is used by the Edinburgh College for preparing the red oxide of mer-

cury; but it is directed to have the density of 1·280, and is, therefore, not the officinal diluted acid of that College.

Off. Prep. Plumbi Nitras. B.

ACIDUM NITRICUM PURUM. *Ed., Dub. Pure Nitric Acid.*

"Purify Nitrate of Potash, if necessary, by two or more crystallizations till nitrate of silver does not act on its solution in distilled water. Put into a glass retort *equal weights* of this purified Nitrate and of Sulphuric Acid; and distil into a cool receiver, with a moderate heat from a sand-bath or naked gas-flame, so long as the fused material continues to give off vapour. The pale-yellow Acid thus obtained may be rendered colourless, should this be thought necessary, by heating it gently in a retort." The density of this Acid is 1·5. *Ed.*

In preparing pure nitric acid, the *Dublin College* distils nitre with nearly an equal weight of sulphuric acid; but before the nitre is used, it is dissolved in boiling water, and purified from common salt by the addition of nitrate of silver, so long as it produces a precipitate. The solution is then strained from the chloride of silver, and evaporated to dryness. The pure nitric acid obtained is directed to have the sp. gr. 1·5.

The officinal pure nitric acid is colourless or pale-yellow. If previously diluted with distilled water, it is not affected by solutions of nitrate of silver or nitrate of baryta; the non-action of these tests showing the absence of muriatic and sulphuric acids. As an acid having the sp. gr. of 1·5, it is considered to be a sesquihydrate by Mr. Phillips; consisting of one eq. of dry acid 54, and one and a half eqs. of water 13·5=67·5. This acid is inconveniently strong, and might with advantage be replaced by a pure acid of the density 1·42. This substitution has been made in the U. S. and London Pharmacopœias of 1850 and 1851.

Nitric Acid has been fully treated of under *Acidum Nitricum*, page 40, to which article the reader is referred.

Pharm. Uses. Pure Nitric Acid is used merely as a chemical agent in preparing Calomelas; Ferri Oxidum Nigrum; Ferri Peroxydum Hydratum; Hydrargyri Oxydum Rubrum; Sublimatus Corrosivus; Tinctura Ferri Acetatis; Tinctura Ferri Sesquichloridi.

Off. Prep. Acidum Nitricum Dilutum; Acidum Nitro-muriaticum; Argenti Nitras; Bismuthi Subnitras; Ferri Pernitratis Liquor; Hydrargyri Pernitratis Liquor; Plumbi Nitras; Spiritus Ætheris Nitrici; Unguentum Hydrargyri Nitratis. B.

ACIDUM NITROMURIATICUM. *U. S., Dub. Nitromuriatic Acid.*

"Take of Nitric Acid [sp. gr. 1·42] *four fluidounces;* Muriatic Acid *eight fluidounces.* Mix them in a glass vessel, and, when effervescence has ceased, keep the product in a well-stopped glass bottle, in a cool and dark place." *U. S.*

"Take of Pure Nitric Acid *one fluidounce;* Pure Muriatic Acid *two fluidounces.* Mix in a green glass bottle, furnished with an accurately ground stopper, and keep in a cool place." *Dub.*

Nitromuriatic acid is the *aqua regia* of the earlier chemists, so called from its property of dissolving gold. Nitric and muriatic acids, when mixed together, mutually decompose each other. According to the researches of Gay-Lussac (June 1848), the reaction gives rise to two compounds, in variable proportions, of nitric oxide and chlorine (NO_2Cl_2 and NO_2Cl), mixed with free chlorine; the former being analogous in constitution to nitrous, the latter to hyponitrous acid. The power, however, of nitromuriatic acid to dissolve gold, and similar metals having a weak affinity for oxygen, is owing exclusively to the free chlorine present, and is in nowise dependent on the compounds above referred to, which remain entirely passive during the solution of the metal. (*Journ. de Pharm.*, Aug. 1848.) Adopting the views of Gay-Lussac, the proportion of the acids

for total mutual decomposition would be two eqs. of nitric and six of muriatic acid; and the products would be the two compounds of nitric oxide and chlorine, free chlorine, and water Assuming this proportion, it follows that a large excess of nitric acid is employed in the U. S. formula. According to the same views, the proportion of free chlorine must be variable, dependent upon the relative proportion of the nitric oxide compounds to each other. For every eq. of NO_2Cl_2 formed, one eq. of chlorine will be set free; while for every eq. of NO_2Cl, two eqs. of chlorine will be evolved. The precise circumstances that determine the simultaneous formation of the two nitric oxide compounds, and their constantly varying proportion to each other, have not been pointed out by Gay-Lussac in the paper above referred to. When nitromuriatic acid is made from strong acids, there is always a loss of the nitric oxide compounds and of free chlorine by effervescence, in consequence of these acids not containing sufficient water to hold the gaseous products in solution. Hence the substitution, in the U. S. Pharmacopœia of 1850, of nitric acid of 1·42 for the acid of the density 1·5 is an improvement. At the same time, as the measure of the nitric acid is not increased, its relative excess in the old formula is diminished.

Properties. Nitromuriatic acid has a golden-yellow colour, and emits the smell of chlorine. It possesses the power of dissolving gold and platinum. It should be kept in a cool dark place, on account of its liability to lose chlorine by heat, and to have it converted, by the action of light, into muriatic acid, through the decomposition of water. On account of its tendency to decomposition, it should not be made by the apothecary until wanted for use, and then only in the quantity ordered; care being taken not to transfer it to the bottle until effervescence has ceased, lest the pressure within should drive out the cork. Nitric and muriatic acids, as found in the shops, are sometimes so weak that when mixed they will not readily act on gold-leaf. In this case, their solvent power may be rendered effective by the addition of a little sulphuric acid, which, by its superior attraction for water, concentrates the other acids, and causes immediate action.*

Medical Properties and Uses. Nitromuriatic acid was brought into notice as a remedy, in consequence of the favourable report of its efficacy as an external remedy in hepatitis, made by Dr. Scott, formerly of Bombay. When thus employed, it produces a tingling sensation in the skin, thirst, a peculiar taste in the mouth, and occasional soreness in the gums and plentiful ptyalism; and at the same time stimulates the liver, as is evinced by an increased flow of bile. It is used either by sponging, or in the form of a local or general bath. When applied by sponging, the acid is first diluted so as to have the acidity of strong vinegar. When used as a foot-bath, three gallons of water, contained in a deep narrow wooden tub, may be acidulated with six fluidounces of the acid. In this the feet and legs are to be immersed for twenty minutes or half an hour. The bath may be employed at first daily, and afterwards twice or thrice a week; and the sponging may be used at the same time. The bath is said to be effective in promoting the passage of biliary calculi. The solution, prepared for a bath, as above mentioned, may be used for a week, adding to it daily a pint of water, acidulated with two fluidrachms of the acid, to make up for the waste by evaporation. The bath should have a temperature of about 97° F., which may be attained by heating part of the acid solution, and throwing it back into the remainder. For some good directions for the preparation and use of the nitromuriatic acid bath, by Mr. Ranald Martin, the reader is referred to the *Pharm. Journ. and Trans.* for July, 1851, p. 38.

* In relation to nitromuriatic acid, see a paper in the third volume of the Journal of the Philadelphia College of Pharmacy, by Daniel B. Smith.

Nitromuriatic acid is also used internally, principally in hepatic and syphilitic diseases, and in the oxalic lithiasis. The dose in this case is three or four drops, largely diluted with water. B.

ACIDUM PHOSPHORICUM DILUTUM. *Lond. Diluted Phosphoric Acid.*

"Take of Phosphorus *six drachms;* Nitric Acid [sp. gr. 1·42.] *four fluidounces;* Distilled Water *eight fluidounces.* Add the Phosphorus to the Acid, previously mixed with the Water in a retort placed in a sand-bath; then apply heat until six fluidounces are distilled. Return these into the retort, and again distil six fluidounces, which are to be rejected. Evaporate the remaining liquor in a platinum capsule until only two ounces remain. Lastly, add to the acid, when it is cold, as much distilled water as may be sufficient to make it accurately measure a pint, and mix." *Lond.* The sp. gr. of this acid is 1·064. An Imperial fluidounce of it is saturated by 132 grains of crystallized carbonate of soda, and nothing is thrown down. Imperial measure is used in this formula.

The process for this officinal preparation of the London College may be thus explained. Phosphorus, when added to strong nitric acid, decomposes it with explosion and rapid combustion; but when it is distilled with the diluted acid the action takes place slowly, the phosphorus gradually melts and becomes oxidized, and nitric oxide is evolved. Before, however, the whole of the phosphorus is acidified, the nitric acid will have distilled over; and hence the necessity of returning it into the retort, as directed by the College, in order to complete the acidification of the phosphorus. When this has been completed, all remains of nitric acid are driven off by evaporation in the platinum capsule; and the residue, which contains all the phosphoric acid that can be generated from six drachms of phosphorus, is brought to a standard degree of dilution, by the addition of sufficient distilled water to make it measure an Imperial pint. (See *Acidum Nitricum* and *Phosphorus.*)

Phosphoric acid may be obtained more economically than by the above process, by decomposing phosphate of lime (calcined bones) by sulphuric acid, saturating the superphosphate formed with carbonate of ammonia, which generates phosphate of ammonia in solution with precipitation of phosphate of lime, and finally decomposing the phosphate of ammonia by a red heat in a platinum crucible. The ammonia is thus expelled, and the solid residuum will be monohydrated phosphoric acid (HO,PO_5), called also *metaphosphoric acid, phosphate of water,* and *glacial phosphoric acid* from its resemblance to ice. Phosphoric acid in this form is a white, transparent, fusible solid, slowly soluble in water, and characterized by producing a white precipitate in a solution of albumen. Forty-five and a half grains of this acid, dissolved in a fluidounce of distilled water, form a solution of about the strength of the officinal acid.

Properties. Diluted phosphoric acid is a colourless, inodorous, sour liquid, acting strongly on litmus, and possessing powerful acid properties. Although evaporated so as to become dense, it is not powerfully corrosive like the other mineral acids. According to the late Mr. Phillips, it contains 8·7 per cent. of monohydrated phosphoric acid. (*Trans. of London Pharm. of* 1851, p. 71.) The officinal acid is not precipitated by chloride of barium or nitrate of silver. If precipitates are produced, chloride of barium indicates sulphuric acid or a sulphate; nitrate of silver, muriatic acid or a chloride. Strips of copper or silver are not affected by the acid, nor is it coloured by sulphuretted hydrogen. If carbonate of soda causes a precipitate, phosphate of lime, or some other phosphate insoluble in water, is probably held in solution. The presence of one-tenth of phosphorous acid, or of a minute quantity of arsenic acid, renders the medicinal acid poisonous. (*Weigel and Krug.*) Dry phosphoric acid consists of one eq. of phosphorus 32, and five of oxygen 40=72.

Medical Properties and Uses. Diluted phosphoric acid is deemed tonic and refrigerant. It is preferable in point of flavour to the diluted sulphuric acid, and is less apt to disturb the digestive functions. Various properties have been ascribed to it, such as allaying pain and spasm, strengthening the sexual organs, preventing the morbid secretion of bony matter, and correcting phosphatic deposits in the urine. The last two properties are attributed to its power of dissolving phosphate of lime. It has been recommended in hysteria, in diabetes, and in leucorrhœa when the secreted fluid is thin and acrid. In diabetes Dr. Paris found it to allay the thirst more effectually than any other acid drink. The dose is from twenty drops to a teaspoonful, diluted with water. B.

ACIDUM SULPHURICUM AROMATICUM. *U. S., Ed., Dub.*

Aromatic Sulphuric Acid. Elixir of Vitriol.

"Take of Sulphuric Acid *three fluidounces and a half;* Ginger, in coarse powder, *an ounce;* Cinnamon, in coarse powder, *an ounce and a half;* Alcohol *a sufficient quantity.* Add the Acid gradually to a pint of the Alcohol, and allow the liquor to cool. Mix the Ginger and Cinnamon, and, having put them into a percolator, pour Alcohol gradually upon them until a pint of filtered liquor is obtained. Lastly, mix the diluted acid and the tincture." *U. S.*

"Take of Sulphuric Acid (commercial) *three fluidounces and a half;* Rectified Spirit *a pint and a half* [Imp. meas.]; Cinnamon, in moderately fine powder, *an ounce and a half;* Ginger, in moderately fine powder, *an ounce.* Add the acid gradually to the spirit, let the mixture digest at a very gentle heat for three days in a closed vessel; mix the powders, moisten them with a little of the acid spirit, let the mass rest for twelve hours, and then put it into a percolator and transmit the rest of the acid spirit. This preparation may also be made by digesting the powders for six days in the acid spirit, and then straining the liquor." *Ed.*

The *Dublin* process is substantially the same as the second process of the Edinburgh Pharmacopœia, and therefore need not be copied.

Properties. Aromatic sulphuric acid is a reddish-brown liquid, of a peculiar aromatic odour, and, when sufficiently diluted, of a grateful acid taste. It has been supposed by some to be a kind of ether, its main ingredients justifying such a suspicion; but the late Dr. Duncan, who originally held this opinion, satisfied himself that the alcohol and sulphuric acid, in the proportions here employed, do not produce a single particle of ether. It must, therefore, be viewed merely as sulphuric acid diluted with alcohol, and containing the essential oils of ginger and cinnamon.

Medical Properties and Uses. This valuable preparation, commonly called *elixir of vitriol*, is a simplification of *Mynsicht's acid elixir.* It is tonic and astringent, and affords the most agreeable mode of administering sulphuric acid. It is very much employed in debility with night sweats, in loss of appetite, and in the convalescence from fevers, especially those of the intermittent type. It is often given in conjunction with cinchona, the taste of which it serves to cover, and, by promoting the solubility of the febrifuge principles of the bark, appears to increase its efficacy. (See *Infusum Cinchonæ Compositum.*) In hæmoptysis and other hemorrhages, when not attended with obvious inflammation, it frequently proves useful in stopping the flow of blood. The dose is from ten to thirty drops in a wineglassful of water, repeated two or three times a day. Care must be taken that the teeth are not injured by the acid.

Off. Prep. Infusum Cinchonæ Compositum. B.

ACIDUM SULPHURICUM DILUTUM. *U. S., Lond., Ed., Dub.*

Diluted Sulphuric Acid.

"Take of Sulphuric Acid *a fluidounce;* Distilled Water *thirteen fluidounces.* Add the Acid gradually to the Water, in a glass vessel, and mix them. The

specific gravity of this acid is 1·09; and 100 grains of it saturate 25 grains of crystallized bicarbonate of potassa." *U. S.*

"Take of Sulphuric Acid *fifteen fluidrachms* [Imp. meas.]; Distilled Water *a pint* [Imp. meas.]. Add the Acid gradually to half a pint of the Water; then pour in sufficient of the remaining Water to fill accurately the measure of a pint, and mix. The sp. gr. is 1·103; and a fluidounce [Imp. meas.] of the Acid is saturated by 216 grains of crystallized carbonate of soda." *Lond.*

"Mix together *one fluidounce* of Sulphuric Acid and *thirteen fluidounces* of Water. The density of this preparation is about 1·090." *Ed.*

"Take of Pure Sulphuric Acid *one fluidounce;* Distilled Water *thirteen* [*fluid*]*ounces*. Mix. The specific gravity of this acid is 1.084." *Dub.*

This preparation is sulphuric acid, diluted to such an extent as to make it convenient for prescription. The *U. S.*, *Edinburgh*, and *Dublin* Pharmacopœias agree in making the strong acid to the water as *one* to *thirteen* in volume, equivalent nearly to *one* to *seven* in weight; but unfortunately the formula of the London College gives an acid considerably stronger. The coincident processes afford an acid containing about 13 per cent. of the strong liquid acid; while the London acid contains 15 per cent., and has a specific gravity as high as 1·103. The strong acid is added gradually to the water, to guard against the too sudden production of heat, which might cause the fracture of the vessel. During the dilution, when commercial sulphuric acid is used, the liquid becomes slightly turbid, and in the course of a few days deposits a grayish-white powder, which is sulphate of lead, and from which the diluted acid should be poured off for use. This noxious salt is thus got rid of, but sulphate of potassa, another impurity in the strong acid, still remains in solution. To avoid these impurities, the Dublin College directs the dilution of *pure* sulphuric acid. The presence of a small portion of sulphate of potassa will do no harm; but if it should be fraudulently introduced into the strong acid to increase its specific gravity, its amount may be ascertained by saturating the acid, after dilution, with ammonia, and expelling by a red heat the sulphate of ammonia formed. Whatever sulphate of potassa is present will remain behind.

Medical Properties and Uses. Diluted sulphuric acid is tonic, refrigerant, and astringent. It is given in low typhoid fevers, and often with advantage. In the convalescence from protracted fevers, it often acts beneficially as a tonic, exciting the appetite and promoting digestion. As an astringent, it is employed in colliquative sweats, passive hemorrhages, and diarrhœas dependent on a relaxed state of the mucous membrane of the intestines. In calculous affections attended with phosphatic sediments, it is the proper remedy, being preferable to muriatic acid, as less apt, by continued use, to disorder the stomach. Externally it is used as an ingredient in gargles for ulcerated sorethroat and for checking excessive ptyalism, and as a wash for cutaneous eruptions and ill-conditioned ulcers. The dose is from ten to thirty drops three times a day, in a wineglassful of plain or sweetened water. It is added with advantage to infusions of cinchona, the organic alkalies of which it tends to hold in solution. As it is apt to injure the teeth, it is best taken by sucking it through a quill. It is much less used in the United States than the elixir of vitriol, which possesses nearly the same medical properties. An elegant form for giving it is the compound infusion of roses. (See *Acidum Sulphuricum Aromaticum* and *Infusum Rosæ Compositum.*)

In the summer of 1851, attention was called by Mr. Buxton, of London, to the remarkable efficacy of diluted sulphuric acid in several forms of diarrhœa, especially choleraic diarrhœa. In October, 1853, Dr. H. W. Fuller, of St. George's Hospital, published a paper in the London *Medical Times and Gazette*, in which he strongly recommends it in choleraic diarrhœa, from his own expe-

rience and that of his friends, in more than ninety cases, without a single failure. The dose employed is half a fluidrachm, diluted with water, given every twenty minutes in ordinary cases; every quarter of an hour in severe cases. The vomiting, purging, and cramps usually cease after the third or fourth dose. For bilious diarrhœa the acid is not a suitable remedy.

Pharm. Uses. Diluted sulphuric acid is used as a chemical agent to prepare Acidum Citricum; Acidum Tartaricum; Aconitia; Antimonii Sulphuretum Præcipitatum; Strychnia.

Off. Prep. Atropiæ Sulphas; Infusum Rosæ Compositum; Morphiæ Sulphas; Potassæ Sulphas; Quinæ Sulphas; Zinci Sulphas. B.

ACIDUM SULPHURICUM PURUM. *Ed., Dub. Pure Sulphuric Acid.*

"If Commercial Sulphuric Acid contain nitrous acid, heat *eight fluidounces* of it with between *ten and fifteen grains* of sugar, at a temperature not quite sufficient to boil the acid, till the dark colour at first produced shall have nearly or altogether disappeared. This process removes nitrous acid. Other impurities may be removed by distillation, which on the small scale is easily managed by boiling the acid, with a few platinum chips, in a glass retort by means of a sand-bath or gas flame, rejecting the first half ounce." *Ed.*

"Take of Oil of Vitriol of Commerce *any convenient quantity.* Introduce it into a small plain retort, containing a few slips of platinum foil, and, passing the beak of the retort into a Florence flask which is to be used as a receiver, with the aid of a small charcoal fire or gas-lamp, distil over one-tenth of the acid. This being rejected, and a fresh receiver of the same kind connected with the retort, let the distillation be resumed, and continued until no more than about an ounce of liquid remains behind. The distilled product should now be transferred to and preserved in a well-stopped bottle. The sp. gr. of this Acid is 1·846." *Dub.*

The object of these processes is the purification of commercial sulphuric acid. This acid contains the sulphates of lead and potassa, amounting not unfrequently to three or four per cent.; and nitrous acid is almost always present. The salts mentioned, not being volatile, are effectually got rid of by distillation, as directed in the formula. The manner of conducting the distillation is explained at *page* 49, under the head of *Acidum Sulphuricum.* The mode of detecting nitrous acid is pointed out at *page* 48. If present in the commercial acid, the Edinburgh College directs, before distilling it, that it should be heated with a small proportion of sugar, according to the plan of Wackenroder. The acid impurity and sugar mutually decompose each other, and the products are dissipated by the heat. The acid is at first rendered dark and opaque, but gradually becomes pale-yellow, if kept for two hours near the boiling point. Nitrous acid is hurtful to the sulphuric, when the latter is used to obtain muriatic acid, which consequently becomes contaminated with chlorine. Hence the Edinburgh College uses *pure* sulphuric acid in the formula for preparing muriatic acid. If the commercial sulphuric acid contain arsenic, it should not be distilled, but rejected. The tests for this impurity are given at *page* 49.

The following tests are given by the Ed. College for pure sulphuric acid. "Density 1·845: colourless: dilution causes no muddiness: solution of sulphate of iron shows no reddening at the line of contact, when poured over it." The negative indication of the last mentioned test shows the absence of nitrous acid.

It is, perhaps, an advantage to have an officinal *pure* sulphuric acid, to be employed in making the preparations containing this acid; in order to avoid the danger of introducing lead into the system, through the use of the commercial acid. It is true that the commercial acid, upon dilution, lets fall the sulphate of

lead; but can we be certain that the precipitate is always removed from the preparations into which the acid enters? When the acid is required as a mere chemical agent, or for forming sulphates, the commercial acid is sufficiently pure.

There is a want of precision in the nomenclature of the officinal sulphuric acids in the Edinburgh Pharmacopœia. The College adopts the names "Acidum Sulphuricum" and "Acidum Sulphuricum Purum," and translates them in three ways in the formulas—"commercial sulphuric acid," "pure sulphuric acid," and "sulphuric acid." The last name is ambiguous, and may mean either the commercial or pure acid; but we shall assume that it is intended to designate the commercial acid.

According to the views here taken, pure sulphuric acid should be used especially in forming "diluted sulphuric acid" and "aromatic sulphuric acid." Nevertheless in neither of these preparations is it employed by the Edinburgh College. Where a dilute acid is required as a chemical agent, and not as a medicine, it might be directed, in the formula, to be formed by the addition of a determinate quantity of water to the commercial acid. While the Edinburgh College has omitted to order "pure sulphuric acid" in making preparations into which the acid enters as an ingredient, it has, with needless refinement, directed it for preparing *Acidum Aceticum* and *Acidum Muriaticum Purum;* though in these preparations it acts merely as a chemical agent.

Off. Prep. Acidum Sulphuricum Aromaticum; Acidum Sulphuricum Dilutum; Potassæ Bisulphas. B.

ACIDUM TANNICUM. *U. S., Lond., Dub. Tannic Acid.*

"Take of Galls, in powder, Ether, each, *a sufficient quantity.* Put into a glass adapter, loosely closed at its lower end with carded cotton, sufficient powdered Galls to fill about one-half of it, and press the powder slightly. Then fit the adapter accurately to the mouth of a receiving vessel, fill it with Ether previously washed with water, and close the upper orifice so as to prevent the escape of the Ether by evaporation. The liquid which passes separates into two unequal portions, of which the lower is much smaller in quantity and much denser than the upper. When the ether ceases to pass, pour fresh portions upon the Galls, until the lower stratum of liquid in the receiver no longer increases. Then separate this from the upper, put it into a capsule, and evaporate with a moderate heat to dryness. Lastly, rub what remains into powder.

"The upper portion of liquid will yield by distillation a quantity of ether, which, when washed with water, may be employed in a subsequent operation." *U. S.*

The *London College* places Tannic Acid in the catalogue of the Materia Medica, prescribing that it shall be prepared from galls. The process of the *Dublin College* is the same as that of the U. S. Pharmacopœia. In relation to the washing of the ether, it gives the more precise direction to incorporate the ether and water by agitation in the proportion of 12 parts, by measure, of the former to 1 of the latter.

The *U. S.* process is that of M. Pelouze. It may be conducted in an ordinary percolator. The ether employed should be that of the shops, containing a small proportion of water, which has been considered necessary to the success of the operation. It has therefore been advised, should the ether contain no water, to wash it with that fluid, which answers the double purpose of depriving it of alcohol and rendering it sufficiently hydrous. To obtain the tannic acid quite pure, the lower stratum may be washed with ether after the separation of the upper, and evaporated in a vacuum with sulphuric acid. The explanation first given of the process was that the water in the ether dissolves the tannic acid, to the exclusion of all the other principles of the galls, and forms a saturated solu-

tion, which separates from the ether, and constitutes the lower stratum in the receiver. But it has been satisfactorily proved that ether as well as water is present in the solution; and the idea was advanced by M. Beral that the tannic acid, ether, and water form a definite compound, which is essentially liquid, and is decomposed during the evaporation; the two fluids escaping, and the solid tannic acid being left behind. M. E. Robiquet considers the liquid not as a definite compound of these ingredients, but simply as a "juxtaposition of water, tannic acid, and ether" in various proportions; founding his belief upon the fact that, at 22° F. the liquid separates into two layers, of which one is ether and the other a watery solution of tannin, while at about 130° F. it is resolved into dry tannin and common sulphuric ether. The upper and larger stratum in the receiver consists of ether, holding colouring matter with a small proportion of gallic and tannic acids in solution. From 30 to 35 per cent. of tannic acid may be obtained from galls by this process, if properly conducted.

According to Sandrock, the presence of water in the ether is unnecessary; and crude ether acts better than the pure, in consequence of the small proportion of alcohol contained in it. If pure ether mixed with one-sixteenth of alcohol be employed as the menstruum, equally satisfactory results are obtained. The alcohol is supposed to operate by rendering the solution of tannin in ether less viscid, and thereby facilitating its percolation. (See *Am. Journ. of Pharm.*, xxv. 446.) Professor Procter informs us that his experience corresponds with that of Sandrock, but that the product is apt to contain a little of the brown colouring matter.

For practical purposes it is unnecessary to obtain the tannic acid quite pure. It is probably sufficiently so when extracted by the following simple process of Leconnet, given in Christison's Dispensatory. The powder of galls is macerated in a bottle, with just enough ether to moisten it, for twenty-four hours, and then expressed in a powerful press; and the process of maceration and expression is repeated, in the same way, until the powder is exhausted. The liquors are mixed, the ether distilled off, and the residue dried by means of a vapour bath. It is stated that 60 per cent. of tannic acid, but very slightly coloured, may be got in this way. As gallic acid exists but in small proportion in galls, being chiefly produced by the reaction of atmospheric air upon tannic acid in the process for extracting it, very little of that principle is found in the ethereal extract, and the amount of colouring matter taken up by the ether, will scarcely interfere with the medicinal efficacy of the preparation.

The term *tannin* was originally applied to a principle or principles existing in many vegetables, having a very astringent taste, and the property of producing a white flocculent precipitate with the solution of gelatin, and a black precipitate with the salts of the sesquioxide of iron. As obtained, however, from different plants, it was found to exhibit some difference of properties; and chemists have recognised two kinds, one existing in oak bark, galls, &c., distinguished by producing a bluish-black precipitate with the salts of the sesquioxide of iron, and the other existing in Peruvian bark, catechu, &c., and characterized by producing a greenish-black or dark-olive precipitate with the same salts. The former is the one which has received most attention, and from an examination of which the characters of tannin have generally been given. It is the substance described in this article. It will probably be found that the latter is essentially distinct from the tannin of galls, and probably different in different vegetables. One striking peculiarity of the tannin of galls is its facility of conversion into gallic acid, which is wanting in some at least of the other varieties. Since the publication of the experiments of M. Pelouze in relation to tannin, this substance has been universally admitted to rank with the acids, and is now, therefore, denominated *tannic acid.* The ordinary variety procured from galls is called, for

the sake of distinction, by some *gallo-tannic acid*, and by others *querci-tannic acid*.

Properties. Pure tannic acid is solid, uncrystallizable, white or slightly yellowish, inodorous, strongly astringent to the taste without bitterness, very soluble in water, much less soluble in alcohol and ether, especially when anhydrous, and insoluble in the fixed and volatile oils. It may be kept unchanged in the solid state; but its aqueous solution, when exposed to the air, gradually becomes turbid, and deposits a crystalline matter, consisting chiefly of gallic acid. During the change, oxygen is absorbed, and an equal volume of carbonic acid disengaged. But, according to M. E. Robiquet, this change does not always take place, and, when it does happen, is ascribable to the presence of pectase in the tannin. (See *Acidum Gallicum*, page 804.) If the solution of tannic acid be boiled for a long time, the pectase loses its property of acting as a ferment, and the solution may be kept indefinitely without change. (*Journ. de Pharm.*, April, 1853, p. 246.) Exposed to heat tannic acid partly melts, swells up, blackens, takes fire, and burns with a brilliant flame. Thrown on red-hot iron it is entirely dissipated. Its solution reddens litmus, and it combines with most of the salifiable bases. With potassa it forms a compound but slightly soluble, and is, therefore, precipitated by this alkali or its carbonates from a solution which is not too dilute, though a certain excess of alkali will cause the precipitate to be redissolved. Its combination with soda is much more soluble; and this alkali affords no precipitate, unless with a very concentrated solution of tannic acid. With ammonia its relations are similar to those with potassa. Baryta, strontia, lime, and magnesia, added in the state of hydrates, form with it compounds of little solubility. The same is the case with most of the metallic oxides, when presented, in the state of salts, to a solution of the tannate of potassa. Many of the metallic salts are precipitated by tannic acid even in the uncombined state, especially those of lead, copper, silver, uranium, chromium, mercury, teroxide of antimony, and protoxide of tin. With the salts of sesquioxide of iron it forms a black precipitate, which is a compound of tannic acid and the sesquioxide, and is the basis of ink. It does not disturb the solutions of the pure salts of protoxide of iron. Several of the alkaline salts precipitate it from its aqueous solution, either by the formation of insoluble compounds, or by simply abstracting the solvent. Tannic acid unites with all the vegetable organic alkalies, forming compounds which are for the most part of a whitish colour, and but very slightly soluble in water; though they are soluble in the vegetable acids, especially the acetic, and in alcohol, and in this latter respect differ from most of the compounds which tannic acid forms with other vegetable principles. On account of this property of tannic acid, it has been employed as a test of the vegetable alkalies; and it is so delicate, that it will throw down a precipitate from their solution, even when too feeble to be disturbed by ammonia. It has an affinity for several acids, and when in solution affords precipitates with the sulphuric, nitric, muriatic, phosphoric, and arsenic acids, but not with the oxalic, tartaric, lactic, acetic, or citric. The precipitates are compounds of tannic acid with the respective acids mentioned, and are soluble in pure water, but insoluble in water with an excess of acid. Hence, in order to insure precipitation, it is necessary to add the acid in excess to the solution of tannic acid. It precipitates also solutions of starch, albumen, and gluten, and forms with gelatin an insoluble compound, which is the basis of leather. Its ultimate constituents are carbon, hydrogen, and oxygen; and its formula, according to Liebig, is $C_{18}H_8O_{12}$ or $C_{18}H_5O_9+3HO$. Mulder, however, from recent investigations, considers it isomeric with gallic acid, and gives its formula $C_{28}H_9O_{17}+HO$. Strecker looks upon it as a compound of gallic acid and sugar, the latter of which is destroyed in the spontaneous change which moistened galls undergo by time. (See *Acidum Gallicum*, page 804.)

Medical Properties and Uses. Tannic acid, being the chief principle of vegetable astringents, is capable of exerting on the system the same effects with this class of medicines, and may be given in the same complaints. It has an advantage over the astringent extracts in the comparative smallness of its dose, which renders it less apt to offend an irritable stomach. In most of the vegetable astringents, it is associated with more or less bitter extractive, or other principle which modifies its operation, and renders the medicine less applicable than it otherwise would be to certain cases, in which there is an indication for pure astringency without any tonic power. Such is particularly the case in the active hemorrhages; and tannic acid, in its separate state, is in these cases preferable to the native combinations in which it ordinarily exists. Dr. Porta, an Italian physician, employed it with great success in the treatment of uterine hemorrhage, and published the results of his experience in 1827. M. Cavalier afterwards used it successfully in the same complaint, and found it effectual also in a case of bleeding from the rectum. It is, without doubt, a useful remedy in most forms of hemorrhage, after a sufficient reduction of arterial action by depletory measures. In diarrhœa it is probably more beneficial than ordinary astringents, as less liable to irritate the stomach and bowels. It has been found beneficial in colliquative sweats, in cases of chronic catarrh with excessive and debilitating expectoration, in the advanced stages of hooping-cough, and in cystirrhœa. The dose for ordinary purposes is from two to five grains, but in urgent cases it may be increased to ten grains. The only disadvantage which has been experienced from it, when taken in excess, is obstinate constipation. Locally, it may be used for all the purposes to which galls or other vegetable astringents are applicable; as for hemorrhages, relaxation of the uvula and chronic inflammation of the fauces, toothache, aphthæ, excessive salivation, leucorrhœa, gleet, gonorrhœa, flabby and phagedenic ulcers, piles, &c. As a wash it may be used in solution, in the proportion of five grains to a fluidounce of water. (*Am. Journ. of Med. Sci., N. S.*, ix. 192.) A Belgian surgeon, M. Hairion, recommends a strong solution, made in the proportion of one part of tannic acid to three of distilled water, as an application in various ophthalmic affections; as acute and chronic inflammation, ulcers and specks on the cornea, swelling of the conjunctiva, &c. (*Journ. de Pharm. et de Chim.*, xviii. 449.) An ointment may be made from it by rubbing two scruples first with twenty minims of water into a paste, and then with an ounce of lard. Given largely to a dog, it caused the urine to become dark-brown and opaque; and this secretion gave evidences of the presence of gallic and pyrogallic acids. (*Chem. Gaz.*, No. 136, p. 231.) W.

ACONITIA. *U. S.*

Aconitia.

"Take of Aconite Root, bruised, *two pounds;* Alcohol *three gallons;* Diluted Sulphuric Acid, Solution of Ammonia, Purified Animal Charcoal, each, *a sufficient quantity.* Boil the Aconite Root with a gallon of the alcohol, in a distillatory apparatus, for an hour. Pour off the liquor, and boil the root in the same manner, and for the same length of time, with another gallon of the Alcohol and the portion distilled. Again pour off the liquor, boil as before with the remaining gallon of the Alcohol and the portion distilled, and decant. Submit the residue to expression, mix all the liquors, distil off the alcohol, and evaporate, by means of a water-bath, to the consistence of an extract. Treat this with distilled water, filter the resulting solution, and evaporate with a gentle heat to the consistence of syrup. To the residue add as much Diluted Sulphuric Acid, mixed with distilled water, as may be sufficient to dissolve the

Aconitia. Precipitate this with Solution of Ammonia, and dissolve the precipitate in Diluted Sulphuric Acid mixed with distilled water as before. Mix the Animal Charcoal with the solution, shake the mixture frequently for fifteen minutes, filter, again precipitate the Aconitia with Solution of Ammonia, and, lastly, wash it with water, and dry it." *U. S.*

Aconitia probably exists in the plant combined with a vegetable acid, forming a soluble salt. In the above process, this is first extracted by alcohol, then taken up from the alcoholic extract by water, and afterwards converted into a sulphate by the addition of dilute sulphuric acid. The sulphate is decomposed by ammonia, which precipitates the aconitia, and this is purified by being once more combined with sulphuric acid, then decolorized by animal charcoal, and again precipitated by ammonia. Care is requisite, in conducting the process, not to add too great an excess of the solution of ammonia, which diminishes the product probably by dissolving the aconitia.*

Properties. Aconitia, when freshly precipitated, is said to be white and in the form of a hydrate; but it speedily parts with its water, and forms a brownish, brittle mass. (Soubeiran, *Trait. de Pharm.*, ii. 716.) It is thought not to be crystallizable. Obtained by evaporating its alcoholic solution, it is described as being in the form of a transparent, colourless mass, having a glassy lustre. In

* The following process, recommended by Mr. F. W. Headland, of London, as being the most satisfactory and the most productive, of those tried by himself, is given in the second edition of *Royle's Manual of Materia Medica*, p. 288. "Take of the root of *Aconitum ferox*, coarsely bruised, two pounds, of *rectified spirit* three gallons. Boil the Aconite with a gallon of the spirit for an hour, in a retort with a receiver adapted to it. Pour off the spirit. Boil the residue with another gallon, and with that which distilled over. Pour off again, and do the same a third time. Press the root, and mix the solutions. Filter. Distil off the spirit from the tincture thus obtained until this is of the consistence of thin syrup. Then pour it out of the retort, and mix with twice its bulk of *distilled water*, and excess of *sulphuric acid*. Filter carefully from the precipitate produced, until it is quite clear. Then again evaporate gently in a water-bath to the consistence of syrup. Pour this syrupy liquid, which should not exceed two fluidounces, into a stoppered bottle, of which it shall occupy about one-third. Add then an excess of *strong solution of ammonia*, and shake gently. To the white mass produced add an equal bulk of pure *ether*. Insert the stopper tightly, and, holding the bottle in a damp cloth, with a finger on the stopper, shake briskly for a few minutes. Allow then a sufficient time for the ether to rise above the water, and, when it has completely separated, remove the stopper, and take up carefully the ethereal solution from the surface of the water with a pipette or common glass syringe. Pour it into an open basin. Again shake up the watery solution with another equal bulk of *ether*, and remove this in the same manner. Do the same a third time. Let the ethereal solution evaporate spontaneously. The Aconitia is deposited.

"This process is quick and certain. It is not difficult; but great care should be taken throughout, on account of the very dangerous nature of the product.

"The *Aconitia* thus prepared is transparent and vitreous in appearance, and of a very light yellow colour, like good gum Arabic. With the exception of this tinge of colouring matter it is quite pure. If required white, it may be again dissolved in a small quantity of acid and water, precipitated by ammonia, and extracted by ether as before. But some of it will be lost by so doing, and there will be no increase in the medicinal virtue of the product."

According to Mr. Headland, the process of the former London Pharmacopœia, which is the one adopted in the U. S. Pharmacopœia, and given in the text, has generally if not invariably proved unsuccessful, even in skilful hands. The defects of this process are mainly the employment of so large an amount of water, the repeated solutions, and the use of animal charcoal, which has the property of absorbing the alkaloids.

The root of *Aconitum ferox*, from the E. Indies, is preferred in consequence of its greater yield. A specimen of this, which we have had the opportunity of examining, was in single roots, fusiform, from two and a half to three and a half inches long, from half an inch to an inch and a half thick at the thickest part near the top, gradually tapering to a point, unequally wrinkled from drying, of a dark-brown colour externally, yellowish internally, hard, with a shining wax-like fracture, and the characteristic taste of the aconites in a high degree.—*Note to the tenth edition.*

powder, it is white when quite pure. It is inodorous, and of a bitter and acrid taste, producing a benumbing impression on the tongue. The acrimony, however, is ascribed by some to a distinct principle associated with it, from which it may be freed by repeated solution in dilute acids and subsequent precipitation. It is unalterable in the air, and fusible by a gentle heat. At a high temperature it is decomposed, with the escape of ammonia, and by a continuance of the heat is entirely dissipated. It is sparingly soluble in water, requiring for solution 150 parts of cold and 50 of boiling water. (*Phillips.*) Alcohol and ether dissolve it readily. It neutralizes the acids; but its salts are not crystallizable. Their solution produces a white precipitate with bichloride of platinum, a yellowish with terchloride of gold, and a yellowish-brown with free iodine. That it contains nitrogen is proved by the evolution of ammonia, when it is decomposed by heat. Dr. A. von Planta gives as its formula $NC_{60}H_{47}O_{14}$. (See *Am. Journ. of Pharm.*, xxiii. 40, from *Liebig's Annalen.*) A spurious substance has sometimes been sold under the same name, which is nearly or quite inert; and at best the alkaloid is apt to be of uncertain strength, as found in the shops.

Medical Properties and Uses. This vegetable principle exercises a powerful influence over the animal economy. One-fiftieth of a grain dissolved in alcohol destroyed a sparrow in a few minutes; and the same quantity administered to an elderly female is said to have nearly proved fatal. In a case of poisoning by aconitia, recorded by Dr. Golding Bird, though two grains and a half were taken, the patient ultimately recovered. But, as vomiting almost immediately ensued, there is reason to believe that much of the poison was thus discharged from the stomach. Besides extreme general prostration, indicated by a cold pale surface, and a scarcely perceptible action of the heart, the prominent symptoms were convulsive vomiting, recurring every minute or two, and fearful spasms of the throat, resembling those of hydrophobia, upon any attempt at swallowing. There was no paralysis, the pupils were sensible to light, and the intellect remained perfectly clear. The remedies were the hot bath, mustard to the epigastrium, and enemata of oil of turpentine, laudanum, and nutriment. (*Lond. Med. Gaz.*, Jan. 1847.) Aconitia is not used internally as a remedy; but Dr. Turnbull has advantageously resorted to its external application. According to this writer, it produces in the skin a sensation of heat and prickling, followed by numbness and a feeling of constriction; and the effect continues, according to the quantity applied, from two to twelve hours or more. He found it not to act as a rubefacient, or at least but slightly so. Applied very much diluted and in minute quantity to the eye, it causes contraction of the pupil, with an almost intolerable sense of heat and tingling. The affections in which Dr. Turnbull employed it with benefit, were neuralgia, gout, and rheumatism. He recommends it either in alcoholic solution, in the proportion of a grain to a fluidrachm, or in the form of an ointment, made by rubbing up two grains of the alkali first with six drops of alcohol, and then with a drachm of lard. These proportions are sufficiently large to begin with, but may be gradually increased to four or five, or even eight grains to the drachm. The preparation should be applied by friction over the part affected, which should be continued till the peculiar sensation above described is produced, and may be repeated three or four times, or more frequently, during the day. No good can be expected unless the sensation alluded to be experienced in a greater or less degree. Care should be taken not to apply the medicine to an abraded surface, or to a mucous membrane, for fear of dangerous constitutional effects. It is very seldom used, and all its beneficial effects can be obtained from safer and cheaper preparations of aconite. W.

ÆTHEREA.

Ethers.

Ethers are peculiar, fragrant, sweetish, very volatile, and inflammable substances, generated for the most part by the action of acids on alcohol. Their composition varies with the acid employed in their formation. Sometimes this merely acts as a chemical agent on the alcohol, without entering into the composition of the ether generated; in which case the ether consists of etherine and water. In other instances the acid employed unites with etherine and water (the ether just mentioned), or with etherine only. On the basis of these differences of composition, the medicinal ethers may be divided into three kinds: 1. those consisting of etherine and water; 2. those consisting of an acid, etherine, and water; and 3. those composed of an acid and etherine only. Hydric ether is the only known ether of the first kind, hyponitrous ether is an example of the second, and muriatic ether of the third. In medicine, the hydric and hyponitrous ethers, and their modifications, are those most commonly employed; though occasionally the acetic and muriatic have been used.

Ethers, from their extreme inflammability, should never be decanted in the vicinity of flame. Hence it is prudent not to pour them out near a lighted candle. They should be kept in accurately stopped bottles in a cool place; otherwise they are liable to considerable loss by evaporation. B.

ÆTHER. *U. S.*, *Lond.* ÆTHER SULPHURICUS. *Ed.*, *Dub.* *Ether.* *Sulphuric Ether.* *Hydric Ether.*

"Take of Alcohol *four pints;* Sulphuric Acid *a pint;* Potassa *six drachms;* Distilled Water *three fluidounces.* To two pints of the Alcohol, in an open vessel, add gradually fourteen fluidounces of the Acid, stirring them frequently. Pour the mixture, while still hot, into a tubulated glass retort, placed upon a sand-bath, and connected by a long adapter with a receiver kept cold by ice or water; then raise the heat quickly until the liquid begins to boil. When about half a pint of ethereal liquid has passed over, introduce gradually into the retort the remainder of the alcohol, previously mixed with two fluidounces of the Acid, taking care that the mixture shall enter in a continuous stream, and in such quantity as shall supply the place, as nearly as possible, of the liquid which distils over. This may be accomplished by connecting a vessel containing the alcoholic liquid with the retort, by means of a tube provided with a stop-cock to regulate the discharge, and passing nearly to the bottom of the retort, through a cork accurately fitted into the tubulure. When all the Alcohol has been thus added, continue the distillation until about three pints have passed over, or until white vapours appear in the retort. To the product thus obtained add the potassa previously dissolved in the distilled Water, and shake them frequently. At the end of twenty-four hours, pour off from the alkaline solution the supernatant ether, introduce it into a retort, and, with a gentle heat, distil until two pints have passed over, or until the distilled liquid has the specific gravity 0·750." *U. S.*

"Take of Rectified Spirit *fifty fluidounces;* Sulphuric Acid *ten fluidounces.* Pour twelve fluidounces of the Spirit gently over the Acid contained in an open vessel, and then stir them together briskly and thoroughly. Transfer the mixture immediately into a glass matrass connected with a refrigeratory, and raise the heat quickly to about 280°. As soon as the ethereal fluid begins to distil over, supply fresh spirit through a tube into the matrass in a continuous stream, and in such quantity as to equal that of the fluid which distils over. This is best accomplished by connecting one end of the tube with a graduated vessel

containing the spirit,—passing the other end through a cork fitted into the matrass,—and having a stop-cock on the tube to regulate the discharge. When forty-two [fluid]ounces have distilled over, and the whole spirit has been added, the process may be stopped. Agitate the impure ether with sixteen fluidounces of a saturated solution of muriate of lime, containing about half an ounce of lime recently slaked. When all odour of sulphurous acid has been thus removed, pour off the supernatant liquor, and distil it with a gentle heat so long as the liquid which passes over has a density not above 0·735. More ether of the same strength is then to be obtained from the solution of muriate of lime. From the residuum of both distillations a weaker ether may be obtained in small quantity, which must be rectified by distilling it gently again." *Ed.*

"Take of Rectified Spirit *three pints* [Imp. meas.]; Oil of Vitriol of Commerce *eight fluidounces* [Imp. meas.]; Fresh burned Lime, in fine powder, *one ounce* [avoirdupois]. Mix the Acid in ten ounces of the Spirit in a glass matrass, capable of holding a quart at least, and, without allowing the mixture to cool, connect the matrass with a Liebig's condenser, and, applying a sufficient heat to maintain the liquid in brisk ebullition, commence the distillation. As it proceeds, admit gradually, through a glass tube traversing the cork of the matrass, the remainder of the spirit, regulating its influx so that the boiling liquid shall maintain a constant level; and, when the entire of it has been introduced, continue the application of the heat until the contents of the matrass become black, and show a tendency to froth over. (The tube through which the Spirit enters should dip by its lower extremity, where its diameter is contracted, at least half an inch beneath the surface of the liquid in the matrass; and the eduction pipe of the reservoir for the Spirit, with which the exterior extremity of the glass tube is connected, should be furnished with a stop-cock, to regulate the descent of the Spirit. This reservoir also should be placed at least three feet above the level of the boiling liquid.) The crude Ether thus obtained is to be agitated with the pulverized quicklime, and then rectified; the distillation being continued as long as the product, on being well shaken, continues to have a specific gravity lower than 0·750. The resulting liquid should be preserved in a cool place in accurately stopped bottles. A fresh receiver being attached to the further end of the condenser, and the distillation resumed, a product will be obtained which may be substituted for Rectified Spirit in a subsequent ether process." *Dub.*

In the last sentence of the above process, a misprint occurs in the Dublin Pharmacopœia of the word "reservoir" for receiver, which we have corrected.

The *London College*, in its Pharmacopœia of 1851, has transferred ether to the list of the Materia Medica, giving the following explanatory note and tests. "Ether prepared from alcohol by the action of sulphuric acid. It is free from colour, and its sp. gr. does not exceed 0·750. It wholly evaporates in the air, and reddens litmus slightly or not at all. A fluidounce requires for its complete solution ten fluidounces of water with which it quickly unites."

The preparation of ether embraces two stages; its generation, and its subsequent rectification to remove impurities. The formulas all agree in obtaining it by the action of sulphuric acid on alcohol. In the United States process, which is adopted, with modifications, from that of the French Codex, half the alcohol taken is mixed with seven-eighths of the acid, and, while still hot from the reaction, distilled from a glass retort, by a heat quickly applied, into a refrigerated receiver. When the distilled product equals one-fourth of this portion of the alcohol, the remainder of it, mixed with the reserved eighth of the acid, is allowed to enter the retort in a continuous stream, the supply being so regulated as to equal the amount of the liquid which distils over. By a complicated reaction which will be explained presently, the acid converts the alcohol into ether, and, were it not that the acid becomes more and more dilute as the process pro-

ceeds, it would be able to etherize an unlimited quantity of alcohol. Although the acid, before it becomes too dilute, is capable of determining the decomposition of a certain amount of alcohol, yet it is not expedient to add this amount at once; as a considerable portion of it would distil over undecomposed with the ether. The proper way of proceeding, therefore, is that indicated in the formula; namely, to commence the process with the use of part of the alcohol; and, when the decomposition is fully established, and a portion of ether has distilled, to add the remainder in a gradual manner, so as to replace that which, every moment during the progress of the distillation, is disappearing by its conversion into ether. As, however, the acid in the retort has already become somewhat weaker, it is considered advantageous to mix a small portion of acid with the alcohol which is thus gradually added. When a portion of ether has distilled, equal to about three-fourths of the alcohol employed, or when white vapours appear in the retort, the process is discontinued. These vapours indicate the commencement of a series of reactions different from those which generate the ether.

The *Edinburgh* and *Dublin* processes for the generation of ether are, in their general features, the same with that of the U. S. Pharmacopœia. In the Edinburgh process less than a fourth of the alcohol is placed in the distilling vessel, previously mixed with the *whole* of the acid, which forms one-fifth of the bulk of the alcohol, instead of one-fourth as in the U. S. formula. As soon as the ether begins to distil by a quick heat, the remainder of the alcohol is added in a continuous stream as in the U. S. process; and the distillation is continued until a quantity of ether has come over, equal to somewhat less than six-sevenths of the bulk of all the alcohol. The ether is conveniently condensed by means of Liebig's excellent refrigeratory, described and figured at *page* 793.

The appearance of white vapours in the retort, or the passing over of a heavier portion in the distillation, is the signal for discontinuing the process. If it were continued afterwards, the boiling point would gradually rise, very little ether would be obtained, and at the temperature of 320° there would be generated, in consequence of new reactions, sulphurous acid, heavy oil of wine, olefiant gas, and a large quantity of resino-carbonaceous matter, blackening and rendering thick the residuary liquid; all products arising from the decomposition of a portion of sulphuric acid, alcohol, and ether. Notwithstanding the process may be stopped in time, yet the ether obtained is contaminated with sulphurous acid, heavy oil of wine, alcohol, and water; and hence its purification becomes necessary. This is conducted in various ways, according to the different Pharmacopœias. The U. S. Pharmacopœia directs for this purpose an aqueous solution of potassa, the Edinburgh a saturated solution of chloride of calcium (muriate of lime), to which a portion of recently slaked lime has been added, and the Dublin fresh burned lime. In all cases, the crude ether is agitated with the purifying agent, and submitted to a new distillation at a gentle heat, called the *rectification.*

The purifying substances are potassa for sulphurous acid and water, and water for alcohol in the U. S. formula; lime for acid, and a saturated solution of chloride of calcium for alcohol and water, in the Edinburgh; and lime alone in the Dublin. The Edinburgh substances for purifying are stated by Dr. Christison to be convenient, and to act perfectly and promptly. The chloride of calcium solution, after having been used, yields, on distillation, a further portion of ether of the officinal density; and by concentrating it, filtering while hot, and separating the crystals of sulphite of lime which form on cooling, the chloride may be recovered for future operations.

The process for forming ether is conducted with most advantage on a large scale. At Apothecaries' Hall, where the operation is performed in this way, the apparatus employed is thus described by Mr. Brande. It "consists of a leaden still, heated by means of high pressure steam carried through it in a con-

torted leaden pipe. A tube enters the upper part of the still, for the purpose of suffering alcohol gradually to run into the acid. The still-head is of pewter, and is connected, by about six feet of tin pipe, with a very capacious condensing apparatus, duly cooled by a current of water. The receivers are of pewter, with glass lids, and have a side tube to connect them with the delivering end of the condensing-pipe." (*Manual of Chemistry*, Ed. 1848.)

Properties. Ether is a colourless very limpid liquid, of a strong and sweet odour, and hot pungent taste. As prepared for medical use, it generally reddens litmus slightly, though this is not a property belonging to the pure substance; but if it reddens litmus strongly, it shows that the ether has been imperfectly prepared or too long kept. When perfectly pure it has the specific gravity 0·713, boils at 95°, and forms a vapour which has the density of 2·586. It is not frozen by a cold of 166° below zero. (Faraday, *Philos. Mag. and Journ. of Sci.* for March, 1845.) The officinal strength of the United States ether is 0·750; of the London, 0·750 or under; of the Edinburgh, 0·735 or under; of the Dublin, under 0·750. That sold in the shops varies from 0·733 to 0·765. Its sp. gr. as directed by the French Codex is 0·758. For medicinal purposes its density should not be greater than 0·750. In the opinion of Dr. Christison, it should not exceed 0·735; because, according to that writer, commercial ether is generally of this density, and may be obtained of such purity without difficulty. It is a very volatile liquid, and, when of the sp. gr. 0·720, boils at about 98°. Its extreme volatility causes it to evaporate speedily in the open air, with the production of a considerable degree of cold. When good it evaporates from the hand without leaving a disagreeable odour. Its inflammability is very great, and the products of its combustion are water and carbonic acid. In consequence of this property the greatest care should be used not to bring it in the vicinity of flame, as, for example, a lighted candle, for fear of its taking fire. One of the great advantages of using steam as the source of heat is that it obviates, in a great measure, the danger of its accidental inflammation. When too long kept it undergoes decomposition, and is converted in part into acetic acid. It dissolves iodine and bromine, and sulphur and phosphorus sparingly. The latter substance is generally exhibited in ethereal solution. (See *Phosphorus.*) Its power to dissolve corrosive sublimate makes it a useful agent in the manipulations for detecting that poison. It is also a solvent of volatile and fixed oils, many resins and balsams, tannic acid, caoutchouc, and most of the organic vegetable alkalies. It does not dissolve potassa and soda, in which respect it differs from alcohol. Water dissolves a tenth of its volume of ether, and reciprocally ether takes up about the same proportion of water. When water dissolves more than a tenth of its volume, the ether is shown to contain an undue quantity of water or alcohol, or both. Ether unites in all proportions with alcohol.

Impurities and Tests. The impurities found in ether, besides acids and fixed substances, are alcohol, water, and heavy oil of wine. Acids are detected by litmus and removed by agitation with potassa; and fixed substances, by their remaining upon the evaporation of the ether. Alcohol is an admissible substance in the officinal ethers; for it is contained in the Edinburgh ether, which has the lowest density of them all. If, however, it is present in too large a quantity, the density of the ether will be too high. It may be separated by *washing* the ether, as it is called; that is, agitating it with twice its bulk of water, which will unite with the alcohol, forming a heavier stratum after rest, from which the ether may be poured off. The ether by this treatment dissolves about a tenth of its bulk of water, from which it may be purified by agitation with fresh burnt lime, and subsequent distillation. An easy method for detecting and measuring any alcohol which may be present in ether, is that given by the Edinburgh College; namely, to agitate it in a minim measure, with half its

volume of a concentrated solution of chloride of calcium. This will remove the alcohol, and the reduction of the volume of the ether, when it rises to the surface, will indicate the amount of the former. Heavy oil of wine may be discovered by the ether becoming milky upon being mixed with water.

Composition, and Theory of its Production. Ether consists of four eqs. of carbon, five of hydrogen, and one of oxygen, and its empirical formula is C_4H_5O. In volumes it consists of four volumes of carbon vapour, five volumes of hydrogen, and half a volume of oxygen, condensed into one volume of ether vapour. Its proximate constituents may be considered to be one eq. of etherine and one of water; or, in volumes, one volume of etherine vapour and one volume of aqueous vapour, condensed into one volume. This view makes it a *hydrate of etherine* (C_4H_4+HO). The sp. gr. of its vapour, calculated on this constitution in volume, is 2·5817, which is very near 2·586, the number obtained by experiment. By the generality of chemists, however, the constituents of the etherine, together with the hydrogen of the alleged water, are supposed to form a peculiar radical, consisting of C_4H_5, to which the name of *ethyle* has been given. On this view, ether is an *oxide of ethyle* (C_4H_5+O). This view of its composition is confirmed by Dr. E. Frankland, who has isolated ethyle by acting on iodide of ethyle with zinc. As described by him, it is a colourless, inflammable gas, of the sp. gr. 2, incondensible at zero, but condensible, under a pressure of 2·25 atmospheres at 37·5° F., into a colourless, mobile liquid. Ether is generally called *sulphuric* ether, in allusion to the *sulphuric* acid usually employed in its preparation; but it contains no sulphuric acid, and an identical ether may be obtained by the action of other substances on alcohol. Hence the epithet sulphuric is improperly applied to it; and, accordingly, its name has been changed from *Æther Sulphuricus* to *Æther* in the U. S. and London Pharmacopœias of 1850 and 1851. In allusion to the water which ether is supposed to contain, it is sometimes called *hydric ether*. *Etherine*, considered as a constituent of ether, is a hypothetical 4-4 carbohydrogen (C_4H_4).

With a view to determine in what manner sulphuric acid acts upon alcohol in order to convert it into ether, it is necessary that a comparison should be instituted between the composition of the two latter. Now alcohol is a hydrated oxide of ethyle, and ether, oxide of ethyle without water. It follows, therefore, that to convert alcohol into ether, it is only necessary to abstract the water of the former. The agent in effecting this abstraction is evidently the sulphuric acid, which is known to have a strong affinity for water; but its action is not direct as originally supposed, but intermediate, as was first pointed out by the late Mr. Hennell. This chemist found that, when two eqs. of sulphuric acid and one of alcohol were merely mixed, the acid lost a portion of its saturating power, and a new acid was formed, to which he gave the name of *sulphovinic acid* (the *etherosulphuric acid* of Liebig). In view of its composition it may be called a bisulphate of alcohol, or, which is the same thing, a bisulphate of ether with one eq. of water, that is, a double sulphate of ether and water. When one eq. of this acid is heated it is decomposed; two eqs. of sulphuric acid with one eq. of water remain in the retort, while one eq. of ether distils over.

If the original proportion of acid and alcohol continued the same throughout the whole of the distillation, all the alcohol would be resolved into ether and water; but, during the progress of the process, the alcohol is constantly diminishing, and of course the relative excess of the acid becoming greater; and at last a point of time arrives when the excess of acid is so great that the generation of ether ceases. As these results depend upon the relative deficiency of the alcohol, while the acid remains but slightly changed in amount, it is easy to understand why it is advantageous to add alcohol gradually to the distilling vessel during the progress of the distillation; for, by this addition, the proper

proportion of the alcohol to the acid is maintained. But the decomposing power of the acid has its limit; as it becomes at last too dilute to act upon the alcohol, notwithstanding a considerable portion of water, towards the close of the distillation, passes over with the ether.

The theory here given of etherification is at present (1851) called in question. Prof. Graham, of London, has succeeded in producing ether without distillation or the formation of sulphovinic acid, using a larger proportion of alcohol than is ordinarily employed. The reaction was made to take place in sealed glass tubes, heated for a short time to a temperature between 284° and 352°. The sulphuric acid appears to act by mere contact with the alcohol, in determining the production of ether, without combining with anything.

Medical Properties and Uses. Ether is a powerful diffusible stimulant, possessed also of expectorant, antispasmodic, and narcotic properties. In low fevers attended with subsultus tendinum, it proves beneficial as a stimulant and antispasmodic. In these cases it is frequently conjoined with laudanum. It is useful also in nervous headache unattended with vascular fulness, and generally in nervous and painful diseases which are unaccompanied by inflammation. In nausea it is given as a cordial; and in cramp of the stomach and flatulent colic, it sometimes acts with singular efficacy. It is also useful, given alone, or mixed with oil of turpentine, in relieving the pain and spasm caused by the passage of biliary calculi. According to Mr. Brande, a small teaspoonful of ether, mixed with a glass of white wine, is often an effectual remedy in sea-sickness. When externally applied it may act either as a stimulant or refrigerant. If its evaporation be repressed, it operates as a powerful rubefacient, and may even vesicate; but, when this is allowed to take place freely, it is refrigerant in consequence of the cold which it produces. In the latter way it is sometimes employed in strangulated hernia, dropped on the tumour and allowed to evaporate. It sometimes produces immediate relief when dropped into the ear in earache. For external use, the unrectified ether may be employed. The dose of sulphuric ether is from fifty drops to a teaspoonful, to be repeated frequently when the full effect of the remedy is desired. When used habitually the dose must be much larger, to produce a given effect. It may be perfectly incorporated with water or any aqueous mixture, by first rubbing it up with spermaceti, employed in the proportion of two grains for each fluidrachm of the ether. (*Durand.*)

Ether is conveniently administered in capsules, each containing four or five drops, according to the plan of M. Clertan, of Dijon. The ether capsules are inodorous, will keep for a year at least without loss, and furnish the means of introducing ether into the stomach, without irritating the mouth and throat.

Ether may be exhibited by inhalation. Many years ago, its use in this way was proposed by Drs. Beddoes, Pearson, and Thornton, in England, as a remedy in certain diseases of the lungs. As early as 1805, Dr. Warren, of Boston, employed ethereal inhalation to relieve the distress attending the last stage of pulmonary inflammation. About the year 1812, in Philadelphia, at a time when the nitrous oxide was the subject of popular lectures, the vapour of ether was frequently breathed from a bladder for experiment or diversion; and its effects in producing a transient intoxication, analogous to that caused by the nitrous oxide, were observed. It was not, however, until October, 1846, that attention was particularly drawn to ethereal inhalation as a remedy for pain. In that month, Dr. Warren, of Boston, was applied to by Dr. W. T. G. Morton, dentist of the same city, to ascertain by trial whether an agent which he had successfully employed to render painless the extracting of teeth, would be equally successful in preventing the pain of surgical operations. This agent is now known to have been the vapour of ether. Dr. Warren acceded to this request, and shortly afterwards, at the Massachusetts General Hospital, performed a severe

operation, without pain to the patient, under the influence of ether, administered by Dr. Morton. A few days subsequently, Dr. C. T. Jackson, of Boston, in conversation with Dr. Warren, claimed to have first made known to Dr. Morton the use of ethereal vapour for the prevention of pain in dental operations.

From this beginning, the employment of ether by inhalation for the prevention and removal of pain, has spread throughout the civilized world. The effect produced, called *etherization*, probably takes place through the medium of the blood. It is sometimes partial, suspending sensibility, without abolishing consciousness; so that the patient, without feeling pain, is aware of everything that is passing around him. At other times, a perfect unconsciousness is produced.

Etherization is usefully resorted to in all severe operations, not merely as a remedy for pain, but as a means of preventing the shock which the system would otherwise suffer as a consequence of pain. Under full etherization, even the actual cautery may be extensively applied, without causing the least suffering. In many cases, the incidental power of ethereal vapour as a relaxing agent is usefully brought into play; as in the treatment of strictures of the urethra and œsophagus, strangulated hernia, retention of urine, dislocations, fractures, anchylosis, &c. In all these cases, the necessary surgical manipulations are very much interfered with by the muscular contractions excited by pain. This is particularly the case in dislocations, and in fractures attended with shortening of the limb. In partial anchylosis, etherization enables the surgeon in many cases to break up the adhesions, without pain to the patient, or resistance from the muscles. Even in lithotomy and lithotrity, the incidental advantage is gained of preventing or lessening the inordinate contraction of the muscular coat of the bladder. In short, in most cases in which the necessary surgical measures are likely to involve severe pain, or to encounter resistance, as in children, etherization may be usefully employed.

Etherization has been employed for the detection of feigned diseases, as a means of suspending the operation of the will; in neuralgia, as a palliative; in tetanus and in the spasms produced by an over-dose of strychnia, as an antispasmodic; in asthma and chronic bronchitis, as an expectorant; and in dysmenorrhœa, as an anodyne and relaxing remedy. Dr. Warren found it useful in relieving the agonizing sufferings which often attend the latter complaint. In vivisections, humanity calls for the use of ether vapour or other anæsthetic agent.

Etherization, employed in midwifery as an anæsthetic, is growing in favour as a safe agent; and, while it does not seem materially to interfere with the due contraction of the uterus, it promotes the relaxation and lubricating secretions of the soft parts.

Ethereal vapour is most conveniently inhaled through a soft sponge, hollowed out on one side to receive the projection of the nose, and saturated with ether of the purest quality. The sponge, thus prepared, is applied over the nostrils, through which the inhalation should be made in preference to the mouth. When the inhalation is thus conducted through a sponge, the ethereal vapour is copiously mixed with air, and there is no fear of inducing asphyxia. At first a short cough is generally produced, but this soon disappears; and after a lapse of from two to five minutes, and the expenditure of about two fluidounces of ether, the quantity being very variable in different cases, the patient becomes insensible, and appears as if in a deep, almost apoplectic sleep. The usual signs of the full effect of the ether are the closure of the eyelids, muscular relaxation, and inability to answer questions. During the whole process of etherization, the fingers should be kept on the pulse; and, in case it becomes feeble and very slow, the sponge should be removed until the circulation becomes more free. At first there is redness, afterwards paleness of the face and neck, succeeded by

cold perspirations. In case the etherization proves excessive, or convulsions supervene, an event which rarely happens, the ether must be immediately withdrawn, and cold water freely applied. This is the mode of proceeding in surgical operations; in midwifery cases, partial etherization is often sufficient. In a few cases persons become unmanageable under the operation of the ethereal vapour; and hence the propriety of a preliminary trial of its effects on a patient, before submitting him to a surgical operation. Sometimes death has ensued from ethereal inhalation; but the number of fatal cases has been small, compared with the great number of instances in which ether has been used in this way. (See the *Treatise on Etherization*, by John C. Warren, M.D., Boston, 1848.)

Pharm. Uses. Ether is used as a chemical agent in preparing Acidum Tannicum; Extractum Cubebæ Fluidum; Extractum Piperis Fluidum; Extractum Valerianæ Fluidum; Morphiæ Acetas.

Off. Prep. Collodium; Spiritus Ætheris Compositus; Spiritus Ætheris Sulphurici; Tinctura Ergotæ Ætherea; Tinctura Lobeliæ Ætherea. B.

OLEUM ÆTHEREUM. *U.S., Lond. Ethereal Oil. Heavy Oil of Wine. Sulphate of Ether and Etherine.*

"Take of Alcohol *two pints;* Sulphuric Acid *three pints;* Solution of Potassa *half a fluidounce;* Distilled Water *a fluidounce.* Mix the Acid cautiously with the Alcohol, and allow the mixture to stand twelve hours; then pour it into a large glass retort, to which a receiver kept cool by ice or water is adapted, and distil by means of a sand-bath until a black froth rises, when the retort is to be removed immediately from the sand-bath. Separate the lighter supernatant liquid in the receiver from the heavier, and expose it to the air for a day; then add to it the Solution of Potassa previously mixed with the Distilled Water, and shake them together. Lastly, separate the Ethereal Oil as soon as it has subsided. The specific gravity of Ethereal Oil is 1·096." *U. S.*

"Take of Rectified Spirit *two pints* [Imp. meas.]; Sulphuric Acid *thirty-six fluidounces* [Imp. meas.]; Solution of Potassa, Distilled Water, each, *a fluidounce* [Imp. meas.], or as much as may be sufficient. Mix the Acid cautiously with the Spirit. Let the liquor distil until a black froth arises; then immediately remove the retort from the fire. Separate the lighter supernatant liquor, and expose it to the air for a day. Add to this the Solution of Potassa previously mixed with the Water, and shake them together. Lastly, when sufficiently washed, separate the Ethereal Oil which subsides. The specific gravity is 1·05." *Lond.*

When alcohol is distilled with a large excess of sulphuric acid, the same products are generated as those mentioned in the last article as being formed towards the close of the distillation of ether. (See *page* 827.) These were stated to be sulphurous acid, heavy oil of wine, olefiant gas, and carbonaceous matter. In the *U. S.* process such an excess of sulphuric acid is employed, for the purpose of obtaining the oil. The product of the distillation is in two layers, a heavier one, consisting of water holding sulphurous acid in solution, and a lighter, formed of ether containing the oil of wine. The lighter liquid is separated and exposed for twenty-four hours to the air, in order to dissipate the ether by evaporation; and the oil which is left is shaken with a dilute solution of potassa to deprive it of all traces of sulphurous acid; after which, as soon as it subsides, it is to be separated. The *London* process is substantially the same as that of the U. S. Pharmacopœia. The differences are, that the London College omits to direct a prolonged contact between the alcohol and acid, and dispenses with a refrigerated receiver.

The nature and mode of formation of heavy oil of wine are not well understood. It has been explained, in the preceding article that, in the early stage of the distillation of a mixture of sulphuric acid and alcohol, sulphovinic acid, or double sulphate of ether and water is formed. During its progress this is

decomposed so as to yield ether. When, however, the alcohol is distilled with a large excess of sulphuric acid, the sulphovinic acid is decomposed so as to form a small quantity of the heavy oil of wine, now considered to be a double sulphate of ether and etherine, having the formula $C_4H_5O,SO_3+C_4H_4,SO_3$. It is conceived to be generated from two eqs. of sulphovinic acid (double sulphate of ether and water), which are resolved into one eq. of heavy oil of wine, two of sulphuric acid, and three of water. When the heavy oil is gently heated with four parts of water, sulphovinic acid is reproduced, and the separated etherine floats on the surface as an oily substance, called, when thus isolated, *light oil of wine*. Light oil of wine, as thus obtained, consists of two substances, which are separated from each other by time; namely, a thick oil called *etherole*, and a concrete substance in crystals, isomeric with it, called *concrete oil of wine*, or *oil of wine camphor*, injudiciously denominated etherine by some chemists.

Properties. The *officinal ethereal oil* is a yellowish liquid, possessing an oleaginous consistency, a penetrating aromatic odour, and rather sharp and bitter taste. It boils at 540°. Its sp. gr. is, according to the U. S. Pharmacopœia, 1·096, according to the London College, after Mr. Hennell's results, 1·05. By Dumas and Serullas its density is stated to be as high as 1·133, which is probably the more correct number for the *pure* oil. When dropped into water it sinks, assuming the form of a globule. It is very sparingly soluble in water, but readily dissolves in alcohol and ether. It is devoid of acid reaction, the sulphuric acid present in it being completely neutralized by the ether and etherine united with it. The sulphuric acid present is not precipitated by the usual reagents; because they furnish a base, which, replacing the etherine, gives rise to one of the salts of sulphovinic acid, all of which are soluble in water and hydrous alcohol. The process by which the heavy oil of wine is formed yields but a small product, being only about one part in weight to thirty-one of the alcohol employed, even when performed on the large scale; and, when conducted on the small scale of the Pharmacopœias, the product is only one part of the oil to about seventy-five of the alcohol. *Etherole* is a pale-yellow oily liquid, having an aromatic odour. Its sp. gr. is 0·921, boiling point 500°, and freezing point 31° below zero. It communicates a greasy stain to paper. *Concrete oil of wine* crystallizes in long, transparent, brilliant, tasteless prisms, soluble in alcohol and ether, insoluble in water, fusible at 230°, boiling at 464°, and having the sp. gr. 0·980.

Composition, &c. The officinal oil of wine is essentially the double sulphate of ether and etherine, or heavy oil of wine; but, as prepared by the officinal formula, it always contains more or less light oil of wine, in addition to that present in the heavy oil. This fact accounts for the different densities assigned to the officinal oil by different authorities.

The article sold in our shops as ethereal oil, is generally a mixture of alcohol and ether, with but a trace of the oil. Four samples of so-called ethereal oil, as imported from England, were examined by Mr. E. N. Kent, of New York, and found to have the composition above stated. (*N. Y. Journ. of Pharm.*, i. 65.) It is much to be wished that our manufacturing chemists would make the officinal ethereal oil for the apothecaries, who could then prepare the genuine compound spirit of ether (Hoffmann's anodyne) for themselves.

Off. Prep. Spiritus Ætheris Compositus. B.

SPIRITUS ÆTHERIS SULPHURICI. *Ed.* *Spirit of Sulphuric Ether.*

"Take of Sulphuric Ether *a pint;* Rectified Spirit *two pints.* Mix them. The density of this preparation ought to be 0·809." *Ed.*

This preparation is merely ether diluted with twice its volume of alcohol.

When prepared with materials of proper strength, its sp. gr. is 0·809. Its medical properties are similar to those of ether. The dose is from one to three fluidrachms, given with a sufficient quantity of sweetened water.

Off. Prep. Tinctura Lobeliæ Ætherea. B.

SPIRITUS ÆTHERIS COMPOSITUS. *U. S.*, *Lond.* SPIRITUS ÆTHEREUS OLEOSUS. *Dub.* *Compound Spirit of Ether. Hoffmann's Anodyne Liquor.*

"Take of Ether *half a pint;* Alcohol *a pint;* Ethereal Oil *three fluidrachms.* Mix them." *U. S.*

"Take of Ether *eight fluidounces;* Rectified Spirit *sixteen fluidounces;* Ethereal Oil *three fluidrachms.* Mix them." *Lond.*

"Take of Rectified Spirit *one pint and a half* [Imp. meas.]; Oil of Vitriol of Commerce *one pint and a half* [Imp. meas.]; Sulphuric Ether *five fluidounces* [Imp. meas.]. Mix the Oil of Vitriol with one pint of the Rectified Spirit, in a matrass of glass, and, connecting this with a Liebig's condenser, apply heat, and distil, till a black froth begins to rise. Separate the uppermost or lighter stratum of the distilled liquid, and having exposed it in a capsule for twenty-four hours to the atmosphere, let the residual oil be transferred to a moist paper filter, and washed with a little cold water, so as to remove any adhering acid. Let it now be introduced into a bottle, containing the remainder of the Spirit mixed with the Ether, and dissolved." *Dub.*

This preparation is an alcoholic solution of ether, impregnated with ethereal oil. In the U. S. and London Pharmacopœias, determinate measures of ether, alcohol and oil are taken, the ether having half the volume of the alcohol. In the Dublin formula, the same relation is preserved between the ether and alcohol; but as the Dublin College has no separate formula for ethereal oil, it mixes five fluidounces of ether and ten fluidounces of alcohol with all the oil produced by the reaction of thirty fluidounces of sulphuric acid on twenty of alcohol. The objections to this process are that the quantity of ethereal oil produced is uncertain, and that washing alone is employed for its purification.

Compound spirit of ether is a volatile liquid, having a burning, slightly sweetish taste, and the peculiar odour of ethereal oil. Its sp. gr. is 0·816, according to the U. S. Pharmacopœia. When pure it is wholly volatilized by heat, and devoid of acid reaction. It becomes milky on being mixed with water, owing to the precipitation of the ethereal oil; but this change does not prove its goodness, as the same property may be given to the spirit of sulphuric ether by the addition of various fixed oils. This sophistication may be detected, according to Prof. Procter, by mixing the suspected preparation with water, drawing a piece of paper over the surface of the liquid to absorb the oily globules, and exposing the paper to heat. If the globules are fixed oil, the greasy stain will be permanent; if ethereal oil, the stain will disappear.

It is much to be regretted that our manufacturing chemists do not follow the Pharmacopœia in making Hoffmann's anodyne. In rectifying crude ether, the distillation is continued, so long as the ether comes over of the proper specific gravity; after which the receiver is changed, and an additional distillate is obtained, consisting of ether and alcohol, impregnated with ethereal oil. Now it is this second distillate, variously modified by the addition of alcohol, ether, or water, so as to make it conform in taste, smell, opalescence, &c., to a standard preparation, that the manufacturer sells as Hoffmann's anodyne. (See Prof. Procter's paper on Hoffmann's anodyne in the *Am. Journ. of Pharm.* for July, 1852, p. 213.) Nothing could be more uncertain in its results than a proceeding like this; and we cannot be surprised that the medicine, as obtained from different apothecaries, varies very much in properties, and often disappoints the expecta-

tions of the physician. The chief excuse for the departure from the officinal directions is the costliness of the ethereal oil; but it can be shown that the oil at nine dollars an avoirdupois pound would increase the cost of a pint and a half of the preparation only twenty-two cents.

Medical Properties. This preparation is intended as a substitute for the anodyne liquor of Hoffmann, which it closely resembles. In addition to the stimulating and antispasmodic qualities of the ether which it contains, it possesses anodyne properties, highly useful in nervous irritation, and want of sleep from this cause. These additional virtues are probably derived from the officinal oil of wine, which is a more important substance than is generally supposed. Mr. Brande supposes that the only effect of it, in the preparation under notice, is to alter the flavour of the ether. In this opinion he is certainly in error. Dr. Hare, in his Chemical Compendium, reports the opinion of Drs. Physick and Dewees in favour of the efficacy of the officinal oil of wine, dissolved in alcohol, in certain disturbed states of the system, as a tranquillizing and anodyne remedy. Such indeed are the generally admitted effects of Hoffmann's anodyne, when made with a due admixture of the ethereal oil. Hoffmann's anodyne is on many occasions a useful adjunct to laudanum, to prevent the nausea which is excited by the latter in certain habits. Its dose is from one to two fluidrachms, given in water sweetened with sugar. B.

SPIRITUS ÆTHERIS NITRICI. *U. S., Lond., Ed.* SPIRITUS ÆTHEREUS NITROSUS. *Dub.* SPIRITUS NITRI DULCIS. *Spirit of Nitric Ether. Sweet Spirit of Nitre.*

"Take of Nitrate of Potassa, in coarse powder, *two pounds;* Sulphuric Acid *a pound and a half;* Alcohol *nine pints and a half;* Diluted Alcohol *a pint;* Carbonate of Potassa *an ounce.* Mix the Nitrate of Potassa and the Alcohol in a large glass retort, and, having gradually poured in the Acid, digest with a gentle heat for two hours; then raise the heat and distil a gallon. To the distilled liquor add the Diluted Alcohol and Carbonate of Potassa, and again distil a gallon." *U. S.*

"Take of Rectified Spirit *forty fluidounces;* Nitric Acid [sp gr. 1·42] *three fluidounces and a half.* Add the Acid gradually to the Spirit and mix them; then distil *twenty-eight fluidounces.*" *Lond.*

"Take of Rectified Spirit *two pints and six fluidounces* [Imperial measure]; Pure Nitric Acid (D. 1·500) *seven fluidounces* [Imp. meas.]. Put fifteen fluidounces of the Spirit, with a little clean sand, into a two pint matrass, fitted with a cork, through which are passed a safety-tube terminating an inch above the Spirit, and another tube leading to a refrigeratory. The safety-tube being filled with Pure Nitric Acid, add through it gradually three fluidounces and a half of the acid. When the ebullition which slowly rises is nearly over, add the rest of the acid gradually, half a fluidounce at a time, waiting till the ebullition caused by each portion is nearly over before adding more, and cooling the refrigeratory with a stream of water, iced in summer. The ether thus distilled over, being received in a bottle, is to be agitated first with a little milk of lime, till it ceases to redden litmus paper, and then with half its volume of concentrated solution of muriate of lime. The pure hyponitrous ether thus obtained, which should have a density of 0·899, is then to be mixed with the remainder of the Rectified Spirit, or exactly four times its volume. Spirit of Nitric Ether ought not to be kept long, as it always undergoes decomposition, and becomes at length strongly acid. Its density by this process is 0·847." *Ed.*

"Take of Rectified Spirit *forty-eight fluidounces;* Pure Nitric Acid *three fluidounces;* Water *one* [*fluid*]*ounce;* Solution of Ammonia *a sufficient quantity.* Place six [fluid]ounces of the Spirit in a glass matrass capable of holding forty

fluidounces, and connect this with a Liebig's condenser, whose further extremity is fitted loosely by a collar of tow into a thin eight ounce vial. Add now the Water to the Nitric Acid, and, having introduced half of the resulting solution into the matrass, through a safety syphon tube, close the mouth of this tube with a cork, and apply for a few moments a gentle heat, so as to cause a commencement of ebullition. When the *action* (which, shortly after commencing, proceeds with much violence, and should be moderated by the external application of cold water) has relaxed, introduce gradually the remainder of the Acid, so as to restore it. The action having entirely ceased, agitate the distilled product with half its bulk of the Solution of Ammonia, allow the mixture to rest for a few minutes, and, having separated the supernatant ethereal liquid, mix four [fluid]ounces of it with the rest of the Spirit, and preserve the product in small, strong, and accurately stopped bottles. In the performance of the preceding distillation, the condenser should be fed with ice-cold water, and the vial, in which the distilled liquid is received, should be surrounded by a mixture of one part salt and two of pounded ice; or, when ice cannot be procured, with a mixture of eight parts of sulphate of soda in small crystals and five of commercial muriatic acid." *Dub.*

The officinal spirit of nitric ether is a mixture, in variable proportions, of hyponitrous ether and alcohol (rectified spirit). Hyponitrous ether is always generated by the reaction of nitric acid and alcohol; and it matters not whether the alcohol be mixed with nitric acid directly, or with the materials for generating it, namely, nitre and sulphuric acid. When the materials for forming the ether contain an excess of alcohol, this distils over with the ether, and forms the preparation under consideration.

The processes of the Pharmacopœias differ considerably. The U. S. Pharmacopœia obtains the requisite nitric acid by using the materials for generating it; while the British Colleges mix the acid ready formed with the alcohol. The London process, however, differs from the Edinburgh and Dublin in one important point; namely, that while the London College distils the nitric acid with an excess of alcohol, which comes over largely with the ether, forming, at once, the sweet spirit of nitre; the other Colleges form a concentrated hyponitrous ether, and dilute it with a determinate quantity of alcohol.

The *United States* formula is modeled after a recipe communicated by Mr. John Carter, manufacturing chemist, to the Philadelphia College of Pharmacy, and recommended for adoption by a committee of that body. The nitre and alcohol being mixed in the retort, the sulphuric acid is gradually added, and a gentle heat applied. Nitric acid is set free, and by reacting with a part of the alcohol produces the hyponitrous ether. Upon the subsequent increase of the heat, the ether and the remainder of the alcohol distil over as the sweet spirit of nitre. The distilled product, however, contains some acid, and hence is rectified by a distillation from carbonate of potassa. The diluted alcohol is added before commencing this distillation, to enable the operator to obtain a quantity of distilled product equal to that procured at first, without distilling to dryness, which would endanger the production of empyreuma. The alcohol is first mixed with the nitre, and the sulphuric acid afterwards gradually added. Were the alcohol and sulphuric acid previously mixed, the risk would be run of generating ether, before their addition to the nitre in the retort. The retort should be of such a size as to be capable of holding twice the amount of the materials employed.

The above process, as conducted by Mr. Carter on a large scale, is performed in a copper still of about twenty gallons capacity, and furnished with a pewter head and worm. The materials for the first distillation are 18 pounds of purified nitre, 12 gallons of alcohol of 34° Baumé (0·847), and 12 pounds of sulphuric acid; and 10 gallons are drawn off. The distilled product is then mixed with

a gallon of diluted alcohol, and rectified by a new distillation from lime or a carbonated alkali; the same quantity being distilled as at first. When large quantities of this preparation are thus obtained, the several portions require to be mixed in a large glass vessel, to render the whole of uniform strength; as the portion which first comes over in the rectification is strongest in hyponitrous ether. Previously to the redistillation, the head and worm must be washed thoroughly with water to remove a little acid which comes over in the first distillation. (*Journ. of the Phil. Col. of Pharm.*, i. 308.)

In the *London* process, nitric acid, ready formed, is mixed with the alcohol; the proportion of acid to the spirit being as 7 to 80 in volume. The proportion of liberated nitric acid to the alcohol in the U. S. formula may be assumed to be the same as that in the London process; since the preparation obtained by the two processes has the same specific gravity. The proportion of sweet spirit of nitre by measure drawn off to the alcohol employed is seven-tenths in the London formula, and about five-sixths in that of the U. S. Pharmacopœia. When the distillation is pushed too far, the product is high-coloured, specifically heavier than it should be, very acid so as to act strongly on litmus paper, decomposes the alkaline carbonates with effervescence, and contains aldehyd, which gives it a pungent odour. (*Dr. Golding Bird.*) The impurities arising from a distillation carried too far may, according to Dr. Bird, be entirely avoided by following the directions of the London Pharmacopœia. The residue of the process, if further distilled, will yield a small additional portion of sweet spirit of nitre, nearly pure, of higher specific gravity than the officinal portion; but, on continuing the process, the hyponitrous ether ceases to come over, and about the same time aldehyd appears in the distilled product, and in the residue, oxalic acid, which replaces the oxalhydric (saccharic) acid, formed at an earlier stage of the reaction. Admitting Dr. Bird's results, it is probable that the sweet spirit of nitre which comes over in the first distillation of the U. S. process will contain aldehyd; as considerably more liquid is drawn over than is distilled in the London process. Supposing this to be the case, it is presumable that this impurity would be separated, together with any contaminating acid, by the second distillation from carbonate of potassa. According to Mr. Alsop and Mr. Scanlan, of London, the process of the London College is a precarious one, and at the same time not economical. (*Pharm. Journ. and Trans.*, iii. 425.) It is probably not economical, but it gives a good preparation when the London College directions are strictly complied with.

The *Edinburgh* process for sweet spirit of nitre consists of two steps: first, the formation of hyponitrous ether, and, secondly, its dilution with four times its volume of alcohol. Dr. Christison, commenting on this process, states that it may be conducted with safety and despatch, when the precautions are attended to which are enjoined by the Edinburgh College. The conditions for success are to add no more acid to the spirit at first than what is necessary to commence the action; to wait until the ebullition thus arising shall have ceased; to add the rest of the acid in small successive portions; to let the acid drop from the height of about an inch into the spirit; to have some clean sand in the bottom of the matrass; and to employ a refrigeratory, such as that figured at *page* 793. Should the ebullition increase too rapidly, it may be repressed by blowing cool air across the matrass. The presence of the sand prevents the dangerous succussions arising from the sudden liberation of ethereal vapour. The ethereal product is first agitated with milk of lime to separate acid, and then with half its volume of a concentrated solution of chloride of calcium, to remove water and alcohol. The density given for this hyponitrous ether is 0·899, which is lower than that of the pure ether. The last step in the process is to mix this ether with the prescribed quantity of alcohol, which gives a sweet spirit of nitre of the density of

0·847. The hyponitrous ether of this process may be presumed to measure, on an average, 7¾ fluidounces, and, consequently, the sweet spirit of nitre obtained from it 38¾ fluidounces. The degree of dilution was fixed, so as to make it conform in ethereal strength with the same preparation of the former Edinburgh Pharmacopœia. The preparation is intended to contain one-fifth of its volume of ether, and is probably between three and four times as strong as the sweet spirit of nitre of the U. S. and London Pharmacopœias. For making this preparation, Dr. Christison prefers the present plan of the Edinburgh College, of diluting the pure hyponitrous ether to a determinate degree, on the ground that it secures a pure and uniform preparation. Many years ago the same plan was proposed by Dr. Hare.

The *Dublin* process proceeds on the same principle as the Edinburgh; namely, that of forming hyponitrous ether, and diluting this with alcohol. But the dilution is carried to a much greater extent; four fluidounces of the ether being mixed with forty-two fluidounces of alcohol, or in the proportion of one to ten and a half. This dilution makes it a little less than two-fifths as strong in hyponitrous ether as the Edinburgh preparation. The sp. gr. of sweet spirit of nitre is not given by the Dublin College; but it may be presumed that the dilution ordered by the College makes it conform in density to the London spirit.

Theory of the Production of Hyponitrous Ether, &c. One eq. of nitric acid, by reacting with one eq. of alcohol, forms one eq. of hyponitrous acid, one eq. of *aldehyd* ($C_4H_4O_2$), and two eqs. of water. Thus NO_5 and $C_4H_6O_2 = NO_3$ and $C_4H_4O_2$ and 2HO. The hyponitrous acid, as soon as formed, reacts with a second eq. of alcohol, so as to form one eq. of hyponitrous ether, with separation of one eq. of water. It has, however, been shown by Dr. Golding Bird that, when an excess of alcohol is used, *oxalhydric* (*saccharic*) acid is first formed, and that, when the formation of the hyponitrous ether has nearly ceased, aldehyd appears in the distilled product, and simultaneously oxalic acid in the contents of the retort, before which time the latter cannot be discovered. All these products result from the oxidizing action of the nitric acid upon the alcohol, increasing the proportion of oxygen in the substances formed, either by removing the hydrogen, or by abstracting this element and adding oxygen at the same time. The reader who may wish to pursue this subject, is referred to an interesting paper by Dr. Bird, in the *Lond. and Ed. Philos. Mag.*, xiv. 324, for May, 1839.

Properties of Hyponitrous Ether. *Pure* hyponitrous ether is pale-yellow, has the smell of apples and Hungary wines, boils at 62° (below 65° Hare), and has the sp. gr. 0·947 at 60°. The density of its vapour is 2·627. Litmus is not affected by it. When it is mixed with an alcoholic solution of potassa, hyponitrite of potassa and alcohol are formed, without producing a brown colour, showing the absence of aldehyd. It is soluble in 48 parts of water, and in all proportions in alcohol or rectified spirit. It is highly inflammable, and burns with a white flame without residue. The *impure* ether, as obtained by the Edinburgh and Dublin processes for subsequent dilution to form sweet spirit of nitre, boils at 70°, and has the density of 0·886 at 40°. The specific gravity assigned to it by the Edinburgh College is 0·899. Mixed with an alcoholic solution of potassa, it becomes dark-brown, with production of *aldehyd resin*. (See *page* 14.) This discoloration shows the presence of aldehyd. When kept it becomes acid in a short time, as shown by litmus; and nitric oxide is given off, which often causes the bursting of the bottle. Its tendency to become acid is rendered greater by the action of the air, and depends on the absorption of oxygen by the aldehyd, which thereby becomes acetic acid. These facts show the propriety of preserving this ether in small, strong bottles, kept full and in a cool place. Hyponitrous ether consists of one eq. of hyponitrous acid and one of ether, and its formula is C_4H_5O,NO_3. It is, therefore, improperly called *nitrous* and *nitric*

ether. Considered as a salt its proper name would be *hyponitrite of ether.* In its pure or concentrated state it is never used in medicine.

Properties of Spirit of Nitric Ether. This is a colourless volatile liquid, of a fragrant ethereal odour, and pungent, aromatic, sweetish, acidulous taste. It slightly reddens litmus, and does not effervesce with carbonate of soda. The Edinburgh preparation is yellow, and contains twenty per cent. of hyponitrous ether. Its officinal sp. gr. is 0·834 *U. S., Lond.;* 0·847 *Ed.* High density is not necessarily an index of deficient strength; as it may arise, as in the Edinburgh preparation, from containing a large proportion of hyponitrous ether. When heated by means of a water-bath, the U. S. sweet spirit of nitre begins to boil at 160°. It mixes with water and alcohol in all proportions. It is very inflammable, and burns with a whitish flame.

Impurities and Tests. Sweet spirit of nitre, when the product of a distillation too long continued, at first contains aldehyd, which afterwards becomes acetic acid by the absorption of oxygen—rapidly if the preparation be insecurely kept. The presence of aldehyd may be detected by its imparting a pungent odour and acrid flavour, and by the preparation containing it assuming a yellow tint on the addition of a weak solution of potassa, owing to the formation of aldehyd resin. Another test for aldehyd is the addition of an equal volume of sulphuric acid to the sweet spirit of nitre. If the sample be good, the change of colour will be slight, and the mixture will become considerably viscid; but if it contain much aldehyd, it will become dark-coloured. If water or spirit be present in undue proportion, the viscidity will be less. (*Phillips.*) As aldehyd appears to be the chief source of impurity in sweet spirit of nitre, and as it is detected by producing a characteristic colour with a solution of potassa, it would seem easy to make this test available as an index when the distillation should be discontinued. For if the distilled product were made to pass through a small portion of this alkaline solution, it would probably give indications of the first appearance of aldehyd, and thus enable the operator to stop the distillation in time. Acetic acid, as well as other acids (usually nitrogen acids) that may happen to be present, may be discovered by the taste, by their acting on litmus strongly, and by their decomposing the alkaline carbonates or bicarbonates with effervescence. These acids often operate injuriously by their chemical reactions with other substances, when associated in mixtures. Thus they liberate iodine from iodide of potassium, gradually decolorize compound infusion of roses, and, in the compound mixture of iron, hasten the conversion of the protoxide into the sesquioxide of iron. To obviate these effects, Mr. Harvey, of Leeds, keeps the sweet spirit of nitre standing on crystals of bicarbonate of potassa, and states that, if the preparation be of full strength, no appreciable portion of the alkali will be dissolved. (*Pharm. Journ. and Trans.*, Jan. 1842.) When acid sweet spirit of nitre is rectified from calcined magnesia, it becomes acid again in a short time; but, according to M. Klauer, when rectified from neutral tartrate of potassa, it continues unchanged for months. The rationale of the action of this salt, however, is not obvious. A deep-olive colour being produced with the sulphate of protoxide of iron, shows the presence of a nitrogen oxide or acid, and a blue tint with tincture of guaiac, passing through various shades of green, a nitrogen acid.

According to Mr. Bastick, sweet spirit of nitre contains about one-fifth of one per cent. of anhydrous hydrocyanic acid, when made from hyponitrous ether, formed by impregnating alcohol with hyponitrous acid, evolved by the action of nitric acid on starch, according to the process of Liebig. The same contaminating acid has been detected by M. Dalpaiz, in the preparation made according to the London Pharmacopœia, though not found in it by Mr. Bastick.

Alcohol and water are often fraudulently added to sweet spirit of nitre. When in undue proportion, they may be detected in the Edinburgh preparation, as

stated by the College, by agitating it with twice its volume of a concentrated solution of chloride of calcium. If the sweet spirit of nitre be of the full strength of this College, twelve per cent. of ether will slowly separate; showing that the chloride of calcium has taken up eight per cent., together with eighty per cent. of alcohol and water. If less ether separates, it shows the presence of too much alcohol and water. This test is hardly applicable to the U. S., London, and Dublin preparations, which are much weaker than the Edinburgh. Dr. Christison states that the London sweet spirit of nitre, when subjected to it, has never yielded in his trials more than four per cent. of ether. But it must be recollected that, when it yields by this treatment four per cent., it really contains twelve per cent.; for eight per cent. has been absorbed by the chloride of calcium test. Specific gravity is no criterion of the goodness of the preparation as obtained by any formula. The addition of water will raise its density; and so will the addition of hyponitrous ether. A high density, in connexion with deficient ethereal qualities, would, of course, show the presence of free acids, or an excess of water, or both. A specific gravity lower than the U. S. and London standard would probably indicate the presence of alcohol stronger than it should be, which might be either in proper amount or in too large proportion.

The fraudulent dilution of sweet spirit of nitre with alcohol and water is a great evil, considering the extensive use of the medicine, and its valuable remedial properties when pure. We have been informed, on good authority, that it is variously diluted with twice, thrice, and even four times its weight of alcohol and water. In some shops a strong and a weak preparation are kept, to suit the views of customers as to price. Some of the wholesale druggists are in the habit of diluting it, either upon the plea that the physician's prescriptions are written in view of the use of a weak preparation, or for the purpose of affording it at a low price. All these evils would be corrected, if the different manufacturing chemists in the Union would comply with the recommendation of the Philadelphia College of Pharmacy, and adopt for preparing it the formula of the United States Pharmacopœia. A uniform preparation being in this way furnished to the druggists, all that would be necessary on their part, would be to refrain from weakening it by the admixture of alcohol and water.

Medical Properties and Uses. Sweet spirit of nitre is diaphoretic, diuretic, and antispasmodic. It is deservedly much esteemed as a medicine, and is extensively employed in febrile affections, either alone, or in conjunction with tartar emetic, for the purpose of promoting the secretions, especially those of sweat and urine. It often proves a grateful stimulus to the stomach, relieving nausea and removing flatulence, and not unfrequently quiets restlessness and promotes sleep. On account of its tendency to the kidneys, it is often conjoined with other diuretics, such as squill, digitalis, acetate of potassa, nitre, &c., for the purpose of promoting their action in dropsical complaints. The late Dr. Duncan praised a combination of it with a small proportion of aromatic spirit of ammonia, as eminently diaphoretic and diuretic, and well suited to certain states of febrile disease. The dose is about a teaspoonful, given every two or three hours in a portion of water. When used as a diuretic, it should be given in larger doses.

Off. Prep. Mistura Glycyrrhizæ Composita. B.

CHLOROFORMUM. *U. S., Dub.* CHLOROFORMYL. *Lond. Chloroform. Terchloride of Formyle.*

"Take of Chlorinated Lime *ten pounds;* Water *three gallons and a half;* Alcohol *two pints.* Mix the Chlorinated Lime first with the Water, and then with the Alcohol, in a distillatory vessel having the capacity of about six gallons. Distil with a brisk heat into a refrigerated receiver, and, when the temperature approaches to 176°, withdraw the fire, in order that the distillation may proceed by the heat derived solely from the reaction of the materials. When the dis-

tillation slackens, hasten it by a fresh application of heat, and continue to distil until the liquid ceases to come over with a sweet taste. Separate the heavier layer of liquid in the receiver from the lighter by decantation, and, having washed it first with water, and then with a weak solution of carbonate of soda, agitate it thoroughly with powdered chloride of calcium, and distil it off by means of a water-bath, stopping the distillation when eleven-twelfths of the liquid have come over. The residue, together with the light liquid of the first distillation, may be reserved for use in a second operation." *U. S.*

"Take of Chlorinated Lime *four pounds;* Rectified Spirit *half a pint* [Imp. meas.]; Water *ten pints* [Imp. meas.]; Chloride of Calcium, broken into pieces, *a drachm.* Put the Chlorinated Lime, previously mixed with the Water, in a retort, and add the Spirit, the retort being of such a size as to be only one-third filled. Heat by means of a sand-bath, and so soon as ebullition begins, quickly withdraw the fire, that the retort may not break from a sudden increase of heat. Distil the liquor into a receiver until nothing comes over, renewing the fire if necessary. To the distilled liquor add four parts of water, and shake the whole well together. Separate carefully the heavier part which subsides, and add to it the Chloride of Calcium, shaking occasionally during an hour. Lastly, again distil the liquor from a glass retort into a glass receiver." *Lond.*

"Take of Chlorinated Lime *ten pounds* [avoirdupois]; Fresh-burned Lime *five pounds* [avoird.]; Water *four gallons* [Imp. meas.]; Rectified Spirit *twenty-five ounces* [avoird.]; Peroxide of Manganese, in fine powder, *two drachms* [Dublin weight]. Slake the lime with two pints [Imp. meas.] of the water, first raised to the boiling temperature, and, having placed the slaked Lime and Chlorinated Lime in a sheet iron or copper still, pour on the residue of the Water first mixed with the Spirit, and raised to the temperature of 100°. Connect now the still with a condenser, and apply heat, which, however, must be withdrawn the moment the distillation commences. The distilled product, the bulk of which need not exceed two pints [Imp. meas.], will occur in two distinct strata, the lower of which is the crude chloroform. Let this be agitated, twice in succession, with an equal volume of distilled water, and then, in a separate bottle, with half its volume of pure sulphuric acid. Lastly, let it be shaken in a matrass with the Peroxide of Manganese, and rectified from off this at a very gentle heat. The lighter liquid which distils over with the chloroform, and the water used in washing the latter, should be preserved with the view of their being introduced, with a new charge, into the still in a subsequent process. The specific gravity of Chloroform is 1·496." *Dub.*

In these processes, by the reaction of the chlorinated lime with the alcohol, chloroform is generated under the influence of a moderate heat. By a calculation it will be found that, while for ten pounds of chlorinated lime, the U. S. formula calls for thirty-two fluidounces of alcohol, the London and Dublin Colleges take about twenty-three and a half fluidounces. The water varies in the different formulæ from twenty-eight (*U. S.*) to thirty-two pints (*Dub.*). The chloroform, as first distilled, is found as a dense yellow layer, forming the lower portion of the distillate, and is quite impure. In order to purify it, the U. S. Pharmacopœia directs it to be washed with water to separate alcohol, agitated with a weak solution of carbonate of soda to remove chlorine, and rectified by distillation from chloride of calcium to free it from water. This distillation is stopped when eleven-twelfths of the liquid have come over, to avoid contaminating the product with a chlorinated pyrogenous oil, the presence of which interferes with the favourable action of the chloroform when inhaled. The same measures of purification, except the use of carbonate of soda, are directed by the London College. The Dublin College uses slaked lime, mixed with the chlorinated lime in the distillation, and purifies the crude chloroform by means of

water, sulphuric acid, and deutoxide of manganese. The object of the slaked lime is probably to lessen the production of the chlorinated pyrogenous oil, the amount of which is greater, according to Soubeiran and Mialhe, in proportion to the relative excess of the chlorine to the lime employed. The crude product, after having been freed from alcohol by washing with water in the usual way, is purified from the oil by agitation with half its volume of sulphuric acid, which must be *pure* and *colourless*, and at least of the density 1·840. The oil is charred and destroyed by the acid, which becomes yellow or reddish-brown, and partially changed into sulphurous acid. To remove the latter acid, agitation with deutoxide of manganese is directed, according to the plan of Mr. Alexander Kemp, of Edinburgh. The process of the Dublin College is the one proposed by Gregory and Kemp, of Edinburgh. According to these chemists chloroform is effectually purified from the pyrogenous oil by agitation with strong and pure sulphuric acid. So long as a ring, darker than the rest of the acid, appears, after rest, at the line of contact between the acid and the chloroform, the agitation must be repeated; and the oil is known to be fully separated, when the acid remains colourless. The same chemists deem it unnecessary to distil the chloroform from deutoxide of manganese to separate sulphurous acid; but consider agitation with the oxide as quite sufficient for this purpose, to be continued until the odour of the acid is replaced by the agreeable smell of pure chloroform. When chloroform is purified by manganese, it is apt to become, after the lapse of a few weeks, of a delicate pink colour, which sometimes disappears and then returns. This coloration depends upon the presence of manganese, and forms an objection to the use of the deutoxide as a purifier.

Dr. Gregory strongly recommends the above described process for purifying commercial chloroform as easily performed, and asserts that all good manufacturers purify it by the action of sulphuric acid. Nevertheless it has been shown that chloroform, thus purified, though apparently pure at first, will not keep, but, after the lapse of some time, becomes so loaded with chlorine that it cannot be inhaled. It appears from the observations of Dr. Christison that chloroform, purified by sulphuric acid containing nitrous acid, changes in less than twenty-four hours; but even when purified with pure acid, the decomposition begins at last, so that at the end of four weeks the odour of chlorine is intolerable. Whether chloroform, purified by chemically pure sulphuric acid, would undergo change, is not, perhaps, fully decided; but, for practical purposes, the purification by the repeated use of sulphuric acid must be abandoned. The manufacturers in Edinburgh have laid the process aside, and have recalled from their customers the chloroform which had been manufactured by it. In July, 1850, Mr. John Abraham pointed out the impurity of chlorine and muriatic acid in specimens of Edinburgh chloroform, no doubt manufactured by Dr. Gregory's process. These specimens had a suffocating odour, first reddened and then bleached litmus paper, and deposited on the inside of the bottle a greenish, oily-looking substance. Prof. Procter (in Oct. 1850) obtained some chloroform from a Philadelphia manufacturer, which presented similar defects, and was ascertained to have been made by the sulphuric acid process.

Chloroform may be made by the action of chlorinated lime on pyroxylic spirit (wood spirit); but when thus prepared it is largely contaminated with a chlorinated pyrogenous oil, analogous to that already mentioned as being found in smaller proportion in chloroform prepared from alcohol. Chloroform, thus prepared, conveniently called *methylic chloroform*, is purified with too much difficulty to be advantageously substituted for that made with alcohol, called by Soubeiran, *normal chloroform*. Chloroform may also be procured by distilling one part of oil of turpentine with eight parts of chlorinated lime and twenty-four of water. (J. Chautard, *Chem. Gaz.*, Feb. 1852, p. 68.)

Messrs. Duncan and Flockhart, druggists, of Edinburgh, manufacture chloroform on a large scale, in a peculiar apparatus, using the proportions of 20 parts of chlorinated lime, about 3¾ parts of rectified spirit, and 60 parts of water. They employ two large wooden barrels as a still, and a third as a receiver, and into the former throw steam, which furnishes both sufficient heat and water for the process. Sixty pounds of chlorinated lime are used by them at each distillation; and they are able to manufacture three hundred ounces of chloroform a day. The heavy layer of the distillate, constituting the impure chloroform, is purified by them, by mixing it with half its measure of strong sulphuric acid, gradually added, and distilling the mixture, when cool, in a leaden retort, from as much carbonate of baryta by weight, as of acid previously used by measure. The product is finally distilled from quicklime, after having stood over the earth, and been repeatedly shaken with it, for a day or two. In this long-tried process sulphuric acid is used; but it may be presumed that the chloroform made by it is not liable to undergo the change which follows the use of Gregory's process. It will be observed that the product, after the action of the sulphuric acid, is successively distilled from baryta and lime, thus removing all traces of the acid, to the presence of which, combined in some unknown way, the liability to change of chloroform, prepared by Gregory's process, may be plausibly attributed.

Discovery and History. Chloroform was discovered by Mr. Samuel Guthrie, of Sackett's Harbor, N. Y., in 1831, and about the same time by Soubeiran in France, and Liebig in Germany. Guthrie obtained it by distilling a gallon from a mixture of three pounds of chlorinated lime and two gallons of alcohol of the sp. gr. 0·844, and rectifying the product by redistillation, first from a great excess of chlorinated lime, and afterwards from carbonate of potassa. (*Silliman's Journal*, vol. xxi., Jan. 1832, p. 64.) In a subsequent letter to Professor Silliman, dated Feb. 15th, 1832, Mr. Guthrie states that the substance which he had obtained, "distilled off sulphuric acid, has the specific gravity of 1·486, or a little greater, and may then be regarded as free from alcohol; and if a little sulphuric acid which sometimes contaminates it be removed by washing it with a strong solution of carbonate of potassa, it may then be regarded as *absolutely pure.*" (*Ibid.*, vol. xxii., July 1832, p. 105.) It is thus evident that Mr. Guthrie obtained in a pure state, the substance now called chloroform; but he erroneously supposed his product to be the well-known oily liquid of the Dutch chemists, which it greatly resembles, and for the preparation of which he believed he had fallen on a cheap and easy process. Under this impression, he calls the substance, in his communications, *chloric ether*, one of the names by which the *Dutch liquid*, or *chloride of olefiant gas*, is designated. He was induced to make the preparation from noticing a passage in Professor Silliman's Elements of Chemistry, which referred to the Dutch liquid as a grateful diffusible stimulant, when properly diluted with alcohol and water. In relation to the anticipated importance of this substance as a medicine, Mr. Daniel B. Smith, President of the Philadelphia College of Pharmacy, holds the following language in July, 1832. "The action of this ether on the living system is interesting, and may hereafter render it an object of importance in commerce. Its flavour is delicious, and its intoxicating qualities equal to or surpassing those of alcohol. It is a strong diffusible stimulus, similar to the hydrated ether, but more grateful to the taste." (*Journ. of the Phil. Col. of Pharm.*, iv. 118.)

Properties. Chloroform is a limpid, colourless, volatile, neuter liquid, having a bland ethereal odour, and hot, aromatic, saccharine taste. It neither reddens nor bleaches litmus paper. It is but slightly soluble in water. Its sp. gr. is 1·49 *U. S.*, 1·48 *London*, and 1·496 *Dub.* Gregory has obtained it of the density 1·5 at 60°. It boils at 142°. It is not inflammable, but renders the flame of an alcohol lamp yellow and fuliginous. It burns, however, with a smoky

flame, when mixed with an equal volume of alcohol. When pure, it has no action on potassium. According to M. Augendre and M. Ed. Robin, chloroform is a powerful antiseptic. It does not, like creasote, coagulate albumen. It is scarcely acted on by sulphuric acid in the cold, but dissolves readily in alcohol and ether. The alcoholic solution, when moderately diluted with water, forms an aromatic, saccharine liquid of a very grateful taste. A strong alcoholic solution is decomposed by abundance of water, the chloroform separating and subsiding, and the alcohol uniting with the water. Chloroform has extensive solvent powers, being capable of dissolving caoutchouc, gutta percha, mastic, elemi, tolu, benzoin, and copal. Amber, sandarac, lac, and wax are only partially soluble. It also dissolves iodine, bromine, the organic alkalies, fixed and volatile oils, most resins, and fats. It dissolves sulphur and phosphorus sparingly. It possesses the power of dissolving a large quantity of camphor, and furnishes the means of administering that medicine in an elegant form. As a general solvent, it has the advantage over ether of not being inflammable; the inflammability of the latter being the cause of frequent accidents. For an extensive list of substances, soluble, insoluble, and partially soluble in chloroform, see a paper by M. Lepage, of Gisors, France, copied into the *Am. Journ. of Pharm.* for April, 1852, p. 147.

Composition. Chloroform is composed of three eqs. of chlorine and one of formyle, and is, therefore, the terchloride of formyle. As formyle is a bicarburet of hydrogen, the formula of chloroform is C_2HCl_3. Its composition was first accurately determined by Dumas in 1835, by whom it was called chloroform from its relation to formic acid (C_2HO_3), being formic acid with its three eqs. of oxygen replaced by three of chlorine. When first obtained by him, Liebig supposed it to consist exclusively of chlorine and carbon; and hence the origin of the erroneous name of *perchloride of carbon*, by which it is sometimes called.

The rationale of the formation of chloroform has not been well made out. If alcohol be considered a bihydrate of etherine C_4H_4+2HO, it may be presumed to be generated by the removal from the etherine of two eqs. of carbon, and the substitution of three eqs. of chlorine for three of hydrogen. Thus $C_4H_4-C_2H_3+Cl_3=C_2HCl_3$.

Impurities and Tests. Chloroform is liable to contain alcohol and ether, both of which lower its specific gravity. To determine the presence of impurity which has this effect on its density, Soubeiran recommends that a drop of the suspected chloroform be added to a mixture of equal weights of concentrated sulphuric acid and water. Such an acid, when cool, will have the specific gravity of 1·38, and good chloroform, being of greater density, will sink in it. Any specimen of chloroform which floats in this acid should be rejected as too light; but its sinking would not prove its density to be sufficiently high. M. Mialhe has proposed the following test for the presence of alcohol. Drop into distilled water a small quantity of the chloroform. If pure, it remains transparent at the bottom of the glass; but, if it contain even a small proportion of alcohol, the globules acquire a milky appearance. The most injurious impurities are the chlorinated pyrogenous oils, already alluded to. These are different as obtained from methylic or normal chloroform. The oil obtained by Soubeiran and Mialhe from methylic chloroform, is an oleaginous, yellow liquid, lighter than water, and having a peculiar nauseous empyreumatic odour, perceptible in the methylic chloroform itself. In commercial chloroform it is sometimes present to the amount of six per cent. It is easily set on fire, and burns with a smoky flame, chlorine being among the products of its combustion. The oil procured from normal chloroform, which contains it only in the amount of about one-fifth of one per cent, is essentially different from the methylic chloroform oil. It is heavier than water, and has an acrid, penetrating odour, unlike that of the other

oil. When the vapour of these oils is inspired or even smelt, it causes, according to Dr. Gregory, distressing sickness and headache. These pyrogenous oils are detected by the action of *pure* and *strong* sulphuric acid. Pure chloroform, when mixed with an equal volume of the acid, does not colour it; but, when contaminated with these oils, gives the acid a colour, varying from yellow to reddish-brown, according to the amount of impurity present. In applying this test, several fluidounces of chloroform should be used; as a slight change of colour cannot be easily seen in a test tube. The discoloration of sulphuric acid by impure chloroform was first noticed by Mr. Morson, of London, in Nov. 1848. A still more delicate test of the oily impurities, according to Dr. Gregory, is the smell which they leave. If chloroform, thus contaminated, be poured upon the hand, it quickly evaporates, leaving the oily impurities, recognizable by their peculiar offensive smell, which is now no longer covered by that of the chloroform. The pure substance, rubbed upon the skin, quickly evaporates, and scarcely leaves any odour. (See the paper of Soubeiran and Mialhe, *Journ. de Pharm.*, July, 1849, copied into the *Am. Journ. of Pharm.*, xxi. 313. Also the paper of Dr. Gregory, *Chem. Gaz.*, May 15, 1850.) According to Mr. Henry Pemberton, of Philadelphia, the pyrogenous oils are not derived from the common whisky ordinarily employed in procuring chloroform; as he ascertained by making the preparation from pure alcohol of 92 per cent. (*Am. Journ. of Pharm.*, March, 1853, p. 113.)

Medical Properties, &c. When taken *internally*, chloroform acts as a sedative narcotic, probably operating through the nervous system, independently of vascular action or congestion. Nevertheless it has been detected by Ragsky in the blood, by distilling an ounce from a flask, furnished with a tube bent horizontally, and containing at its further extremity a strip of paper, coated by iodide of potassium and starch paste. A portion of the horizontal tube is heated to redness; and the volatilized chloroform, being decomposed as it passes along the tube, furnishes muriatic acid and chlorine, which, by coming in contact with the iodide and starch, develop iodine and strike a blue colour. The inside of the further extremity of the tube may be moistened with a solution of nitrate of silver, dispensing with the iodide and starch, according to the plan of Dr. Snow, in which case chloride of silver will be formed. Proceeding in a similar manner, Dr. Snow has proved that chloroform may be detected in different portions of the dead body destroyed by this agent.* Dr. H. Hartshorne, who tried its physiological effects in the dose of seventy-five drops on himself, found it to produce a general diminution of sensorial power, with drowsiness, and without exhilaration or acceleration of the pulse. (*Am. Journ. of Med. Sci.*, Oct. 1848, p. 353.) Since then he has used it internally in a number of cases, and finds it a safe anodyne and soporific remedy, altogether free from the dangerous effects which sometimes follow the inhalation of its vapour. In the dose of a fluidrachm, its soporific effect is about equal to that of thirty-five drops of laudanum. Dr. Hartshorne has given it in doses of from fifty to seventy-five drops every half hour for several hours together. The best vehicle is orgeat syrup, in the proportion of two fluidounces to each fluidrachm of the chloroform. When mixed with mucilage of gum Arabic, the mixture requires agitation, immediately before swallowing each dose. (*Ibid.*, Jan. 1854, p. 113.) Chloroform, as prepared by Mr. Guthrie, was used internally as early as 1832 by Professor Ives, and Dr. Nathan B. Ives, of New Haven, in asthma, spasmodic cough, scarlet fever, and atonic quinsy, with favourable results. (*Silliman's Journ.*, xxi. 406, 407.) It was employed by Dr. Formby, of Liverpool, in hysteria, in 1838; by Mr. Tuson,

* In relation to the detection of chloroform in dead bodies, see the paper of M. Duroy, of Paris, in the *Journ. de Pharm.*, Avril, 1851.

of London, in cancer and neuralgic affections, in 1843; and by M. Guillot, of Paris, in asthma, in 1844. Antiperiodic properties have been attributed to it by Dr. Delioux, of Rochefort, who proposes it as a remedy in intermittents, given, during the apyrexia, in cases in which the bark and quinia fail to effect a cure. Dr. Aran has employed it with success in lead colic, administered by the mouth and rectum, and applied to the abdomen. In these cases it probably acts by relaxing the intestinal spasm. One of the authors of this work has frequently used it with advantage for the relief of neuralgic and other painful affections, in the dose of from forty to eighty drops, suspended in water by means of gum Arabic or yolk of egg. This dose may be repeated, if necessary, at intervals of one or two hours, until some effect on the system is produced. A disadvantage connected with the internal use of chloroform is its liability to sicken the stomach, an effect which may sometimes arise from the presence of pyrogenous oil as an impurity. *Externally*, it was used, in 1843, by Mr. Tuson, in cancer, senile gangrene, and sloughing ulcers, and, in the form of injection and gargle, in profuse discharges from the uterus, and foul ulcers of the throat, with the effect of relieving pain, destroying fetor, and promoting the separation of diseased parts. It has also been employed externally with benefit by an anonymous writer in the *Boston Medical and Surgical Journal*, in a painful wound of the forearm, implicating the radial nerve; by Dr. Legroux in a painful affection of one of the lower extremities, consequent to a cancerous tumour of the pelvis; by Mr. Higginson in labour, applied to the perineum when painfully stretched, and in dysmenorrhœa, brought in contact with the os uteri by means of a sponge; by Dr. Watson in swelled testicle and acute spinal tenderness; by Dr. Hays and Dr. Bond in neuralgia; by the late Dr. I. Parrish in the supra-orbitar pain of rheumatic ophthalmia, and in syphilitic ulceration at the root of the nail; and by M. Devergie in papulous eruptions, made into an ointment in the proportion of a fluidrachm to ten drachms of lard. It has also been used with success by Dr. Venat, of Bordeaux, in the form of injection, in the commencement of acute gonorrhœa, as an abortive treatment. Mr. Behrend, of Liverpool, recommends it in all stages of this complaint, injected pure, or mixed with mucilage. This treatment gives great pain, and is, moreover, hazardous. Dr. Rauch, of Iowa, has employed chloroform topically with decided benefit in neuralgia, colic, and other painful affections. For some purposes he found it useful to incorporate it with olive oil and solution of ammonia, which formed a mixture having effects less transient than those of the uncombined chloroform. (*Am. Journ. of Med. Sci.*, July, 1851, p. 112.) As a wash, injection, and gargle, Mr. Tuson prepared it diluted with water, in the proportion of one or two drachms to the pint; but, as an application to the sound skin, it is generally used undiluted, by means of lint or soft rags, covered with oiled silk to prevent evaporation. When employed undiluted it should be pure; as, according to M. Mialhe, when it contains absolute alcohol, it acquires caustic properties.

A third method of using chloroform is by *inhalation*. The first case we have met with in which it was employed in this way, is related by Professor Ives, of New Haven, under date the 2d of Jan. 1832. The case was one of pulmonic disease, attended with general debility and difficult respiration, and was effectually relieved. (*Silliman's Journ.*, vol. xxi., Jan. 1832, p. 406.) In March, 1847, the action of the pure substance by inhalation was tried on the lower animals by M. Flourens, and its effects on the spinal marrow described. In November of the same year, Dr. Simpson, of Edinburgh, after experimenting with a number of anæsthetic agents, in order to discover a substitute for ether, tried chloroform at the suggestion of Mr. Waldie, and, having found its effects favourable, brought it forward as a new remedy for pain, by inhalation, in surgery and midwifery. The advantages which he conceives it to possess over ether, are the small-

ness of its dose, its more prompt action, its more agreeable effects, its less tenacious odour, its greater cheapness, and the readiness with which it may be exhibited.

The usual effects produced by a full dose of chloroform, administered by inhalation, are the rapid production of coma, relaxation of the muscles, slow and often stertorous breathing, upturning of the eyes, and total insensibility to agents which ordinarily produce acute pain. The effect on the heart's action is variable. Sometimes frothing of the mouth takes place, and, more rarely, convulsive twitches of the face and limbs. The insensibility is generally produced in one or two minutes, and usually continues for five or ten minutes; but the effect may be kept up for many hours, provided the inhalation be cautiously renewed from time to time. The immediate effects of the agent are followed by a drowsy state, sometimes by quiet sleep. As a general rule, no recollection is retained of anything that occurred during the state of insensibility. Experience has shown that the effects, here described as those of a full dose of chloroform by inhalation, cannot be induced without danger to life. Hence all prudent surgeons will be content with an impression short of the abolition of all consciousness. It is generally admitted that, at a certain stage of anæsthesia, there is insensibility to pain, while consciousness to a certain extent remains; and it is this condition that the surgeon should aim to produce. According to Mr. Skey, chloroform has been administered in 9000 cases in St. Bartholomew's Hospital, without a single accident, a fact which must be taken as proof of its careful and skilful employment in that institution. (See *Am. Journ. of Med. Sci.*, April, 1851, p. 498.) It is asserted to be an advantage of chloroform in surgical operations, that less blood is lost. If this assertion should prove true, there will be greater necessity of delaying the dressings until reaction has taken place.

The relative advantages and disadvantages of chloroform, when compared with ether as an anæsthetic in operative surgery, have not been satisfactorily determined; but on one point the evidence appears to be conclusive, namely, that it is far more dangerous to life than ether. According to Dr. Snow, of London, the vapour in the air breathed by the patient should not exceed six per cent. When thus used, insensibility is slowly and safely induced. (*London Med. Times*, Nov. 1853, p. 485.) Dr. Gilman, of New York, thinks that chloroform has a more sudden and powerful effect than under ordinary circumstances, when inhaled immediately after bleeding; a fact which he explains by the increased power of absorption produced by the loss of blood. (*N. Y. Med. Times*, Oct. 1852.)

In midwifery, chloroform has been extensively employed to relieve pain and facilitate labour, since it was first recommended by Dr. Simpson. Its effects in subduing the pain of childbearing are similar to those of ether; and each agent has its exclusive advocates among those practitioners of midwifery who are willing to use anæsthetics. The remarks, made in relation to ether used in labour, are applicable for the most part to chloroform, and, therefore, need not be repeated here. (See *page* 831.)

The dose of chloroform for inhalation is a fluidrachm, equivalent to 220 drops or more, to be repeated in two minutes, if the desired effect should fail to be produced. The most convenient inhaler is a handkerchief, loosely twisted into the form of a bird's nest, which, after having been imbued with the chloroform, is held to the mouth and nose. The use of this simple inhaler insures a due admixture of atmospheric air with the vapour of the chloroform. The moment insensibility is produced, the inhalation should be suspended; and, if consciousness return too soon, it should be cautiously renewed. It is a good rule not to administer chloroform to persons subject to epilepsy, affected with organic disease of the heart, or predisposed to cerebral congestion. For the rules laid down by M. Baudens for the administration of chloroform, see the *Am. Journ. of Med. Sci.* for Jan. 1854, p. 208.

Chloroform, as ordinarily prepared, is apt to produce, when inhaled, headache, nausea, and even vomiting. Perfectly pure chloroform, according to Soubeiran and Mialhe, does not produce these disagreeable effects, which are plausibly attributed to the presence of the pyrogenous oils. Dr. Simpson, however, finds that the purest chloroform that he uses not unfrequently causes vomiting; but Dr. Gregory attributes this effect, when following the use of the pure substance, to its administration after a full meal, which should always be avoided.

Chloroform has been recently used in Paris (Feb. 1854), with alleged success, by Dr. Delabarre, for producing local anæsthesia before surgical operations, without affecting the general system.

Chloroform having proved to be a relaxing agent and remedy for pain, when used by inhalation in surgery and midwifery, it was natural that its effects should be tried in the same way in spasmodic and painful affections. Accordingly, it has been inhaled in hiccough, hooping-cough, hysteria, the paroxysm of asthma, angina pectoris, nephritic colic, tetanus, poisoning from strychnia, hydrophobia, and the paroxysm of tic douloureux, and generally with decided advantage. Several German physicians have recently (1853) praised it in pneumonia as an expectorant and calming remedy. It has been employed also with success for the reduction of strangulated hernia. Mr. R. J. Mackenzie, of Edinburgh, bears testimony to its good effects, used by inhalation, in spasmodic stricture of the urethra, attended with retention of urine. Sometimes the urine is caused to flow at once; and, when this is not the case, the passage of the catheter is facilitated. (See *Am. Journ. of Med. Sci.*, July, 1852, p. 250.) As a hypnotic it has been given beneficially in delirium tremens, and in the noisy forms of chronic insanity.

Much has been said in relation to the dangers attendant upon the inhalation of chloroform, and, certainly, many more deaths have been reported from its use than from that of ether. Dr. Warren, in 1849, gave the details of ten cases, in which death was caused by chloroform, all occurring in little more than a year, and many other fatal cases have since occurred; and he declares that, if he were compelled to substitute chloroform for ether in inhalation, he would do it with much anxiety. Chloroform is unquestionably a more powerful agent than ether, and acts not only differently, but in a much smaller dose. The comparative smallness of its dose is certainly a ground of danger, when its administration falls into reckless or incompetent hands. At the same time it must be borne in mind that a great number of persons have inhaled chloroform, either as patients, or with a view to its pleasurable effects.

When the effects of chloroform inhalation proceed too far, the proper remedies are the horizontal posture, cold air fanned upon the face, cold water poured upon the head, sinapisms to the feet, frictions and heat to the body and extremities, and ammonia to the nostrils. If these remedies fail, artificial respiration must be resorted to. When the patient can swallow, strong coffee may be given with advantage. Galvanic electricity, passed through needles inserted in different parts of the body, is recommended by M. Abeille, of Ajaccio, as a powerful means of recalling sensibility; and it is highly probable that the electro-magnetic battery would be found useful. When an over-dose is taken by the stomach, the same remedies may be employed, with the addition of the stomach-pump, when vomiting cannot be produced by alum or mustard. In a case of suicide by swallowing chloroform, in which death took place in about thirty-four hours, reported in the fifth volume of the *Edinburgh Journ. of Med. Science*, the lining membrane of the larynx and trachea was found inflamed, the bronchi were loaded with a dirty-gray purulent fluid, the lungs were inflamed as in the first stage of pneumonia, and the brain and its membranes congested.

A preparation for inhalation, composed of one-third pure chloroform and

two-thirds nearly absolute alcohol, has been recommended by Dr. Warren, under the name of *strong chloric ether*. As the name, chloric ether, was originally applied by Dr. T. Thomson to the Dutch liquid, or chloride of olefiant gas, it would be well to abandon the same appellation to designate either chloroform, or its union with alcohol. Correct names for the latter combination would be either *alcoholic solution of chloroform*, or *tincture of chloroform*. Dr. Warren has used his preparation in fifty cases with success, and considers it safer than chloroform, and more agreeable than ether. (*Warren on the Effects of Chloroform and of Strong Chloric Ether*. Boston, 1849.) Further observation is required to determine the value of "strong chloric ether" as an anæsthetic. The alcohol may prove useful by obviating, through its stimulant properties, the depressing influence of the chloroform; and ether has been occasionally given, in connexion with chloroform, with the same view.

The preparation, sold in London and elsewhere under the name of "chloric ether," is a weak tincture of chloroform of variable quality, containing at most but 16 or 18 per cent. of chloroform, and sometimes not more than 5 or 6 per cent. B.

COLLODIUM. *U. S. Collodion. Ethereal Solution of Gun Cotton. Maynard's Adhesive Liquid.*

"Take of Cotton, freed from impurities, and finely carded, *half an ounce;* Nitrate of Potassa, in powder, *ten ounces;* Sulphuric Acid *eight fluidounces and a half;* Ether *two pints and a half;* Alcohol *a fluidounce*. Add the Sulphuric Acid to the Nitrate of Potassa in a Wedgwood mortar, and triturate them until uniformly mixed; then add the Cotton, and, by means of the pestle and a glass rod, imbue it thoroughly with the mixture for four minutes. Transfer the Cotton to a vessel containing water, and wash it, in successive portions, by agitation and pressure, until the washings cease to have an acid taste, or to be precipitated on the addition of chloride of barium. Having separated the fibres by picking, dry the Cotton with a gentle heat, dissolve it by agitation in the Ether previously mixed with the Alcohol, and strain. Collodion should be kept in closely stopped bottles previously well dried." *U. S.*

Cotton is changed into a peculiar explosive substance, called gun cotton, by the action of nitric acid. (See *Gun Cotton* in the *Appendix*.) It is this substance, freshly prepared, which is dissolved in ether assisted by a little alcohol, to form collodion. Gun cotton may also be prepared by the process of Dr. Ellet, of South Carolina College, which consists in steeping the cotton in a mixture of nitre and sulphuric acid. This mixture sets free the necessary nitric acid for effecting the change in the cotton. As this process affords a gun cotton which readily dissolves in ether, while other processes furnish a product which sometimes dissolves only partially, at other times not at all, it has been selected in the U. S. Pharmacopœia for preparing the cotton for solution in the ether. Gun cotton, prepared by the above process, if well washed, is not liable to decomposition. Prof. Procter has kept it for a year, and found it still perfectly soluble in ether.

Collodion is a transparent, colourless liquid, of a syrupy consistence, and ethereal smell. When applied to a dry surface, the ether quickly evaporates, and a transparent film is left, having remarkable adhesiveness and contractility. On account of the great volatility of ether, collodion must be kept in bottles well stopped. When insecurely kept, the liquid thickens and becomes less fit for the use of the surgeon. The thickened liquid sometimes contains acicular crystals of gun cotton, as was first observed by Mr. Higginson, of London, and afterwards by Dr. J. Leidy, of this city, who examined collodion for crystalline bodies with the microscope at the suggestion of Mr. E. Parrish.

Collodion was first applied to the purposes of surgery by Mr. J. Parker Maynard, student of medicine, of Boston, in January, 1847. It is employed for holding together the edges of incised wounds, for covering ulcers or abraded surfaces with an impervious film, not acted upon by water, and for encasing parts which require to be kept without relative motion. It is applied alone, brushed over the part, or by means of strips of muslin. In whatever way applied, the solvent quickly evaporates, and leaves the solid adhesive material. According to Lepage, gun cotton will dissolve in equal parts of ether and alcohol, forming a solution quite as adhesive as that made with ether alone. As this solution dries more slowly, it may prove preferable to the ethereal solution in certain cases. The strong contractile power of the collodion coating is an objection to it for some purposes. This property is removed, according to Mr. C. S. Rand, of Philadelphia, by dissolving first one part of gun cotton, and then one part of Venice turpentine in twenty parts of ether. To give more flexibility to the film, M. Sourisseau, of Kaiserberg, adds one part of elemi to twelve of collodion. According to Mr. Startin, of London, opacity and elasticity may be imparted at the same time, by adding from half a drachm to a drachm of lard, or some similar fatty matter, previously dissolved in ether, to an ounce of collodion. The qualities of softness and elasticity are given by combining collodion with castor oil, in the proportion of thirty parts to two, agreeably to the plan of M. Guérsant, who found it useful, thus modified, in erysipelas. An elastic collodion, somewhat similar, in which, besides castor oil, Venice turpentine and white wax are added, has been proposed by E. Lauras. (*Pharm. Journ.*, xii. 303.) In order to imitate the colour of the skin, an ethereal tincture of turmeric or of saffron may be added, so as to produce the desired tint. Dr. Meller has proposed a solution of shell lac in highly rectified alcohol, so as to have a gelatinous consistence, as a succedaneum for collodion.

Collodion has been used with advantage by Dr. J. R. Mitchell, of Dublin, and by Dr. Aran, to form an artificial covering to ulcers of the os and cervix uteri, thereby allowing the healing process to go on underneath; by M. Wetzlar, of Aix-la-Chapelle, in chilblains; by M. Sourisseau, and by Dr. Liman, of Berlin, in burns; and by Dr. J. W. Freer, of Illinois, in erysipelas. According to Dr. Christen, of Prague, collodion is useful in erysipelas from local causes only, such as wounds, ulcers, burns, &c., but hurtful in the disease from an internal cause. The same writer condemns its use to prevent pitting in smallpox as positively injurious. In superficial inflammation it appears to act on the principle of the contractile power of the film, thus driving out the blood from the inflamed vessels; and it is in this way probably that it proves useful in erysipelas.

Mr. Erasmus Wilson has used collodion with decided advantage in certain diseases of the skin. It acts principally by furnishing a substitute for the epidermis, and by the local pressure which its contraction in drying produces. In chapped nipples it has an admirable effect. Dr. J. H. Claiborne has used a thick coating of collodion with decided advantage as a compressing agent for the discussion of buboes. When applied to ulcers, abrasions, or chaps of the skin, it requires to be diluted with ether, so as to render it nearly as limpid as water. Mr. J. H. Tucker found it useful in stopping the bleeding from leech-bites. M. Sourisseau and Mr. E. H. Durden have used it as a coating for pills, which are thereby deprived of taste, but not injured in medicinal properties.

Collodion has become an important agent in photography, in the preparation of crystallotypes. B.

ALCOHOL.

Preparations of Alcohol.

ALCOHOL AMYLICUM. *Dub. Fusel Oil. Grain Oil. Corn Spirit Oil. Potato Spirit Oil. Amylic Alcohol. Hydrated Oxide of Amyle.*

"Take of the light liquid, which may be obtained at any large distillery, by continuing the distillation for some time after the pure spirit has been drawn off, *any convenient quantity*. Introduce it into a small still or retort connected with a condenser, and apply heat so as to cause distillation. As soon as the oil begins to come over unmixed with water, the receiver should be changed, and the distillation being resumed and carried nearly to dryness, the desired product will be obtained. The liquid drawn over during the first part of the distillation will consist of an aqueous fluid, surmounted by a stratum of the Fusel Oil. This latter, though impregnated with a minute quantity of water, should be separated and preserved, as being sufficiently pure for use." *Dub.*

This oil is always present in the products of the alcoholic fermentation. It is an ingredient in the ardent spirit obtained from various grains, but is most abundant in that procured from fermented potatoes. In grain spirit it is present in the proportion of about one part in five hundred by measure. When grain or potato whisky is distilled for the purpose of obtaining alcohol, the pure spirit will continue to come over for a certain time, after which, if the distillation be continued, a milky liquid will be obtained, which, upon standing, will be covered with a stratum of this peculiar oil. Subjected to distillation, the milky liquid will at first boil at a comparatively low temperature, and yield water and a little of the oil; but after a time the boiling point will rise to 269°, when the oil will come over pure. By changing the receiver when the oil begins to distil free from water, the Dublin College collects the oil separate from the watery part. In relation to fusel oil, see a paper by Edward N. Kent, in the *N. Y. Journ. of Pharm.* (i. 257); and one by Dr. Charles M. Wetherill, copied into the *Am. Journ. of Pharm.* for Sept. 1853.

Properties. Fusel oil is an oily, colourless liquid, of a strong offensive odour, and acrid burning taste. As usually prepared it has a pale-yellow colour. Its sp. gr. is 0·818; that of its vapour 3·15. It boils at 269°, and congeals at −4°, in the form of crystalline leaves. It is very sparingly soluble in water, but unites in all proportions with alcohol and ether. It dissolves iodine, sulphur, and phosphorus, and forms a good solvent for fats, resins, and camphor. When dropped upon paper it does not leave a greasy stain. It does not take fire like alcohol by the contact of flame, but requires to be heated to a temperature of about 130° before it begins to burn. Experiments on inferior animals show it to be an active irritant poison. It consists of ten eqs. of carbon 60, twelve of hydrogen 12, and two of oxygen 16=88. It is generally considered to be a hydrated oxide of a compound radical called *amyle* ($C_{10}H_{11}$); and on this view its formula will be $C_{10}H_{11},O+HO$. When subjected to oxidizing agents, it loses two eqs. of hydrogen and gains two of oxygen, and becomes $C_{10}H_9,O_3+HO$, or *amylic acid*, which is identical with *valerianic acid*, the acid found in valerian. This acid bears the same relation to fusel oil that acetic acid does to wine alcohol, and formic acid to methylic alcohol. Amyle has been isolated by Dr. E. Frankland. It is a colourless pellucid liquid, of the sp. gr. 0·7704. (*Chem. Gaz.*, March 15, 1850.)

Crude fusel oil may be obtained from the alcohol distillers. According to Mr. Kent, of New York, it contains, as impurities, water, alcohol, acetic and valerianic acid, oxide of iron, and an amyle compound, analogous to œnanthic ether.

Fusel oil was made officinal by the Dublin College, in its Pharmacopœia of 1850, as an artificial source of valerianic acid, to be used in forming valerianate of soda, from which, by double decomposition, three other valerianates, namely, those of iron, zinc, and quinia, are directed to be formed by the College.

Off. Prep. Sodæ Valerianas. B.

SPIRITUS FORTIOR. *Dub. Stronger Spirit.*

"Take of Rectified Spirit *half a gallon* [Imp. meas.]; Carbonate of Potash from Pearlash *eight ounces* [avoirdupois]. Having dried the Carbonate of Potash at a low red heat, and rapidly reduced it to powder in a warm mortar, let it be shaken occasionally for four hours in a bottle with the Spirit, maintaining the temperature of the mixture at or about 100°. After a subsidence of twenty minutes' duration, the liquid will form two distinct strata, the uppermost of which (measuring about seventy-four ounces) should be separated by decantation or a syphon, and then distilled with the aid of a Liebig's condenser, and chloride of zinc bath, until the product amounts to seventy-two ounces. The specific gravity of this spirit is 0·818." *Dub.*

In this newly introduced formula of the Dublin College, rectified spirit (sp. gr. 0·840) is shaken with hot and dry carbonate of potassa, to separate water; and the strengthened spirit, floating over the more aqueous portion, which forms the solvent of the added carbonate, is decanted, and distilled with a heat regulated by a chloride of zinc bath, until $\frac{6}{7}$ths have passed over.

Stronger spirit has the same general properties as alcohol, described at *page* 61 as the type of a class, including its varieties of different strengths. Agreeably to the density assigned to it by the Dublin College (0·818), it contains between eight and nine per cent. of water. It is used by the Dublin College in preparing several essences, and in making absolute alcohol. (See *next article.*)

Off. Prep. Alcohol, *Dub.*; Essentia Menthæ Piperitæ; Essentia Menthæ Viridis; Essentia Myristicæ Moschatæ. B.

ALCOHOL. *Ed., Dub. Absolute Alcohol.*

"Take of Rectified Spirit *one pint* [Imp. meas.]; Lime *eighteen ounces.* Break down the Lime into small fragments; expose the Spirit and Lime together to a gentle heat in a glass matrass till the Lime begins to slake; withdraw the heat till the slaking is finished, preserving the upper part of the matrass cool with damp cloths. Then attach a proper refrigeratory, and with a gradually increasing heat distil off seventeen fluidounces [Imp. meas.]. The density of this alcohol should not exceed 0·796; if higher, the distillation must have been begun before the slaking of the Lime was finished." *Ed.*

"Take of Stronger Spirit *one pint* [Imp. meas.]; pulverized fresh-burned Lime *ten ounces* [avoirdupois]. Having introduced the Lime and Spirit into a matrass, connected in the usual manner with a Liebig's condenser, let heat be applied until the lime begins to slake, and when this process is completed, distil by means of a chloride of zinc bath until the liquid which comes over, together with that obtained during the slaking, measures two ounces [Imp. meas.]. This being rejected, the receiver should be changed, and the distillation resumed, and continued until a product of nearly sixteen ounces [Imp. meas.] is procured. The specific gravity of this product is 0·795." *Dub.*

In these processes an alcoholic liquid of a given specific gravity is brought to its highest strength, so as to form absolute alcohol, by the dehydrating action of lime, and subsequent distillation. These processes are good ones, and, if carefully followed, will yield absolute alcohol. Dr. Christison assures us, that, on using pure quicklime, with the precautions mentioned in the Edinburgh formula, he has "always obtained from rectified spirit of the density of 0·838, seventeen-twentieths of its volume of alcohol, of density 0·796; and if the first tenth be kept apart, the rest may be obtained so low as 0·7942."

Soubeiran recommends the following as an easy method for obtaining alcohol free from water, abundantly and economically. 1st. Rectify alcohol, marking 86° of the centesimal alcoholmeter of Gay-Lussac (rectified spirit), by distilling it from carbonate of potassa. This operation raises its strength to 94° or 95°. 2d. Raise this alcohol to 97°, by distilling it with fused chloride of calcium, or by digesting it with quicklime (from which it must be afterwards poured off), in the proportion of a pint of the alcohol to 1½ ounces of the chloride, or 2¼ ounces of the lime. 3d. Distil the product of this operation slowly with quicklime, in the proportion of 3¾ ounces to the pint. The product will be absolute alcohol. The operation may be shortened to two steps, by distilling the alcohol of 94° or 95°, with an excess of quicklime (7½ ounces to the pint). In all cases, before decanting or distilling, the alcohol must be digested for two or three days with the lime, at a temperature between 95° and 100° F. Lime will not answer as a substance to be distilled from, unless it be in sufficient excess; for otherwise, towards the end of the distillation, the hydrate of lime formed will yield up its water to the alcohol, and weaken the distilled product. (*Journ. de Pharm.*, xxv. 1, Jan. 1839.) Thus it appears that the Edinburgh and Dublin processes for absolute alcohol are substantially the same as the short process of Soubeiran.

Properties. Absolute alcohol is a colourless, volatile liquid, of an agreeable odour and burning taste. It boils at 172°, and is not congealed by a cold of 166° below zero. Its officinal density is 0·794–6 *Ed.*; 0·795 *Dub.* Its sp. gr. is 0·7978 at 68°, according to Regnault; 0·79381 at 60° according to Drinkwater. The sp. gr. of its vapour is 1·59. Its freedom from water may be ascertained by dropping into it a piece of anhydrous baryta, which will remain unchanged if the alcohol be free from water; but otherwise will fall to powder. Another method for determining the same point, is to allow alcohol to stand for some time, in a stoppered bottle, on anhydrous sulphate of copper. If the alcohol be anhydrous, the salt will remain white; otherwise it will become blue. (*Casoria.*) Absolute alcohol should be free from fusel oil. In view of this impurity, the Edinburgh College gives the following test. "When mixed with a little solution of nitrate of silver and exposed to bright light, it remains unchanged, or only a very scanty dark precipitate forms."

Absolute alcohol burns with a pale flame without residue, the products being carbonic acid and water. Its vapour, passed through a porcelain tube filled with pumice-stone and heated to redness, yields carbon, gaseous carbohydrogens, aldehyd, naphthaline, benzine, phenic acid, and various other substances. (*Berthelot.*) It unites in all proportions with ether and water. Its union with water is attended by condensation and a rise of temperature. When mixed with water in the proportion of 51·9 volumes of alcohol to 48·1 of water, corresponding with one eq. of the former to six of the latter, the decrease of volume is at the maximum, amounting to 3·4 per cent. The powers of absolute alcohol as a solvent are very much the same as those of officinal alcohol, noticed at *page* 62.

Composition. Absolute alcohol consists of four eqs. of carbon 24, six of hydrogen 6, and two of oxygen 16=46; or, in volumes, of four volumes of the vapour of carbon, six of hydrogen, and one of oxygen, condensed into two volumes. Its empirical formula is, therefore, $C_4H_6O_2$. Viewed as a hydrated oxide of ethyle, its formula is $C_4H_5,O+HO$.

It has been stated at *page* 60, that during the vinous fermentation sugar disappears, and the sole products are alcohol and carbonic acid, which, taken together, are equal in weight to the sugar lost. Now, the comparative composition of the substances concerned supports the opinion that these are the sole products. Preparatory to the fermentation, the cane sugar is changed into *grape sugar*, or, according to Mitscherlich and Soubeiran, into *uncrystallizable sugar*. These two

sugars, dried at 212°, consist of $C_{12}H_{12}O_{12}$. Supposing one eq. of this fermentable sugar to be the subject-matter of the change, it will be found to have a composition which admits of its being broken up into two eqs. of alcohol and four of carbonic acid, without a remainder; for $C_{12}H_{12}O_{12}=2(C_4H_6O_2)$ and $4(CO_2)$.

The reasons are not obvious which induced the Edinburgh and Dublin Colleges to include absolute alcohol in their officinal lists. It is used in no preparation of the Edinburgh Pharmacopœia, and in only two of the Dublin, in neither of which is it necessary.

Pharm. Use. Employed as a solvent in preparing Arsenici et Hydrargyri Hydriodatis Liquor.

Off. Prep. Essentia Fœniculi. B.

ALCOHOL DILUTUM. *U.S.* SPIRITUS TENUIOR. *Lond., Ed., Dub.* *Diluted Alcohol. Proof Spirit.*

"Take of Alcohol, Distilled Water, each, *a pint.* Mix them. The specific gravity of Diluted Alcohol is 0·935." *U. S.*

"Take of Rectified Spirit *two pints;* Distilled Water *a pint.* Mix them. The density of the product should be 0·912." *Ed.*

"Take of Rectified Spirit *seven pints;* Distilled Water *four pints.* Mix. The specific gravity of Proof Spirit is 0·920." *Dub.*

The London College places diluted alcohol or proof spirit in the list of the Materia Medica. The *Edinburgh* College has ordered the strongest proof spirit, its density being 0·912, which is 7 over proof. It contains 52 per cent. of absolute alcohol, and is considerably stronger than the corresponding spirit of the former Edinburgh Pharmacopœia. The *London* College directs the sp.gr. to be 0·920. When of this strength, it contains 49 per cent. of pure alcohol, and may be formed by mixing five measures of the rectified spirit of that College with three of distilled water at the temp. of 62°. The Dublin proof spirit has the sp. gr. 0·920 also, and, therefore, agrees in strength with the corresponding spirit of the London College. The diluted alcohol of the U. S. Pharmacopœia has the sp. gr. 0·935, and contains only 42 per cent. of absolute alcohol. It is, therefore, the weakest officinal proof spirit.

Medical and Pharmaceutical Uses. The medicinal effects of alcohol, as it exists in brandy and other ardent spirits, have been detailed under other heads. (See *Alcohol, U. S., Spiritus Vini Gallici,* and *Vinum Album.*) As a pure diluted spirit, however, consisting solely of alcohol and water in determinate proportions, its use is exclusively pharmaceutical. It is employed as an addition to the compound infusion of gentian, and to some of the distilled waters and preparations of vinegar, in order to preserve them from decomposition; as a menstruum for extracting the virtues of some plants, preparatory to their being brought to the state of extracts and syrups; and in preparing many of the spirits, and a few of the medicated wines. But it is in forming the tinctures that diluted alcohol is principally employed. Many of these are formed with the officinal alcohol (rectified spirit), but the majority, with diluted alcohol (proof spirit) as the menstruum. As the latter contains more than half its weight of water, it is well fitted for acting on those vegetables, the virtues of which are partly soluble in water and partly in alcohol. The apothecary, however, should never substitute the commercial proof spirit for diluted alcohol, even though it may be of the same strength, on account of the impurities in the former; but when it is recollected how variable the so called proof spirits are in strength, the objection to their use in pharmacy becomes still stronger. Thus, according to Mr. Brande, gin contains 51·6 per cent. of alcohol of 0·825; and the percentage of the same alcohol is 53·39 in brandy, 53·68 in rum, 53·90 in Irish whisky, and 54·32 in Scotch whisky. The alcohol on which these results are based already contains 11 per cent. of water. B.

ALUMEN.

Preparations of Alum.

ALUMEN EXSICCATUM. *U. S., Lond., Ed.* ALUMEN SICCATUM. *Dub. Dried Alum.*

"Take of Alum, in coarse powder, *a convenient quantity.* Melt it in a shallow iron or earthen vessel, and maintain it at a moderate heat until ebullition ceases, and it becomes dry; then rub it into powder." *U. S.*

"Take of Alum *a pound.* Melt it over the fire; then increase the heat until ebullition has ceased." *Lond.*

The *Edinburgh* and *Dublin* processes agree substantially with that of the U. S. Pharmacopœia. When alum is heated, it quickly dissolves in its water of crystallization, which, if the heat be continued, is gradually driven off; and the salt swells up exceedingly, so as to make it expedient to use a vessel, the capacity of which is at least equal to three times the bulk of the alum operated on. When the boiling up has ceased, it is a sign that all the water has been driven off.

Properties. Dried alum, sometimes called *alumen ustum* or *burnt alum*, is in the form of an opaque white power, possessing a more astringent taste than the crystallized salt. Before pulverization, it is a light, white, opaque, porous mass. During the exsiccation, it loses from 41 to 46 per cent. of its weight in dissipated water. If, however, the heat be strongly urged, some of the acid is driven off, and the loss becomes still greater. Dried alum resists the action of water for a long time, showing that the process to which it has been subjected has altered its state of aggregation. In composition it differs from crystallized alum merely in the absence of water.

Medical Properties and Uses. Dried alum has occasionally been given in obstinate constipation, with the effect of gently moving the bowels, and of affording great relief from pain. (See *Alumen.*) The dose is from five to ten grains or more. Its principal medical use is as a mild escharotic for destroying fungous flesh. B.

LIQUOR ALUMINIS COMPOSITUS. *Lond. Compound Solution of Alum.*

"Take of Alum, Sulphate of Zinc, each, *an ounce;* Distilled Water *three pints* [Imp. meas.]. Rub the Alum and Sulphate together, and dissolve in the Water; then strain." *Lond.*

This was formerly called *aqua aluminosa Bateana*, or *Bates's alum water.* It is a powerful astringent solution, and is employed for cleansing and stimulating foul ulcers, and as an injection in gleet and leucorrhœa. It is also sometimes employed as a collyrium in ophthalmia after depletion; but when used in this way it must be diluted. A convenient formula is half a fluidounce of the solution, mixed with six and a half fluidounces of rose water. B.

AMMONIA.

Preparations of Ammonia.

AMMONIÆ CARBONAS. *U. S., Ed.* AMMONIÆ SESQUICARBONAS. *Lond., Dub. Carbonate of Ammonia. Sesquicarbonate of Ammonia. Mild Volatile Alkali.*

"Take of Muriate of Ammonia *a pound;* Chalk, dried, *a pound and a half.* Pulverize them separately; then mix them thoroughly, and sublime with a gradually increasing heat." *U. S.*

The *Edinburgh* process is the same as that of the U. S. Pharmacopœia. The *London* and *Dublin Colleges* have placed this salt in the list of the Materia Medica.

In the above process, by the reciprocal action of the salts employed, the carbonic acid unites with the ammonia, generating carbonate of ammonia, and the muriatic acid with the lime, forming water and chloride of calcium. The carbonate and water sublime together as a hydrated carbonate of ammonia, and the residue is chloride of calcium. In conducting the process, the retort should be of earthenware, and have a wide cylindrical neck; and the receiver should be cylindrical, to facilitate the extraction of the sublimate. The relative quantities of chalk and muriate of ammonia, for mutual decomposition, are 50·5 of the former, and 53·42 of the latter, or one eq. of each. In the formula a great excess of chalk is taken. An excess is desirable to ensure the perfect decomposition of the muriate of ammonia; any redundancy of which would sublime along with the carbonate, and render it impure.

Carbonate of ammonia is obtained, on the large scale, usually by subliming the proper materials from an iron pot into a large earthen or leaden receiver. Sulphate of ammonia may be substituted for the muriate with much economy, as was shown by Payen. Large quantities of this carbonate are manufactured indirectly from *coal-gas liquor* and *bone spirit;* the ammoniacal products in these liquors being successively converted into sulphate, muriate, and carbonate of ammonia. (See *Ammoniæ Murias.*) The salt as first obtained has a slight odour of tar, and leaves a blackish carbonaceous matter when dissolved in acids. Hence it requires to be purified, which is effected in iron pots, surmounted with leaden heads.

Properties. Carbonate (*sesquicarbonate*) of ammonia, recently prepared, is in white, moderately hard, translucent masses, of a fibrous and crystalline appearance, a pungent ammoniacal smell, and a sharp penetrating taste. It possesses an alkaline reaction, and when held under a piece of turmeric paper changes it to brown, owing to the escape of monocarbonate of ammonia. When long or carelessly kept, it gradually passes into the state of bicarbonate, becoming opaque and friable, and falling into powder. It is soluble without residue in about four times its weight of cold water, and is decomposed by boiling water with effervescence. According to Dr. Barker (*Observations on the Dublin Pharmacopœia*), it dissolves abundantly in diluted alcohol, as also in heated alcohol of the sp. gr. 0·836, with effervescence of carbonic acid. When heated on a piece of glass, it should evaporate without residue, and, if turmeric paper held over it undergoes no change, it has passed into bicarbonate. As now prepared from coal-gas liquor, it usually contains traces of tarry matter, which gives a dark colour to its solution in acids. When saturated with nitric acid, neither chloride of barium nor nitrate of silver causes a precipitate. The non-action of these tests shows the absence of sulphate and muriate of ammonia. It is decomposed by acids, the fixed alkalies and their carbonates, lime-water and magnesia, solution of chloride of calcium, alum, acid salts, such as bitartrate and bisulphate of potassa, solutions of iron (except the tartrate of iron and potassa), corrosive sublimate, the acetate and subacetate of lead, and the sulphates of iron and zinc.

Composition. It consists of three eqs. of carbonic acid 66, two of ammonia 34, and two of water 18=118; or, which comes to the same thing, of one eq. of bicarbonate 61, and one of monocarbonate 39, combined with the same quantity of water. The medicinal carbonate of ammonia is, therefore, when perfect, a *sesquicarbonate*, as it is called by the London and Dublin Colleges. Dalton and Scanlan, however, have rendered it probable that it is a double salt; for, when treated with a small quantity of cold water, monocarbonate is dissolved

and bicarbonate left. When converted into bicarbonate by exposure to the air, each eq. of the medicinal salt loses one eq. of monocarbonate, a change which leaves the acid and base in the proper proportion to form the bisalt. The mutual decomposition of the salts, employed in its preparation, would generate, if no loss occurred, the monocarbonate, and not the sesquicarbonate. The way in which the latter salt is formed may be thus explained. By the mutual decomposition of three eqs. of muriate of ammonia and of chalk respectively, three eqs. of monocarbonate of ammonia, three of water, and three of chloride of calcium are generated. During the operation, however, one eq. of ammonia, and one of water, forming together oxide of ammonium, are lost; so that there remain to be sublimed, three eqs. of carbonic acid, two of ammonia, and two of water; or, in other words, the exact constituents of the hydrated sesquicarbonate. When this is re-sublimed in the process of purification, two eqs. of the salt lose one eq. of carbonic acid, and become one eq. of 5-4 carbonate of ammonia.

Medical Properties and Uses. Carbonate of ammonia is stimulant, diaphoretic, antispasmodic, powerfully antacid, and in large doses emetic. Under certain circumstances it may prove expectorant; as when, in the last stages of phthisis, it facilitates, by increasing the muscular power, the excretion of the sputa. As a stimulant, it is exhibited principally in typhus fever, and very frequently in connexion with wine whey. Its principal advantage, in this disease, is its power to increase the action of the heart and arteries without unduly exciting the brain. It is employed, with a view to the same effect, and as an antacid, in certain stages of atonic gout, and in the derangement of the stomach supervening on habits of irregularity and debauchery. As a diaphoretic, it is resorted to in gout and chronic rheumatism, particularly the latter, in conjunction with guaiac. Dr. Pereira has employed it in many cases of epilepsy with benefit. In diabetes it has been recommended by Dr. Barlow in England, and Bouchardat in France. In cases of scrofula attended with languid circulation and dry skin, it is said to produce excellent effects. It is very seldom used as an emetic; but is supposed to act with advantage, in this way, in some cases of paralysis. In psoriasis and lepra vulgaris, Cazenave has used it with remarkable success. Two cases of glanders, successfully treated chiefly with five-grain doses of carbonate of ammonia, repeated every hour or two hours, are reported by Dr. Mackensie, of London. (*Ranking's Abstract*, No. 18, p. 230.) As an external application, it is rubefacient, and may be employed in several ways. Reduced to fine power, and mixed with some mild ointment, it is useful in local rheumatism. One part of it, incorporated with three parts of extract of belladonna, forms a plaster very efficacious in relieving local and spasmodic pains. Coarsely bruised, and scented with oil of lavender, it constitutes the common smelling salts, so much used as a nasal stimulant in syncope and hysteria. The ordinary dose is five grains, every two, three, or four hours, given in the form of pill or mixture; and as an emetic, thirty grains, to be repeated if necessary, and assisted by free dilution. It should never be given in powder, on account of its volatile nature. Pills of it may be made up with some vegetable extract, as of gentian, for example, and should be dispensed in a wide-mouthed vial, and not in a box.

Carbonate of ammonia is used as a chemical agent in preparing Zinci Oxidum and Ferrum Tartarizatum. It is sometimes employed to make effervescent draughts, 20 grains of the salt requiring for this purpose 6 fluidrachms of lemon juice, 24 grains of citric acid, or 25½ grains of tartaric acid.

Off. Prep. Ammoniæ Bicarbonas; Cuprum Ammoniatum; Liquor Ammoniæ Acetatis; Liquor Ammoniæ Citratis; Liquor Ammoniæ Sesquicarbonatis; Potassæ Bicarbonas; Potassæ Carbonas Purum. B.

AMMONIÆ BICARBONAS. *Dub. Bicarbonate of Ammonia.*

"Take of Commercial Sesquicarbonate of Ammonia *any convenient quantity.* Reduce it to a fine powder, and having spread it on a sheet of paper, expose it to the air for twenty-four hours. Let it be now enclosed in a well stopped bottle." *Dub.*

This salt is officinal only in the Dublin Pharmacopœia. The sesquicarbonate, by exposure to the air, loses monocarbonate by evaporation, and is converted into bicarbonate. This salt is an opaque white powder, having a faint ammoniacal taste and smell. It is less soluble in water than the sesquicarbonate, requiring eight times its weight of that liquid to dissolve it. It possesses, though in an inferior degree, the same medical properties as the sesquicarbonate, and furnishes, according to Dr. Barker, of Dublin, the means of prescribing ammonia in a convenient and palatable form. The dose is from six to twenty-four grains, dissolved in cold water, as hot water decomposes the salt.

The curious fact has been ascertained by Mr. L. Thompson, of Newcastle on Tyne, that bicarbonate of ammonia is exhaled from the lungs in the amount of about three grains in twenty-four hours. (*Philos. Mag.* for Feb. 1847.) B.

LIQUOR AMMONIÆ SESQUICARBONATIS. *Lond.* AMMONIÆ CARBONATIS AQUA. *Ed. Solution of Sesquicarbonate of Ammonia. Water of Carbonate of Ammonia.*

"Take of Sesquicarbonate of Ammonia *four ounces;* Distilled Water *a pint* [Imp. meas.]. Dissolve and strain." *Lond.*

The *Edinburgh* solution is of the same strength as the London.

This preparation may be viewed as a saturated aqueous solution of carbonate of ammonia. It is very properly omitted in the United States Pharmacopœia; as it is liable to change by keeping, and the solution of the salt may be readily ordered of any desired strength in prescription. The dose is from half a fluidrachm to a fluidrachm, given in any bland liquid.

Off. Prep. Linimentum Ammoniæ Sesquicarbonatis; Pilulæ Cupri Ammoniati. B.

AMMONIÆ HYDRO-SULPHURETUM. *Dub. Hydrosulphuret of Ammonia. Solution of Hydrosulphate of Ammonia.*

"Take of Solution of Ammonia *four fluidounces* [Imp. meas.]; Sulphuret of Iron *one ounce and a half* [avoirdupois]; Oil of Vitriol of Commerce *one fluidounce and a half* [Imp. meas.]; Water *fifteen ounces* [avoird.]; Distilled Water *two ounces* [avoird.]. Place the Sulphuret of Iron and Water in a two-necked bottle, and, adding the Oil of Vitriol by degrees through a safety funnel, conduct by suitable tubes the sulphuretted hydrogen which is disengaged, first through the Distilled Water placed in a small intermediate vial, and then to the bottom of a bottle containing the Ammonia, the neck of the latter, through which the glass tube conveying the gas passes, being loosely plugged with tow. If, when the development of gas has ceased, a drop of the ammoniacal liquid, added to a saturated solution of sulphate of magnesia, gives no precipitate, the preparation is completed; but should a precipitate occur, the hydrosulphuret still contains free ammonia, and must, therefore, be again subjected to the action of a stream of sulphuretted hydrogen. The Hydrosulphuret of Ammonia must be kept in a green glass bottle, furnished with an accurately ground stopper. The specific gravity of this solution is 0·999." *Dub.*

This preparation is a solution of hydrosulphate of ammonia in water, and is formed by passing a stream of hydrosulphuric acid gas (sulphuretted hydrogen) through water of ammonia, contained in a Wolfe's bottle. The hydrosulphuric acid is generated by the action of dilute sulphuric acid on sulphuret of iron. The water yields its oxygen to the iron forming protoxide of iron, with which the

sulphuric acid combines; while the hydrogen of the water, uniting with the sulphur, generates the hydrosulphuric acid.

Properties. Hydrosulphuret of ammonia is a liquid of a greenish-yellow colour, very fetid smell, and acrid, disagreeable taste. It is characterized by giving coloured precipitates with neutral metallic solutions, for which it is much used as a test. It is decomposed by acids, which cause the escape of hydrosulphuric acid with effervescence, and the deposition of sulphur. The salt present in it appears to be a bihydrosulphate, consisting of two eqs. of hydrosulphuric acid 34, and one of ammonia 17=51.

Medical Properties. This preparation is sedative, lessening the action of the heart in a remarkable degree, and producing nausea, vomiting, vertigo, and drowsiness. It has been used in diabetes mellitus, in which it was proposed as a remedy by Dr. Cruickshank, for the purpose of lessening the morbid appetite which often attends that affection, and has been employed by Dr. Rollo and others. The dose is from five to six drops in a tumblerful of water three or four times a day, to be gradually increased until giddiness is produced. B.

LIQUOR AMMONIÆ. *U. S.* AMMONIÆ LIQUOR. *Lond., Dub.* AMMONIÆ AQUA. *Ed.* AQUA AMMONIÆ. *Solution of Ammonia. Water of Ammonia.*

"Take of Muriate of Ammonia, in fine powder, Lime, each *a pound;* Distilled Water *a pint;* Water *nine fluidounces.* Break the Lime in pieces, and pour the Water upon it in an earthen or iron vessel; then cover the vessel, and set it aside till the Lime falls into powder and becomes cold. Mix this thoroughly with the Muriate of Ammonia in a mortar, and immediately introduce the mixture into a glass retort. Place the retort upon a sand-bath, and adapt to it a receiver, previously connected, by means of a glass tube, with a quart bottle containing the Distilled Water. Then apply heat, to be gradually increased till the bottom of the iron vessel containing the sand becomes red-hot; and continue the process so long as ammonia comes over. Remove the liquor contained in the quart bottle, and for every fluidounce of it add three and a half fluidrachms of Distilled Water, or so much as may be necessary to raise its specific gravity to 0·960. Keep the solution in small bottles well stopped. Solution of Ammonia may also be prepared by mixing one part, by measure, of Stronger Solution of Ammonia with two parts of Distilled Water." *U. S.*

"Take of Sal Ammoniac, in fine powder, fresh-burned Lime, each *eight ounces* [avoirdupois]; Water *four ounces* [avoird.]; Distilled Water *sixteen ounces* [avoird.]. Pour on the Lime the four ounces of Water, and, when the slaked lime has cooled, mix it well with the Sal Ammoniac by trituration in a mortar. Introduce the mixture into a matrass of glass, or, if such can be had, an iron bottle, and, having closed this by means of a cork perforated by a suitable tube for conveying off the gas, apply, with the intervention of sand, a gentle heat, which must be gradually augmented, and cause the ammonia, as it is evolved, to pass first through a small Wolfe's bottle furnished with a syphon safety-tube containing mercury, and thence to the bottom of an [Imperial] pint bottle containing the Distilled Water. The temperature of the latter must be prevented from rising as the absorption of the gas proceeds, by surrounding the bottle which contains it with cold water, which should be frequently renewed. The specific gravity of this solution is 0·950." *Dub.*

The *London* College now places solution of ammonia in the Materia Medica list, directing it to have the specific gravity 0·960.

The *Edinburgh* process includes the formation of Liquor Ammoniæ Fortior and this preparation at one operation. The process has been quoted at length and explained under another head. (See *Liquor Ammoniæ Fortior.*) The solution of ammonia of this College is directed to have the sp. gr. 0·960.

The object of the above processes is to obtain a weak aqueous solution of the alkaline gas ammonia. The muriate of ammonia is decomposed by the superior affinity of the lime for its acid, ammonia is disengaged, and the lime, combining with the acid, forms chloride of calcium and water. The lime is slaked to render it pulverulent, in which state it acts more readily on the muriate of ammonia. The Wolfe's bottle is intended to retain any water holding in solution undecomposed muriate, or the oily matter sometimes contained in this salt, as well as other impurities, which may be driven over by the heat; while the pure gas passes forward through the glass tube into the bottle containing the distilled water, which should not fill it, on account of the increase of bulk which the water acquires during the absorption of the gas. The tube should continue down to near the bottom of the bottle, and pass through a cork, loosely fitting its mouth. To prevent the regurgitation of the water from the bottle into the intermediate vessel, the latter should be furnished with a Welter's tube of safety, as directed by the Dublin College. Large bottles are improper for keeping the water of ammonia obtained; as, when they are partially empty, the atmospheric air contained within them is apt to furnish a little carbonic acid to the ammonia.

In preparing solution of ammonia, the Pharmacopœias now agree in using equal weights of muriate of ammonia and lime for generating the gaseous ammonia. This proportion gives a great excess of lime, compared with the quantity required if determined by the equivalents. But in practice it is found advantageous to have an excess, as well to insure the full decomposition of the muriate of ammonia, as to make up for accidental impurities in the lime.

Solution of ammonia is obtained on the large scale by manufacturing chemists, with greater economy, from the sulphate instead of the hydrochlorate of ammonia.

The *U. S.*, *London*, and *Edinburgh* Pharmacopœias give directions for diluting *Liquor Ammoniæ Fortior*, so as to reduce it to the strength of *Liquor Ammoniæ*. This is effected by mixing one measure of the stronger preparation with two measures of distilled water (*U. S.*, *Lond.*), or with two and a half measures (*Ed.*). By dilution to this extent the stronger solution is brought uniformly to the sp. gr. 0·960; the Edinburgh solution requiring more water, because more concentrated.

Properties. The properties of Liquor Ammoniæ Fortior have already been given. (See *page* 84.) Those of the officinal solution of ammonia, described in this place, are the same in kind, but weaker in degree. Its specific gravity in the U. S., London, and Edinburgh Pharmacopœias is the same, 0·960; in the Dublin, 0·950. When of the density 0·960, 100 grains of it saturate 30 grains of officinal sulphuric acid, and contain nearly 10 grains of ammonia. It is incompatible with acids, and with acidulous and most earthy and metallic salts; but it does not decompose the salts of lime, baryta, or strontia, and decomposes those of magnesia only partially. If precipitated by lime-water, the ammonia is partly carbonated. When saturated with nitric acid, it should give no precipitate with carbonate of ammonia, nitrate of silver, or chloride of barium. A precipitate with the first indicates earthy matter; with the second muriatic acid or a chloride; with the third sulphuric acid or a sulphate. Commercial solution of ammonia sometimes contains *pyrrol*, *naphthaline*, and other soluble impurities. These may be detected by the solution being reddened by nitric acid, and, after having been supersaturated with muriatic acid, by its tinging a slip of fir wood of a rich purple colour, characteristic of pyrrol. (*Maclagan.*) The source of these impurities is coal-gas liquor, from which the ammoniacal compounds are largely obtained.

Composition. Water is capable of absorbing 670 times its volume of ammoniacal gas at 50°, and increases its bulk about two-thirds. But the officinal solution of ammonia is by no means a saturated one. Thus, the ammonia con-

tained in the U. S., London, and Edinburgh preparations is about 10 per cent.; in the Dublin, about 12½ per cent. The following table gives the per centage of ammoniacal gas in aqueous solutions of different densities.

Specific Gravity.	Ammonia per cent.	Specific Gravity.	Ammonia per cent.	Specific Gravity.	Ammonia per cent.
0·8750	32·50	0·9326	17·52	0·9545	11·56
0·8875	29·25	0·9385	15·88	0·9573	10·82
0·9000	26·00	0·9435	14·53	0·9597	10·17
0·9054	25·37	0·9476	13·46	0·9619	9·60
0·9166	22·07	0·9513	12·40	0·9692	9·50
0·9255	19·54				

Medical Properties and Uses. Solution of ammonia is stimulant, sudorific, antacid, and rubefacient. It stimulates more particularly the heart and arteries, without unduly exciting the brain. As a stimulant, it is occasionally employed in paralysis, hysteria, syncope, asphyxia, and similar affections. In the same complaints it is often applied to the nostrils with advantage; but, in cases of insensibility, care must be taken not to carry the application too far, for fear of inducing dangerous and even fatal bronchitis. As an antacid, it is one of the best remedies in heartburn, and for the relief of sick headache when dependent on acidity of stomach. In these cases it acts usefully also by stimulating the stomach. In the bites of poisonous serpents, it has long been deemed a powerful antidote. A successful case, caused by the bite of a cobra de capello, is reported by Dr. W. Chalmers, formerly of Bengal, in which the solution of ammonia was chiefly relied on. It has been recommended by Dr. Guérard as an application to burns, which have proceeded to the extent of rubefaction or raising the cuticle, as a means of relieving the pain and hastening the cure. (*Journ. de Pharm.*, Jan. 1849.) As a rubefacient it is employed united with oils in the form of volatile liniment. (See *Linimentum Ammoniæ.*) The dose is from ten to thirty drops, largely diluted with water to prevent its caustic effect on the mouth and throat. When swallowed in an over-dose, its effects are those of a corrosive poison. The best antidotes are vinegar and lemon-juice, which act by neutralizing the ammonia, and must be promptly applied to be useful. The consecutive inflammation must be treated on general principles.

Pharm. Uses. To prepare Aconitia; Calcis Phosphas Præcipitatum; Ferri Oxidum Hydratum; Morphia; Morphiæ Acetas; Pulvis Antimonialis, *Dub.;* Spiritus Ætherеus Nitrosus; Strychnia; Veratria.

Off. Prep. Ammoniæ Liquor Fortior, *Dub.;* Ammoniæ Hydro-sulphuretum; Ferri Ammonio-citras; Hydrargyrum Ammoniatum; Linimentum Ammoniæ; Linimentum Camphoræ Compositum; Linimentum Hydrargyri. B.

LIQUOR AMMONIÆ ACETATIS. *U. S.*, *Lond.* AMMONIÆ ACETATIS AQUA. *Ed.* AMMONIÆ ACETATIS LIQUOR. *Dub.* SPIRITUS MINDERERI. *Solution of Acetate of Ammonia. Spirit of Mindererus.*

"Take of Diluted Acetic Acid *two pints;* Carbonate of Ammonia, in powder, *a sufficient quantity.* Add the Carbonate of Ammonia gradually to the Acid until it is saturated." *U. S.*

The *London* and *Dublin* processes are substantially the same as the above.

"Take of Distilled Vinegar (from French Vinegar in preference) *twenty-four fluidounces* [Imperial measure]; Carbonate of Ammonia *an ounce.* Mix them and dissolve the salt. If the solution has any bitterness, add by degrees a little Distilled Vinegar till that taste be removed. The density of the Distilled Vinegar should be 1·005, and that of the Aqua Acetatis Ammoniæ 1·011." *Ed.*

This preparation is an aqueous solution of acetate of ammonia. The process by which it is formed constitutes a case of single elective affinity. The acetic acid decomposes the carbonate, combines with the ammonia forming the acetate of ammonia, and disengages the carbonic acid with effervescence. The Edinburgh is now the only British Pharmacopœia that uses distilled vinegar in forming this preparation; the London and Dublin Colleges having followed in their recent Pharmacopœias the U. S. process, which takes the officinal diluted acetic acid instead of distilled vinegar for saturating the carbonate. (See *Acidum Aceticum Dilutum.*) The use of diluted acetic acid is preferable to that of distilled vinegar; for, besides furnishing a solution of the acetate of uniform strength, a result which cannot be attained by the employment of distilled vinegar, it avoids the production of a brownish solution, which uniformly follows the use of the latter, especially when it has been condensed in a metallic worm. The quantity of carbonate of ammonia, necessary to saturate a given weight of the acid of average strength, cannot be laid down with precision, on account of the variable quality of the salt. The preparation, when made with the diluted acetic acid of the U. S. Pharmacopœia, contains about six per cent. of acetate of ammonia. It is more convenient to add the salt to the acid than the acid to the salt; as the point of saturation is thus more easily attained. This point is best ascertained by the alternate use of turmeric and litmus paper; and it is a good rule to allow a slight acidity to prevail, which will be due to carbonic acid dissolved in the liquid, and will disappear as soon as this acid is dissipated by time.

Properties. Solution of acetate of ammonia, when made of pure materials, is a limpid and colourless liquid without smell. Its taste is saline, and resembles that of a mixture of nitre and sugar. When it contains an excess of alkali, its taste is bitterish. It should be freshly prepared at short intervals; as its acid becomes decomposed, and a portion of carbonate of ammonia is generated. As formerly prepared, under the name of *spiritus Mindereri*, it was made from the impure carbonate of ammonia containing animal oil, which modified the preparation by giving rise to a portion of ammoniacal soap. When pure it is not coloured by hydrosulphuric acid, nor precipitated by chloride of barium. Nitrate of silver precipitates crystals of acetate of silver, soluble in water and especially in nitric acid. An insoluble precipitate with this test is chloride of silver, and shows the presence of muriatic acid. Potassa disengages ammonia, sulphuric acid, acetous vapours. When evaporated to dryness, the residue is wholly dissipated by heat, with the smell of ammonia. It is incompatible with acids, the fixed alkalies and their carbonates, lime-water, magnesia, sulphate of magnesia, corrosive sublimate, the sulphates of iron, copper, and zinc, and nitrate of silver. When it contains free carbonic acid, it produces with the acetate or subacetate of lead a precipitate of carbonate of lead, which, being mistaken for the sulphate, has sometimes led to the erroneous conclusion that sulphuric acid was present in the distilled vinegar, when this has been employed. Acetate of ammonia, the salt in solution in this preparation, is difficultly crystallizable, and very deliquescent. It may be obtained by sublimation from a mixture of equal parts of dry acetate of potassa or of lime, and muriate of ammonia. It consists of one eq. of acetic acid 51, and one of ammonia 17=68. When crystallized it contains seven eqs. of water 63.

Medical Properties and Uses. Solution of acetate of ammonia is a valuable diaphoretic, much employed in febrile and inflammatory diseases. According to the indications to be answered by its use, it is variously combined with nitre and antimonials, camphor and laudanum. If, instead of promoting its determination to the skin by external warmth, the patient walk about in a cool air, its action will be directed to the kidneys. It is sometimes used externally as a discutient. Mr. Brande speaks of it as an excellent application in mumps, applied hot upon

a piece of flannel. In the hydrocele of children, it is strongly recommended by Dr. Maushner, applied by means of compresses kept constantly moist. (*Journ. de Pharm.*, 3e *sér.*, v. 317.) Mixed in the quantity of a fluidounce with seven fluidounces of rosewater, and two fluidrachms of laudanum, it forms a useful collyrium in chronic ophthalmia. The late Dr. A. T. Thomson used it as a lotion with good effect in porrigo affecting the scalp. The dose is from half a fluidounce to a fluidounce and a half, every three or four hours, mixed with water and sweetened with sugar. It proves sometimes very grateful to febrile patients, when prescribed with an equal measure of carbonic acid water. B.

LIQUOR AMMONIÆ CITRATIS. *Lond. Solution of Citrate of Ammonia.*

"Take of Citric Acid *three ounces;* Distilled Water *a pint* [Imperial measure]; Sesquicarbonate of Ammonia *two ounces and a half*, or *a sufficient quantity*. Dissolve the Acid in the Water, and add the Sesquicarbonate to saturation." *Lond.*

In consequence of the want of correspondence between the London measures and those in use with us, it will be more convenient to make this preparation in accordance with the U. S. process for Solution of Citrate of Potassa. The result will not be materially different. All that is required is to saturate lemon or lime juice, or an equivalent solution of citric acid, with carbonate of ammonia. Such a solution may be made by rubbing half an ounce of citric acid first with two minims of oil of lemons, and then with half a pint of water till it is dissolved.

A more elegant mode of exhibition is that of an extemporaneous effervescing draught. To half a fluidounce of lemon juice mixed with an equal measure of water, or to a fluidounce of a solution of citric acid containing 17 grains of the acid, is to be added half a fluidounce of a solution containing 13 grains of carbonate of ammonia, and the mixture is to be administered while effervescing.

The solution of citrate of ammonia is given as a refrigerant diaphoretic in febrile complaints, and is especially applicable to typhoid fevers, with a hot and dry skin. A tablespoonful of the saturated solution, or the whole quantity above mentioned of the effervescing preparation, may be repeated every hour, two, or three hours. W.

SPIRITUS AMMONIÆ. *U. S., Ed. Spirit of Ammonia.*

"Take of Muriate of Ammonia, in fine powder, Lime, each *a pound;* Alcohol *twenty fluidounces;* Water *nine fluidounces*. Slake the lime with the Water, mix it with the Muriate of Ammonia, and proceed in the manner directed for Solution of Ammonia, the Alcohol being introduced into the quart bottle instead of Distilled Water. When all the ammonia has come over, remove the liquor contained in the quart bottle, and keep it in small bottles well stopped." *U. S.*

"Take of Rectified Spirit *two pints* [Imperial measure]; fresh-burnt Lime *twelve ounces* [a pound]; Muriate of Ammonia, in very fine powder, *eight ounces;* Water *six fluidounces and a half* [Imp. meas.]. Let the Lime be slaked with the Water in an iron or earthenware vessel, and cover the vessel till the powder be cold; mix the Lime and Muriate of Ammonia quickly and thoroughly in a mortar, and transfer the mixture at once into a glass retort; adapt to the retort a tube which passes nearly to the bottom of a bottle containing the Rectified Spirit; heat the retort in a sand-bath gradually, so long as anything passes over, preserving the bottle cool. The bottle should be large enough to contain one-half more than the spirit used." *Ed.*

Spirit of ammonia is now officinal in the U. S. and Edinburgh Pharmacopœias only; the London and Dublin Colleges having dismissed the preparation under the same name. It is a solution of caustic ammonia in rectified spirit. The proportions of the ingredients of the *U. S.* formula are so adjusted as to give a preparation, containing between 10 and 11 per cent. of ammonia, and capable of

saturating about 30 per cent. of officinal sulphuric acid. Accordingly it agrees, as it was intended it should, in ammoniacal strength, with the U. S. *Liquor Ammoniæ.* Its sp. gr. is 0·831, or thereabouts. The *Edinburgh* spirit of ammonia may be roughly estimated to be not quite one-third as strong as that of the U. S. Pharmacopœia; for the ammonia extricated from the same quantity of muriate of ammonia, is passed into three times as much rectified spirit. The density of the Edinburgh spirit is "about 0·845." As rectified spirit becomes lighter by the absorption of ammoniacal gas, it is evident that the alcoholic menstruum, in the Edinburgh preparation, gains water as well as ammonia in the distillation. This addition of water to the product is prevented by the intermediate receiver used in the U. S. process, and consequently the spirit of ammonia obtained has a less specific gravity than that of rectified spirit.

Properties. The *U. S.* spirit of ammonia, formerly called *ammoniated alcohol*, is a transparent colourless liquid, having a strong ammoniacal odour, and acrid taste. When good it does not effervesce with diluted muriatic acid; but if old or carelessly kept, it is apt to be partially carbonated, as shown by this test. It, however, absorbs carbonic acid more slowly than Liquor Ammoniæ. The *Edinburgh* preparation agrees in nature with the *U. S.* spirit, but is only one-third its strength.

Medical Properties and Uses. Spirit of ammonia is stimulant and antispasmodic, and is given in hysteria, flatulent colic, and nervous debility. It is, however, not much used; the aromatic spirit, which is pleasanter and has similar properties, being preferred. The dose of the U. S. preparation is from ten to thirty drops in a wineglassful of water; of the Edinburgh from thirty drops to a fluidrachm. Spirit of ammonia dissolves resins, gum-resins, camphor, and the volatile oils. The Edinburgh College uses its spirit for making the aromatic and fetid spirits of ammonia, and the *ammoniated tinctures*, as is seen by the subjoined list. The U. S. spirit enters into no officinal preparation.

Off. Prep. Spiritus Ammoniæ Aromaticus, *Ed.;* Spiritus Ammoniæ Fœtidus, *Ed.;* Tinctura Castorei Ammoniata; Tinct. Guaiaci Ammoniata, *Ed.;* Tinct. Opii Ammoniata; Tinct. Valerianæ Ammoniata, *Ed.* B.

SPIRITUS AMMONIÆ AROMATICUS. *U. S., Lond., Ed., Dub.* *Aromatic Spirit of Ammonia.*

"Take of Muriate of Ammonia *five ounces;* Carbonate of Potassa *eight ounces;* Cinnamon, bruised, Cloves, bruised, each, *two drachms;* Lemon Peel *four ounces;* Alcohol, Water, each, *five pints.* Mix them and distil seven pints and a half." *U. S.*

The London formula is the original of the above, and need not be quoted.

"Take of Spirit of Ammonia *eight fluidounces;* Volatile Oil of Lemon Peel *a fluidrachm;* Volatile Oil of Rosemary *a fluidrachm and a half.* Dissolve the Oils in the Spirit by agitation." *Ed.*

"Take of Rectified Spirit *three pints;* Stronger Solution of Ammonia *six fluidounces;* Oil of Lemon *half a fluidounce;* Oil of Nutmeg *two fluidrachms;* Oil of Cinnamon *half a fluidrachm.* Dissolve the Oils in the Spirit, and add the Solution of Ammonia. Mix with agitation and filter. The specific gravity of this solution is 0·852." *Dub.* The measures used are Imperial.

The *London* and *U. S.* aromatic spirit of ammonia is made by impregnating the menstruum with monocarbonate of ammonia, formed by double decomposition between muriate of ammonia and carbonate of potassa. Thus the product is a spirituous solution of the monocarbonate, impregnated with aromatics. The aromatic spirit of the *Edinburgh* College is a mere solution of certain volatile oils in the caustic simple spirit of that College. The *Dublin* College, in its revised Pharmacopœia of 1850, ammoniates rectified spirit with stronger solution of ammonia, and impregnates the product with certain volatile oils.

The *U. S.* and *London* aromatic spirits are the same, and have the sp. gr. 0·918. The *Edinburgh* and *Dublin* preparations are much stronger, being rectified spirit highly impregnated with caustic ammonia. The density of the Edinburgh preparation is not given, that of the Dublin is 0·852.

Medical Properties and Uses. Aromatic spirit of ammonia is fitted to fulfill the same indications as the simple spirit; but is much more used on account of its grateful taste and smell. It is advantageously employed as a stimulant antacid in sick headache. The dose of the U. S. and London spirit is from thirty drops to a fluidrachm or more, sufficiently diluted with water; that of the Edinburgh and Dublin, about one-third as much. The spirit is compatible with sulphate of magnesia, and may be usefully added to aperient draughts of that salt, to render them less offensive to the stomach.

Off. Prep. Tinctura Colchici Composita; Tinct. Guaiaci Ammoniata, *U. S.*, *Lond.*; Tinct. Valerianæ Ammoniata, *U. S.*, *Lond.* B.

SPIRITUS AMMONIÆ FŒTIDUS. *Lond., Ed., Dub. Fetid Spirit of Ammonia.*

"Take of Hydrochlorate [Muriate] of Ammonia *ten ounces;* Carbonate of Potassa *sixteen ounces;* Rectified Spirit, Water, each, *three pints* [Imperial measure]; Assafetida *five ounces.* Mix them; then with a slow fire distil three pints [Imp. meas.]." *Lond.* Sp. gr. 0·861.

"Take of Spirit of Ammonia *ten fluidounces and a half* [Imp. meas.]; Assafetida *half an ounce.* Break the Assafetida into small fragments, digest it in the Spirit for twelve hours, and distil over ten fluidounces and a half by means of a vapour-bath heat." *Ed.*

"Take of Assafetida *one ounce and a half* [avoirdupois]; Rectified Spirit *one pint and a half* [Imperial measure]; Stronger Solution of Ammonia *three fluidounces.* Break the Assafetida into small pieces, and macerate it in the Spirit for twenty-four hours; then distil off the entire of the Spirit, and mix the products with the Solution of Ammonia. The sp. gr. of this preparation is 0·849." *Dub.*

Of these preparations that of the London College is mainly an alcoholic solution of Carbonate of Ammonia; those of the Edinburgh and Dublin Colleges a similar solution of caustic ammonia. The small proportion of the volatile oil of assafetida can have little other effect than to impart a disagreeable odour and taste. The spirit is colourless at first, but becomes brownish with age. It is given in hysteria in doses of from thirty drops to a fluidrachm. W.

ANTIMONIUM.

Preparations of Antimony.

ANTIMONII TERCHLORIDI LIQUOR. *Dub. Solution of Terchloride of Antimony.*

"Take of Prepared Sulphuret of Antimony *one pound* [avoirdupois]; Muriatic Acid of Commerce *four pints* [Imp. meas.]. Upon the Sulphuret, placed in a porcelain capsule, pour the Acid, and, constantly stirring, apply to the mixture, beneath a flue with a good draught, a gentle heat, which must be gradually augmented as the development of gas begins to slacken, and finally carried to ebullition, and maintained at this temperature for fifteen minutes. The vessel being now removed from the fire, let its liquid contents be separated by filtration through calico, returning what passes through first, in order that a perfectly clear solution may be obtained. Transfer the liquid to another capsule, and having boiled it down to the bulk of one quart [Imp. meas.], allow it to cool,

and preserve it in a bottle, furnished with a well-ground glass stopper. The specific gravity of this solution is 1·470." *Dub.*

When tersulphuret of antimony is dissolved by the aid of heat in muriatic acid, a double decomposition takes place, resulting in the formation of terchloride of antimony and hydrosulphuric acid (sulphuretted hydrogen), which gives rise to effervescence. As this gas is exceedingly offensive and deleterious, the materials, during the reaction, are directed to be placed under a flue with a good draught. After the reaction is over, the resulting aqueous solution of terchloride of antimony, after having been strained, is boiled down to a determinate volume.

Properties. Solution of terchloride of antimony is a pale-yellow, transparent, dense liquid, possessing caustic properties. When of a deep-red colour, it is impure from the presence of iron. Its sp. gr., concentrated to the extent directed by the Dublin College, is 1·470. When it is distilled, water, the excess of muriatic acid, and any tersulphuret of arsenic that may happen to be present, are first expelled, and afterwards the terchloride volatilizes. The pure terchloride may be obtained by changing the receiver, as soon as the distilled product concretes on cooling. Pure terchloride of antimony, called by the earlier chemists *butter of antimony*, is a white, readily fusible solid, of the consistence of butter, deliquescent and powerfully caustic, and volatilizable under an obscure red heat. It was formerly used in medicine as a caustic. It usually acts without causing much pain or inflammation, and, after the separation of the eschar, forms a clean, healthy ulcer.

Solution of terchloride of antimony is a new officinal of the Dublin Pharmacopœia of 1850, and was probably introduced not as a therapeutic agent, but as a source of the officinal oxide of antimony.

Off. Prep. Antimonii Oxydum. B.

ANTIMONII OXIDUM. *Ed.* Antimonii Oxydum. *Dub. Oxide of Antimony. Teroxide of Antimony.*

"Take of Sulphuret of Antimony, in fine powder, *four ounces;* Muriatic Acid (commercial) *a pint* [Imp. meas.]; Water *five pints* [Imp. meas.]. Dissolve the Sulphuret in the Acid with the aid of a gentle heat; boil for half an hour; filter; pour the fluid into the Water; collect the precipitate on a calico filter; wash it well with cold water, then with a weak solution of carbonate of soda, and again with cold water till the water ceases to affect reddened litmus paper. Dry the powder over the vapour bath." *Ed.*

"Take of Solution of Terchloride of Antimony *sixteen fluidounces* [Imp. meas.]; Water *two gallons* [Imp. meas.]; Solution of Caustic Potash *one pint* [Imp. meas.]; Distilled Water *a sufficient quantity.* Pour the antimonial Solution into the Water, and, having stirred the mixture well, set it by until the white precipitate which forms has subsided. Draw off the supernatant liquid by decantation, or the syphon, and having agitated the sediment with a gallon of Distilled Water, allow the whole to stand until the Oxide has fallen to the bottom. Decant again, and having placed the sediment on a calico filter, wash it with Distilled Water until the liquid which trickles through reddens blue litmus paper only in a very slight degree. The precipitate is now to be shaken occasionally for half an hour with the Solution of Caustic Potash, and then washed on a filter with boiling Distilled Water, until the washings cease to give a precipitate on being dropped into an acid solution of nitrate of silver. Lastly, let the product be dried at a heat not exceeding 120°." *Dub.*

In these processes the teroxide of antimony is obtained from the solution of the terchloride, formed by a step of the Edinburgh formula, but by a separate formula of the Dublin Pharmacopœia. By dissolving tersulphuret of antimony in muriatic acid, the Edinburgh College forms the Dublin solution of terchloride

of antimony, though the College does not give it a distinct name. When this solution is poured into a large quantity of water, there is precipitated a white powder, formerly called *powder of Algaroth* (see *Appendix*), which is an oxychloride, consisting of nine eqs. of teroxide and two of terchloride. The terchloride is in great part decomposed by the water, the elements of which convert it into muriatic acid and teroxide. The muriatic acid remains in solution, while the teroxide falls in union with a small proportion of terchloride, forming the oxychloride. The oxychloride is first washed with abundance of water to separate adhering muriatic acid, and afterwards acted upon by a solution of alkali (carbonate of soda, *Ed.*, caustic potassa, *Dub.*) to remove the terchloride; when the teroxide is left, and only requires to be washed with water in order to render it pure. The last washing separates the chloride of sodium or potassium, resulting from the decomposition of the terchloride; and the water of this washing is tested, in the Dublin formula, for the absence of a chloride by nitrate of silver. In making this oxide, the apothecary should give the preference to the Dublin formula, as more precise in its directions.

Properties. Teroxide of antimony is a snow-white, heavy powder, permanent in the air, insoluble in water, but readily soluble in muriatic or tartaric acid, or in a boiling solution of bitartrate of potassa. When heated in close vessels, it becomes yellow, fuses at a full red heat, and finally sublimes in crystalline needles. When cooled from a state of fusion, it forms a fibrous crystalline mass. Heated in open vessels, it suddenly becomes red-hot, and, by the absorption of oxygen, changes into antimonious acid, which differs from the teroxide in being insoluble in muriatic acid, less fusible, and not volatile. This oxide is the active ingredient of all the medicinal preparations of antimony. It is frequently impure from containing antimonious acid, in which case it will not be *entirely* soluble in muriatic acid. If it contain terchloride, which it is apt to do from the imperfect action of the alkaline solutions employed in its purification, its solution in tartaric acid will be precipitated by nitrate of silver. When antimonious acid is substituted for it, the fraud may be detected by the spurious preparation being entirely insoluble in muriatic acid. Teroxide of antimony consists of one eq. of antimony 129, and three of oxygen 24=153, and its formula is consequently SbO_3.

Medical Properties. This oxide possesses the general therapeutic properties of the antimonials. It deserves more attention than has been paid to it; and its effects, comparatively with those of tartar emetic, should be carefully studied. It is probable that its sedative operation would be found the same, with less nausea and disturbance of the stomach. Like antimonial powder, it is very unequal in its effects, sometimes vomiting, at other times being apparently inert. In the case of the French Codex oxide, prepared by boiling the oxychloride with a solution of bicarbonate of potassa, these differences are attributed by M. Durand, of Caen, to the presence of more or less terchloride, which is separated with difficulty. Objecting to the Codex oxide, M. Durand proposes to obtain it by precipitating tartar emetic with ammonia in excess. The oxide, thus obtained, contains no terchloride, and does not vomit. (*Journ. de Pharm.*, 3e *sér.*, ii. 364.) The dose of the oxide is from three to ten grains, repeated every two or three hours, and given in powder with syrup or molasses, or in pill made up with confection of roses, or other suitable excipient.

Off. Prep. Antimonium Tartarizatum. B.

ANTIMONII ET POTASSÆ TARTRAS. *U. S.* Antimonii Potassio-tartras. *Lond.* Antimonium Tartarizatum. *Ed.*, *Dub.* *Tartrate of Antimony and Potassa. Tartarized Antimony. Tartar Emetic.*

"Take of Sulphuret of Antimony, in fine powder, *four ounces;* Muriatic Acid *twenty-five ounces;* Nitric Acid *two drachms;* Water *a gallon.* Having mixed

the Acids together in a glass vessel, add by degrees the Sulphuret of Antimony, and digest the mixture, with a gradually increasing heat, till effervescence ceases; then boil for an hour. Filter the liquor when it has become cold, and pour it into the Water. Wash the precipitated powder frequently with water, till it is entirely freed from acid, and then dry it. Take of this powder *two ounces;* Bitartrate of Potassa, in very fine powder, *two ounces and a half;* Distilled Water *eighteen fluidounces.* Boil the Water in a glass vessel; then add the powders previously mixed together, and boil for an hour; lastly, filter the liquor while hot, and set it aside to crystallize. By further evaporation, the liquor may be made to yield an additional quantity of crystals, which should be purified by a second crystallization." *U. S.*

"Take of Sulphuret of Antimony, in fine powder, *four ounces;* Muriatic Acid (commercial) *a pint* [Imperial measure]; Water *five pints* [Imp. meas.]. Dissolve the Sulphuret in the Acid with the aid of a gentle heat; boil for half an hour; filter; pour the liquid into the Water; collect the precipitate on a calico filter, wash it with cold water till the water ceases to redden litmus paper; dry the precipitate over the vapour-bath. Take of this precipitate *three ounces;* Bitartrate of Potash *four ounces and two drachms;* Water *twenty-seven fluidounces* [Imp. meas.]. Mix the powders, add the Water, boil for an hour, filter, and set the liquid aside to crystallize. The mother-liquor, when concentrated, yields more crystals, but not so free of colour, and, therefore, requiring a second crystallization." *Ed.*

"Take of Oxide of Antimony *five ounces* [avoirdupois]; white Bitartrate of Potash *six ounces* [avoird.]; Distilled Water *one quart* [Imp. meas.]. Rub the Bitartrate to a fine powder, and, having carefully mixed it with the Oxide of Antimony, add a little Water, so as to convert the mixture into a thick paste, which should be set by for twenty-four hours. Pour on this the remainder of the Water, previously raised to the temperature of 212°, and, having boiled for fifteen minutes, with repeated stirring, in a glass or porcelain vessel, filter through calico, returning the slightly turbid liquor which first passes through, so as to obtain a clear solution. After twelve hours let the solution be decanted from the crystals which will have formed, and boiled down to one-third, when, on cooling, an additional product will be obtained. The salt, after being dried upon blotting paper without the application of heat, should be preserved in a bottle." *Dub.*

"Take of Tersulphuret of Antimony, in very fine powder, *a pound;* Sulphuric Acid *fifteen fluidounces* [Imp. meas.]; Bitartrate of Potassa *ten ounces;* Distilled Water *five pints* [Imp. meas.]. Mix the Tersulphuret with the Acid in an iron vessel, and expose the mixture, under a chimney, to a gentle heat, occasionally stirring with an iron spatula. Then increase the heat, until, the flame of burning sulphur having gone out, nothing remains but a whitish pulverulent mass. Wash this, when cold, with water, until all acid is removed, and dry it. Mix thoroughly *nine ounces* of this salt with the Bitartrate, and boil in the Water for half an hour. Strain the liquor while still hot, and set it aside to form crystals. Having poured off the liquor, dry these, and again evaporate that crystals may form." *Lond.*

This preparation is a double salt, consisting of tartrate of potassa, united with tartrate of teroxide of antimony. The principle of its formation is exceedingly simple, being merely the saturation of the excess of acid in the bitartrate (cream of tartar) with the teroxide. The officinal processes all consist in boiling a mixture of cream of tartar and some form of the teroxide with water. The U. S. and Edinburgh Pharmacopœias agree in using the form of teroxide, called *oxychloride of antimony*, or *powder of Algaroth*, which is not officinal under a distinct name, but is formed in the first step of the tartar emetic processes of those works. The Dublin College, in its revised Pharmacopœia of 1850, has

substituted the pure teroxide of antimony for the oxychloride, which, not being now used in any officinal preparation, is expunged from its catalogue. The London College has abandoned the use of the *crocus of antimony*, and employs at present (Pharmacopœia of 1851) the form of teroxide obtained by boiling sulphuric acid with the tersulphuret to dryness, and washing the product.

The *U. S.* and *Edinburgh* Pharmacopœias agree in the same general plan for making the oxychloride. The tersulphuret of antimony is dissolved in from five to six times its weight of muriatic acid, assisted by a hundredth of nitric acid in the U. S. formula, but without this acid in the Edinburgh. The solution is thrown into a large quantity of water, equal to about twenty-five or thirty times the weight of the sulphuret employed, and the oxychloride is precipitated. This is mixed with from one and a quarter to about one and a half times its weight of cream of tartar, and boiled, for from half an hour to an hour, with about eight and a half times its weight of distilled water; and the liquor obtained is filtered while hot and set aside to crystallize. By further evaporation the mother-liquor may be made to yield a second crop of crystals, which, not being free from colour, must be purified by a second crystallization. When no more crystals can be obtained, the liquor which is left contains, according to Knapp, a gummy salt, which consists of tartrate of potassa united to the tertartrate of teroxide of antimony. If this liquor be boiled with a fresh portion of oxychloride, as long as this is taken up, it will furnish an additional quantity of crystals of tartar emetic; and, finally, if the new mother-liquor be saturated with carbonate of potassa, it will furnish a third crop of the antimonial salt, after which the liquor is entirely exhausted. (*Journ. de Pharm.*, xxvi. 136, from *Annal. der Pharm.*) The oxychloride, as its name imports, contains a portion of terchloride. This is decomposed during the boiling, by means of the elements of water, into additional teroxide, which helps to form the tartar emetic, and muriatic acid which serves to hold in solution iron and other metallic impurities, which otherwise would fall and contaminate the crystals. Accordingly, it is asserted that the pure teroxide is not so well fitted for making tartar emetic as the oxychloride, in which the teroxide is usefully combined with some terchloride. If this statement should be confirmed, the Dublin College has injudiciously substituted the pure teroxide for the oxychloride in its last formula for tartar emetic.

In the *London* formula, the teroxide is formed in the following manner. By gently heating sulphuric acid with the tersulphuret of antimony, the metal is teroxidized at the expense of part of the acid, sulphurous acid is evolved, and sulphur set free. By increasing and continuing the heat until dryness is produced, the whole of the sulphurous acid is driven off, the free sulphur is burnt out, and nothing remains but the teroxide, united with sulphuric acid, in the form of the tersulphate of the teroxide of antimony. This, by continued washing, is converted into the anhydrous disulphate of the teroxide ($2SbO_3,SO_3$). (*Phillips.*) The disulphate is then mixed with cream of tartar in the proportion of nine parts in weight to ten, and the mixture boiled with water in the usual manner.

The use of disulphate of antimony in making tartar emetic originated with the late Mr. Phillips as early as the year 1811. He recommended it to be prepared by boiling metallic antimony with twice its weight of sulphuric acid to dryness, and washing the product with water. This method of preparing it was greatly improved by the substitution of the tersulphuret for metallic antimony, as suggested by the late Dr. Babington. The disulphate, made in this way, has been for a long time used in England for preparing tartar emetic, and is now adopted for the same purpose by the London College. The disulphate process is an eligible one, and, at the same time, has the merit of being economical. Mr. Phillips says it affords "a very pure and beautiful salt."

Having given a sketch of the several officinal formulas, it may be useful to

present them in a table. The form of teroxide selected is reduced to the same quantity, and the measures of water in the U. S., London, and Edinburgh Pharmacopœias are converted into the nearest corresponding weights.

AUTHORITY.	Form of Teroxide employed.	Proportion of Teroxide.	Proportion of Cream of Tartar.	Proportion of Water.
London Pharmacopœia.	Disulphate.	4	4·4	44.4
Dublin do.	Teroxide, pure.	4	4.8	32
U. S. do.	Oxychloride.	4	5	34
Edinburgh do.	Do.	4	5.7	33

It is seen by the table that for a given amount of teroxide, the London College orders the least cream of tartar, and the Edinburgh the most. The proportion of water is not very different in the Dublin, U. S. and Edinburgh Pharmacopœias, but is considerably greater in the London.

In judging of the relative eligibility of these processes, several circumstances are to be taken into view. The cream of tartar should not be in excess; as in that case it is apt to crystallize upon cooling with the tartar emetic formed. To avoid such a result it is better to have a slight excess of antimonial oxide. No rule is applicable to the determination of the proper proportion of water, except that it should be sufficient to dissolve the tartar emetic formed. The hot filtration, directed in the U. S. and London Pharmacopœias, may be conveniently performed by means of the tin apparatus, devised by Dr. Hare for filtering liquids at the point of ebullition. (See *page* 773 for a figure of this apparatus.) The U. S. and Edinburgh Pharmacopœias boil for an hour; the London, for half an hour; the Dublin for fifteen minutes. In all cases the salt should be obtained in well defined crystals, unmixed with those of cream of tartar, as the best index of its purity. The practice of some manufacturing chemists of boiling the filtered liquor to dryness, whereby an impure mass is obtained, consisting in part only of the antimonial salt, is very reprehensible.

It is not easy to decide as to the relative eligibility of the different forms of antimonial oxide used for preparing tartar emetic; but it may be proper to state that the preference was given to the oxychloride (*powder of Algaroth*) by Berzelius; and M. Henry, an eminent pharmaceutist of Paris, after a careful comparison of the different processes, declared in favour of the use of this oxide. This testimony in favour of the oxychloride induced the revisers of our national Pharmacopœia in 1830, to adopt it for making tartar emetic; and the Edinburgh College judiciously substituted it for the crocus of antimony in its revision of 1839.

M. Henry has given a process for preparing tartar emetic with the oxychloride on a large scale; and as his formula may be useful to the manufacturing chemist, we subjoin it, turning the French weights into the nearest *apothecaries'* weights and measures. Take of prepared sulphuret of antimony, in very fine powder, three pounds four ounces; muriatic acid, marking 22° (sp. gr. 1·178), eighteen pounds and a half; nitric acid two ounces and a half. Introduce the sulphuret into a glass matrass, of a capacity double the volume of the mixture to be formed; and add to it from three to five pounds of the acids previously mixed, so that the sulphuret may be thoroughly penetrated by them; then add the remainder of the acids. Place the matrass on a sand-bath, and heat the mixture gradually to ebullition, avoiding the vapours, which are disengaged in large quantity. Continue the heat until the vapours given off are so far deprived of sulphuretted hydrogen as not to blacken white paper moistened with solution of acetate of lead; after

which allow the liquor to cool, and to remain at rest until it has become clear. Decant the clear liquor, and, in order to procure the portion of liquid which may be retained by the moist residue, add to this a small portion of muriatic acid, and again decant. Mix the decanted liquids, which consist of a solution of terchloride of antimony, and add them to a large quantity of water, in order that the oxychloride may be precipitated; taking care, during their addition, to stir constantly in order that the precipitated powder may be more minutely divided, to facilitate its subsequent washing. To determine whether the water has been sufficient to decompose the whole of the terchloride, a part of the supernatant liquid, after the subsidence of the powder, is to be added to a fresh portion of water; and, if a precipitate take place, more water must be added to the mixture, so as to obtain the largest possible product of oxychloride. The precipitation being completely effected, wash the powder repeatedly with water, until this no longer affects litmus, and place it on linen to drain for twenty-four hours. The quantity of oxychloride thus obtained will be about three pounds and a half in the moist state, or two pounds nine ounces when dry. Assuming it to be this quantity, mix it with three pounds eleven ounces of cream of tartar, in fine powder, and add the mixture to two gallons and five pints of boiling water, contained in an iron kettle. Concentrate the liquor rapidly until it marks 25° of Baumé's hydrometer for salts, and then filter. By repose the liquor furnishes a crop of very pure crystals, which require only to be dried. The mother waters are treated in the following manner. Saturate the excess of acid with chalk, filter, and concentrate to 25°. By cooling a second crop of crystals will be obtained; and by proceeding in a similar manner, even a third crop. But these crystals are somewhat coloured, and must be purified by recrystallization.

In relation to the above process, it may be observed that the proportion of oxychloride and cream of tartar must be adjusted according to the numbers given, on the assumption that the former is dry; but it by no means follows that the whole of the oxide should be dried. To proceed thus would be a waste of time. The mode of proceeding is to weigh the whole of the moist oxide, and afterwards to weigh off a small part of it, and ascertain how much this loses in drying. Then by a calculation it is easy to determine how much the whole of the moist oxide would weigh in the dry state.

Tartar emetic is not usually prepared by the apothecary, but made on a large scale by the manufacturing chemist. Different processes are pursued in different manufactories; and it is not material what plan is adopted, provided the crystals of the antimonial salt are carefully purified. In an extensive manufactory in London, antimony ash (see *page* 104) is employed for boiling with the cream of tartar, and it is stated to form the cheapest material for making tartar emetic. (*Pereira, Mat. Med.*) Mohr prefers the use of a *moist* oxide, prepared by adding gradually an intimate mixture of one part, each, of tersulphuret of antimony and nitrate of potassa, to a boiling mixture of one part of sulphuric acid and two of water. The liquid is boiled down nearly to dryness and allowed to cool. The grayish-white mass, thus formed, is then washed thoroughly with water. The details of this process are given by Soubeiran, by whom it is praised, in the *Journ. de Pharm.*, 3e *sér.*, iii. 327.

Properties, &c. Tartrate of antimony and potassa was discovered in 1631 by Adrian de Mynsicht. It is in the form of transparent, colourless crystals, which possess a nauseous, metallic, styptic taste, and have usually the form of rhombic octohedrons. When prepared from the oxychloride, it crystallizes in tetrahedrons. As it occurs in the shops it is in the form of a white powder, resulting from the pulverization of the crystals. The crystals, when exposed to the air, effloresce slightly and become white and opaque. They are insoluble in alcohol, but dissolve in proof spirit or wine. (See *Vinum Antimonii.*) They are soluble in about

fifteen parts of water at 60°, and in between two and three parts of boiling water. The late Dr. Perceval, of Dublin, alleged that good tartar emetic dissolves in twelve parts of water, and this statement agrees nearly with the results of Brandes, who found it to be soluble in 12·65 parts of water at 70°. Its aqueous solution slightly reddens litmus, and undergoes decomposition by keeping. It is incompatible with acids, with alkalies and their carbonates, with some of the earths and metals, with chloride of calcium, and with acetate and subacetate of lead. It is incompatible also with astringent vegetable infusions and decoctions, such as of rhubarb, cinchona, catechu, galls, &c.; but these substances, unless galls be an exception, do not render it inert, though they lessen its activity to a greater or less extent.

Characteristics and Tests of Purity. Tartar emetic, when pure, exhibits its appropriate crystalline form. A crystal or two, dropped into a solution of hydrosulphuric acid, will be covered with an orange-coloured deposit of tersulphuret of antimony. One hundred grains of the salt dissolved in water, yield forty-nine grains of tersulphuret with this test. (*Lond. Pharm.*, 1851.) Entire solubility in water is not a character belonging exclusively to the pure salt; for, according to the late Mr. Hennell, tartar emetic may contain ten per cent. of uncombined cream of tartar, and yet be wholly soluble in the proper proportion of water. (*Phillips.*) This being the case, the character, given in the U. S. and Edinburgh Pharmacopœias, of entire solubility in twenty parts of water, is not to be depended upon. A dilute solution is not precipitated by chloride of barium or nitrate of silver, nor rendered blue by ferrocyanuret of potassium. A solution, containing one part of tartar emetic in forty of water, is not disturbed by an equal volume of a solution of eight parts of acetate of lead in thirty-two of water and fifteen of acetic acid. This test is adopted in the U. S. Pharmacopœia from the Edinburgh, and is intended to show the absence of uncombined bitartrate of potassa; for when the acidulated acetate is used as here directed, it does not form the white tartrate of lead with the pure antimonial salt, but only with the bitartrate, when this happens to be present. The acidulated acetate is a delicate test of this impurity, capable of detecting one per cent. of it in tartar emetic; but Dr. Christison finds difficulties in using it which render it too precarious for practice. Mr. Hennell's method of detecting uncombined bitartrate, is to add a few drops of a solution of carbonate of soda to a boiling solution of the antimonial salt. If the precipitate formed is not redissolved, no bitartrate is present.

The impurities found in tartar emetic are uncombined cream of tartar from faulty preparation or fraudulent admixture, tartrate of lime, iron, sulphates, and chlorides. The mode of detecting cream of tartar has been indicated above. Tartrate of lime is derived from the cream of tartar, which always contains this impurity. It is apt to form on the surface of the crystals of tartar emetic in crystalline tufts, which are easily brushed off. Iron is sometimes present, especially when the antimonial salt has been prepared from glass of antimony. It is detected by a blue colour being *immediately* produced by ferrocyanuret of potassium, added after a little acetic acid. If the blue colour be *slowly* produced, it may arise from reactions on the iron of the ferrocyanuret itself. If much iron be present, the solution of the tartar emetic will be yellow instead of colourless. Sulphates are detected by chloride of barium. The presence of a chloride is shown by a precipitate being produced by nitrate of silver, added to a dilute solution. According to Serullas, tartar emetic, except when well crystallized, and all the other antimonial preparations usually contain a minute proportion of arsenic, derived from the native tersulphuret of antimony, which almost always contains this dangerous metal. (For the mode of detecting it, see *Acidum Arseniosum.*) Tartar emetic is sometimes sold in powder to conceal its imper-

fections. It should never be bought in this state by the apothecary, but always in crystals, in which state the salt is pure, or very nearly so, and entirely free from arsenic. Its powder is perfectly white, and when yellowish-white, iron is probably present. It is said that some druggists ignorantly prefer a tartar emetic which is yellowish-white in powder.

It has been already stated, in general terms, that tartar emetic in solution is incompatible with acids and alkalies, and with some of the earths; but this salt is so important, that some details in regard to the effects of particular reagents, included under these titles, seem to be necessary. Muriatic and sulphuric acids, added to a solution of the antimonial salt, not too dilute, throw down a white precipitate of subchloride or subsulphate of antimony, mixed with cream of tartar, which is redissolved by an excess of the precipitant. Nitric acid throws down a subnitrate, which is taken up by an excess of it. This effect of nitric acid is given by the London College as a character of good tartar emetic, but is certainly not very distinctive. When caustic potassa is added to a tolerably concentrated solution of the antimonial salt, it produces at first no effect, then a precipitate of teroxide, and afterwards the solution of this precipitate, if the addition of the alkali be continued. Lime-water acts in a weaker solution, and throws down a white precipitate, consisting of the mixed tartrates of lime and antimony. Carbonate of potassa affects still weaker solutions, throwing down a white precipitate of teroxide; but this test does not act in solutions containing less than a quarter of a grain of the antimonial salt to the fluidounce. Ammonia, both pure and carbonated, precipitates a solution of tartar emetic, throwing down the pure teroxide. Dr. Barker, of Dublin, has proposed the carbonate of ammonia as a precipitant for obtaining the oxide, when wanted as a medicine. (See *page* 867.) To these reagents may be added the infusion of galls, which, when fresh and strong, causes a dirty, yellowish-white precipitate of tannate of the teroxide of antimony.

Composition. Tartar emetic consists of two eqs. of tartaric acid 132, one of potassa 47·2, one of teroxide of antimony 153, and three of water 27=359·2. It is evident that it contains tartaric acid and potassa in the precise proportion to form bitartrate of potassa or cream of tartar; and, accordingly, it may be viewed as a compound of one eq. of cream of tartar, and one of antimonial teroxide. The excess of acid in the bitartrate may be considered as united with the teroxide; and on that view it is a double salt, composed of the tartrate of potassa, united with the tartrate of teroxide of antimony. The name, therefore, of the U. S. Pharmacopœia is correct.

Medical Properties and Uses. Tartrate of antimony and potassa is the most important of the antimonials, and is capable of fulfilling numerous indications in disease. Its general action is that of a sedative upon the circulation; while, on the contrary, it excites most of the secretions. According to the dose, and the peculiar circumstances under which it is administered, it acts variously as an alterative, diaphoretic, diuretic, expectorant, purgative, and emetic. In minute doses it is employed, either alone or conjoined with calomel, with a view to its alterative effects, and has been found useful in diseases of the skin. In small doses, mostly associated with saline remedies, such as nitre or sulphate of magnesia, and assisted by copious dilution, it is frequently resorted to in febrile complaints, for the purpose of producing perspiration, which is often copiously induced, especially if the remedy gives rise to nausea. If the surface be exposed to cool air, so as to constrict the pores, the tendency will be to the kidneys, with the effect of producing an increased flow of urine. On the principle of exciting the secretions, it proves useful, on many occasions, in pulmonary and bronchial disease as an expectorant; and with a view to its action in this way, it is frequently conjoined with squill, ammoniac, and similar remedies. In full

doses it acts as an emetic, and as such is characterized by certainty, strength, and permanency of operation. It remains longer in the stomach than ipecacuanha, produces more frequent and longer continued efforts to vomit, and exerts a more powerful impression upon the system generally. The nausea and attendant prostration are often very considerable. As an emetic, its use is indicated where the object is not merely to evacuate the stomach, but to agitate and compress the liver and other abdominal viscera. By the extension of its action to the duodenum, it often causes copious discharges of bile, and hence forms an appropriate remedy in those diseases in which there is an accumulation of that secretion. It is employed as an emetic in the commencement of fevers, especially those of an intermittent or bilious character; in jaundice, hooping-cough, and croup; and in several diseases of the nervous system, such as mania, amaurosis, tic douloureux, &c. In efforts to reduce old dislocations, its relaxing power over the muscles, when acting as a nauseant, is taken advantage of, in order to facilitate the operation. As an incidental effect to its diaphoretic and emetic operation, tartar emetic often produces purging. Taking advantage of this tendency, practitioners are frequently in the habit of adding it to purgatives, the operation of which it promotes in a remarkable degree. It is contra-indicated in diseases of great debility, in the advanced stages of febrile affections, and in fevers attended with irritability of stomach.

Of late years, on the continent of Europe, and to a certain extent in Great Britain and this country, tartar emetic has been given in large doses, with a view to its sedative, or, as it is usually termed, *controstimulant* operation. This practice originated with Rasori, professor of clinical medicine at Milan, who published his views in 1800. The principal diseases in which it has been thus used, are pneumonia, pleurisy, bronchitis, acute rheumatism, especially of the joints, articular dropsies, chorea, hydrocephalus, and apoplexy. The medicine is directed in doses, varying from a grain to two grains or more, every two hours, dissolved in a small quantity of water; the patient being restricted in the use of drinks whilst under its operation. It is stated that when the remedy is thus given in diseases of high action, it seldom produces vomiting, an effect which the authors of the practice wish to avoid. The power of the system to bear large doses of tartar emetic, during the existence of acute disease, was considered by Rasori to depend upon the coexistent high morbid excitement, and the capability of bearing them was expressed by the term *tolerance*. It is in pneumonia especially that the controstimulant practice has most advocates. It is admitted to have the effect of lowering the force and frequency of the pulse, and the rapidity of the respirations; and, in not a few instances, it produces marked remedial effects. In pleurisy and bronchitis, the advantages of the same practice are less decided. Though we are disposed to admit the controlling influence of tartar emetic, when thus exhibited, in the diseases named; yet we by no means think that its use should supersede bloodletting, or even form our chief reliance. In cases, however, in which bloodletting, both general and local, has no effect, or has been carried as far as the circumstances of the case will warrant, tartar emetic, administered on the controstimulant plan, may be found useful. If the tolerance cannot be otherwise established, laudanum may be conjoined with the antimony, in order to bring it about. In the treatment of articular dropsies, the decided benefit derived from large doses of tartar emetic is fully shown by M. Gimelle, who has reported twenty-eight successful cases in support of the practice. The medicine was gradually increased from four grains to sixteen or twenty daily, and, generally, the tolerance was established on the first day. The effusion was absorbed in a space of time varying from eight to sixteen days. M. Vidart has used large doses of tartar emetic, associated with laudanum, with good effect, in a case of delirium tremens. (*Journ. de Pharm. et de Chim.*, April, 1851.)

Externally, tartar emetic is sometimes employed as a counter-irritant, mixed with lard or cerate, or sprinkled in very fine powder on adhesive plaster. (See *Unguentum Antimonii.*) It causes, after a longer or shorter interval, a burning sensation, accompanied by a peculiar and painful pustular eruption. This mode of producing counter-irritation is serviceable in a number of diseases; but particularly in deep-seated pains, spinal irritation, hooping-cough, and chronic inflammation of the chest threatening consumption. Care must be taken, when the salt is applied by means of a plaster, that the pustular inflammation does not proceed too far; as, in that event, it produces deep and very painful ulcerations, difficult to heal. According to M. Guerin, inflamed parts exhibit a condition of tolerance to the local effects of tartar emetic, evinced by the absence of pustulation. In support of this view, he asserts that he has treated hundreds of cases of acute arthralgia with tartar emetic ointment with the best effects, mostly without the production of any eruption; and when the pustules were produced, the benefit accrued before they appeared. When no pustulation follows, M. Guerin supposes that the antimony acts by absorption.

Tartar emetic is generally given in solution, and in an amount which varies with the intention in view in its administration. Its dose as an alterative is from the thirtieth to the twelfth of a grain; as a diaphoretic or expectorant, from the twelfth to the sixth of a grain; and as a nauseating sudorific, from a quarter to half a grain; in each case, repeated every hour, two, or four hours. If required to act as a purgative, a grain may be dissolved in half a pint of water with an ounce of Epsom salt, and two tablespoonfuls of the solution given every two or three hours. As an emetic the full dose is from two to three grains; though it is usually given in divided portions of a grain, dissolved in a tablespoonful of water, every ten or fifteen minutes till it vomits; the operation being aided by warm water, or warm chamomile tea. It is often conjoined with ipecacuanha, in the proportion of one or two grains to twenty of that emetic. For convenient administration in small doses, the Pharmacopœias order it dissolved in wine. (See *Vinum Antimonii.*) It is given very conveniently to children in dilute aqueous solution, which, being nearly tasteless, is readily taken by them. In all cases this medicine should be given with caution; as, in some peculiar constitutions, it acts in small doses with unexpected violence.

Effects as a Poison. The effects produced by a poisonous dose of tartar emetic are an austere metallic taste; nausea; copious vomiting; frequent hiccough; burning pain in the stomach; colic; frequent stools and tenesmus; fainting; small, contracted, and accelerated pulse; coldness of the skin; sometimes intense heat; difficult respiration; loss of sense; convulsive movements; very painful cramps in the legs; prostration and death. To these effects is sometimes added difficulty of deglutition. Vomiting and purging in a few instances do not take place; and when they are absent, the other symptoms are aggravated. A case of poisoning by tartar emetic is reported by Dr. J. T. Gleaves, of Tennessee, in which a pustular eruption, like that caused by the external application of the antimonial, was copiously produced. (*Amer. Journ. of Med. Sci.*, xv. 573, from the *Western. Journ. of Med. and Surg.*) These are the effects produced on the healthy economy; but it has been fully proved that the doses which, in a state of health would prove fatal, are sometimes borne with safety in certain morbid states of the system, attended with internal acute inflammation.

In treating a case of poisoning by tartar emetic, if it is found that the patient has not vomited, immediate recourse must be had to tickling the throat with a feather, and the use of abundance of warm water. Usually, however, the vomiting is excessive and distressing, and here it is necessary to use remedies calculated to decompose the poison, and to allay the pain and irritation. To effect the former object, astringent decoctions and infusions, such as of bark and common

tea, are recommended as antidotes. These, however, act but imperfectly, according to the experiments of M. Toulmouche, who found that a decoction of cinchona had usually no power in lessening the emetic effect of this antimonial. Similar observations have been made by Dr. Clutterbuck. (*Pereira.*) The decoction of galls acts more decidedly; but M. Toulmouche accords the preference to the galls, given in substance, as an antidote in poisoning by tartar emetic. A case of accidental poisoning with half an ounce of tartar emetic, successfully treated with copious draughts of green tea and large doses of tannin, is reported by Dr. S. A. McCreery, U. S. Navy. (*Am. Journ. of Med. Sci.*, Jan. 1853, p. 131.) Galls no doubt act by the tannin they contain, which forms, with the antimonial part of the salt, the insoluble and probably inert tannate of antimony. To stop the vomiting and relieve pain, laudanum should be given, either by the mouth or injection, and to combat consecutive inflammation, bleeding, both local and general, and other antiphlogistic measures should be resorted to.

After death from suspected poisoning by tartar emetic, it is necessary to search for the poison in the body. The substances in the stomach should be digested in water, acidulated with a little muriatic and tartaric acids. The former acid will serve to coagulate some organic matter; the latter to give complete solubility to the antimony. The solution obtained, after having been filtered, is subjected to a stream of sulphuretted hydrogen, which will throw down the orange-red tersulphuret of antimony, distinguishable from the tersulphuret of arsenic, and all other precipitates, by its forming with hot muriatic acid a solution, from which, when added to water, a white curdy precipitate of oxychloride of antimony is thrown down. Sulphuretted hydrogen is by far the most delicate test for tartar emetic.

Sometimes the antimony cannot be found in the stomach and bowels, and yet may exist in other parts. When it leaves the alimentary canal, it has been found by Orfila especially in the liver and kidneys and their secretions. The mode of extracting the antimony, recommended by Orfila, is to carbonize the dried viscera with pure concentrated nitric acid in a porcelain capsule, to boil the charred mass obtained for half an hour with muriatic acid, assisted with a few drops of nitric acid, to filter the liquor, and introduce it into Marsh's apparatus. Antimoniuretted hydrogen will be formed, which, being inflamed, will deposit the antimony on a cold surface of porcelain, as a black stain, distinguishable from the similar stain produced by arsenic by its less volatility, and by its forming with hot muriatic acid a solution which affords a white precipitate when added to water. (See *Arch. Gén.*, 3e *sér.*, vii. 511.)

Off. Prep. Pulvis Antimonialis, *Dub.*; Syrupus Scillæ Compositus; Unguentum Antimonii; Vinum Antimonii. B.

VINUM ANTIMONII. *U. S.* Vinum Antimonii Potassio-tartratis. *Lond.* Vinum Antimoniale. *Ed.* Antimonii Tartarizati Liquor. *Dub.* *Antimonial Wine.*

"Take of Tartrate of Antimony and Potassa *a scruple;* White Wine [Sherry] *ten fluidounces.* Dissolve the Tartrate of Antimony and Posassa in the Wine." *U. S.*

The *London* and *Edinburgh Colleges* direct *two scruples* of the salt [crystals, *Lond.*] to be dissolved in *a pint* [Imperial measure] of Sherry Wine. The *Dublin College* dissolves *a drachm* [54·68 grains] of the salt in *a pint* [Imperial measure] of distilled water, and adds *seven fluidounces* of Rectified Spirit.

In the first edition of the United States Pharmacopœia, the proportion of tartar emetic was four grains to the fluidounce of wine. In the revision of 1830, the quantity was reduced to two grains, and, as this is very nearly the proportion directed by the British Colleges, the highly important object has been accom-

plished, of uniformity in the strength of this very popular preparation. The seeming discrepancy between the London and Edinburgh formulæ, and that of the U. S. Pharmacopœia will disappear, when it is considered that the Imperial pint, adopted by the two British Colleges, contains twenty fluidounces, each very nearly equal to the fluidounce of the ordinary apothecaries' measure. The U. S. officinal name was adopted as most convenient, sufficiently expressive, and in accordance with the nomenclature of several other metallic preparations, such as *Emplastrum Ferri*, *Mistura Ferri Composita*, &c.

Difficulty is often experienced in effecting a solution of tartar emetic in wine; and precipitation is apt to occur after the solution has been effected. These results are attributable either to impurity in the antimonial salt, which frequently contains bitartrate of potassa and various insoluble substances, or to inferiority in the character of the wine, which holds in solution vegetable principles that form insoluble compounds with the teroxide of antimony. Dr. Paris states that he has seen the decomposition of the tartar emetic so complete, that no traces of the salt could be detected in the supernatant liquid. The difficulty is not avoided by the plan, at one time directed, of first dissolving the antimonial in water, and then adding the wine; for, even allowing that the solution may be accomplished, the same ingredients are present, and their mutual reaction must ultimately result in the same effects. The proper course is to select perfectly pure crystallized tartar emetic, and sound Sherry or Teneriffe wine, which make a permanent solution. To obviate the risk of decomposition, the Dublin College directs water and rectified spirit in about the proportion in which these exist in the wines just mentioned. The only objection to this menstruum is the want of colour, which renders the preparation liable to be confounded with less active liquids.

The advantages of antimonial wine are, that it affords the means of administering minute doses of tartar emetic, and is more permanent than an aqueous solution of that salt, which is liable to spontaneous decomposition. It is usually administered in small doses as a diaphoretic or expectorant, or as an emetic in infantile cases. Where a considerable quantity of tartar emetic is requisite, it should always be given in extemporaneous aqueous solution. The dose of the wine, as an expectorant or diaphoretic, is from ten to thirty drops, given frequently; as an emetic for children, from thirty drops to a fluidrachm, repeated every fifteen minutes till it operates.

Off. Prep. Mistura Glycyrrhizæ Composita. W.

ANTIMONII SULPHURETUM PRÆPARATUM. *Dub. Prepared Sulphuret of Antimony.*

"Take of Sulphuret of Antimony of Commerce *any convenient quantity*. Let this be reduced to powder, and the finer particles having been separated from the coarser by the method explained in the formula for *Creta Præparata*, let them be dried, and preserved for use." *Dub.*

Sulphuret of antimony in mass is placed in the Materia Medica list of all the Pharmacopœias noticed in this work. But for use in medicine, and for some pharmaceutical processes, it requires to be in powder, and the above process is intended to bring it to that state. But it is hardly necessary to have a distinct formula to indicate the mode of proceeding, and accordingly this preparation is not included in the U. S., London, and Edinburgh Pharmacopœias.

Properties. Prepared sulphuret of antimony is in the form of an insoluble powder, without taste or smell, usually of a dull blackish colour, but reddish-brown, when perfectly pure. By exposure to the air, it absorbs, according to Buchner, a portion of oxygen, and becomes partially converted into teroxide. Its impurities and composition are mentioned under another head. (See *Antimonii Sulphuretum.*)

Medical Properties and Uses. This preparation is very uncertain in its operation; being sometimes without effect, at other times, if it meets with acid in the stomach, operating with extreme violence by vomiting and purging. The effects usually attributed to it are those of a diaphoretic and alterative; and the diseases in which it has been principally used, are scrofula, glandular obstructions, cutaneous diseases, and chronic rheumatism. It is not employed by physicians in the United States, its use in this country being exclusively confined to veterinary practice. The dose is from ten to thirty grains, given in powder or bolus.

Off. Prep. Antimonii Sulphuretum Præcipitatum; Antimonii Terchloridi Liquor. B.

ANTIMONII SULPHURETUM PRÆCIPITATUM. *U.S.*, *Dub.* ANTIMONII OXYSULPHURETUM. *Lond.* ANTIMONII SULPHURETUM AUREUM. *Ed.* *Precipitated Sulphuret of Antimony. Oxysulphuret of Antimony.*

"Take of Sulphuret of Antimony, in fine powder, *six ounces;* Solution of Potassa *four pints;* Distilled Water, Diluted Sulphuric Acid, each, *a sufficient quantity.* Mix the Sulphuret of Antimony with the Solution of Potassa and twelve pints of Distilled Water, and boil them over a gentle fire, for two hours, constantly stirring, and occasionally adding Distilled Water, so as to preserve the same measure. Strain the liquor immediately through a double linen cloth, and drop into it, while yet hot, Diluted Sulphuric Acid so long as it produces a precipitate; then wash away the sulphate of potassa with hot water, dry the Precipitated Sulphuret of Antimony, and rub it into a fine powder." *U. S.*

"Take of Tersulphuret of Antimony, powdered, *seven ounces;* Solution of Soda *four pints* [Imp. meas.]; Distilled Water *two gallons* [Imp. meas.]; Diluted Sulphuric Acid *a sufficient quantity.* Mix the Tersulphuret and Soda with the Water, and boil with a slow fire for two hours, frequently stirring, Distilled Water being often added, so that the mixture may fill about the same measure. Strain the liquor, and gradually drop into it as much of the Acid as may be sufficient to throw down the Oxysulphuret of Antimony; then wash away the sulphate of soda with water, and dry what remains with a gentle heat." *Lond.*

"Take of Sulphuret of Antimony, in fine powder, *an ounce;* Solution of Potash *eleven fluidounces* [Imp. meas.]; Water *two pints* [Imp. meas.]. Mix the Water and Solution of Potash, add the Sulphuret, boil for an hour, filter immediately, and precipitate the liquid, while hot, with an excess of Diluted Sulphuric Acid. Collect the precipitate on a calico filter, wash it thoroughly with water, and dry it with a gentle heat." *Ed.*

"Take of Prepared Sulphuret of Antimony *five ounces* [avoirdupois]; Carbonate of Potash from Pearlash, first dried at a low red heat, and reduced to powder, *four ounces* [avoird.]; Water *one gallon* [Imp. meas.]; Pure Sulphuric Acid *two fluidounces* [Imp. meas.]; Distilled Water *one quart* [Imp. meas.]. Mix the Sulphuret of Antimony and Carbonate of Potash in a mortar, and heat the mixture in a Hessian crucible, first cautiously until effervescence ceases, and then to low redness, so as to produce liquefaction. Pour out the melted mass on a clean flag, and, when it has concreted and cooled, rub it to a fine powder in a porcelain mortar. Add this, in successive portions, to the gallon of Water while boiling in an iron vessel, and, having maintained the ebullition for twenty minutes, transfer the whole to a calico filter, and cause the solution which passes through to drop into the Distilled Water, previously mixed with the Sulphuric Acid. Let the precipitate which forms be collected on a calico filter, and let warm distilled water be repeatedly poured upon it, until the liquid which passes through ceases to give a precipitate when dropped into a solution of nitrate of barytes. Finally, dry the product on porous bricks, placed in a warm atmosphere." *Dub.*

As the theory of the formation of the precipitated sulphuret of antimony is intimately connected with that of the production of the substances called *kermes mineral* and *golden sulphur*, we shall first describe the latter preparations as introductory to our account of the former.

Kermes mineral, according to Thenard, may be obtained by treating the tersulphuret of antimony in three ways; 1st with a boiling solution of the carbonated alkalies, 2d with a boiling solution of the caustic alkalies, and 3d with the carbonated alkalies at a red heat. These several processes give brown powders, which vary in their shade of colour, and which, though usually considered as identical, differ in composition. The kermes obtained by means of the carbonated alkalies in solution is an oxysulphuret, that is, a mixture of teroxide of antimony with hydrated tersulphuret; while the product, when either the caustic alkalies in solution, or the carbonated alkalies at a red heat are used, is essentially a hydrated tersulphuret, though containing occasionally a little oxysulphuret.

In France the process by the use of the carbonated alkalies in solution is preferred for preparing kermes; and the alkali selected is soda as giving a handsomer product. The formula of Cluzel is to boil for half an hour one part of pulverized tersulphuret of antimony with twenty-two or twenty-three parts of crystallized carbonate of soda, in two hundred and fifty parts of water, to filter the liquor, and receive it in warm earthen pans, which must be covered, and allowed to cool slowly. At the end of twenty-four hours, the kermes is deposited. It is then collected on a filter, washed with *boiled* water cooled without contact of air, dried at the temperature of 77°, and kept in bottles well stopped. This formula is substantially the same with that given in the French Codex of 1837.

The rationale of the formation of kermes by this process is as follows. A portion of the carbonate of soda is converted, by a transfer of carbonic acid, into caustic soda and sesquicarbonate. By a double decomposition taking place between a part of the tersulphuret of antimony and the caustic soda, teroxide of antimony and sulphuret of sodium are formed. The teroxide then dissolves in the solution of the remaining carbonate of soda, and the undecomposed portion of the tersulphuret in that of the sulphuret of sodium. The teroxide and tersulphuret being both more soluble in these menstrua hot than cold, precipitate together as the liquid cools, and constitute this variety of kermes. When thus obtained, it is light, velvety, of a dark reddish-purple colour, brilliant in the sun, and of a crystalline appearance. It consists, according to M. Henry, jun., of tersulphuret of antimony 62·5, teroxide 27·4, water 10, and soda a trace: proportions which correspond most nearly with two eqs. of tersulphuret, one of teroxide, and six of water. In consequence of the presence of a considerable amount of teroxide of antimony in this variety of kermes, it must be far more active than the other kinds, and ought, therefore, to be preferred for medicinal use.

Kermes, when obtained by means of the caustic alkalies, may be formed by the use of either potassa or soda. When the former alkali is selected, it may be prepared by boiling for a quarter of an hour, two parts of the tersulphuret of antimony with one part of caustic potassa dissolved in twenty-five or thirty parts of water, filtering the liquor, and allowing it to cool; whereupon the kermes precipitates. In this process, one portion of the tersulphuret, by reacting with a portion of the potassa, gives rise to teroxide of antimony and sulphuret of potassium. A second portion dissolves in the solution of sulphuret of potassium formed, and a third forms an insoluble compound with a part of the teroxide. The remainder of the teroxide unites with the undecomposed potassa, forming a compound, which, being but sparingly soluble, is only in part dissolved. The hot filtered liquor, therefore, contains this compound dissolved in water, and tersulphuret of antimony dissolved in the solution of sulphuret of potassium. By refrigeration, the tersulphuret in a hydrated state falls down,

free or nearly free from teroxide, this latter being still held in solution by means of the caustic alkali with which it is united.

Kermes is obtained by the third method, that is, in the dry way, by rubbing together two parts of tersulphuret of antimony and one of carbonate of potassa, fusing the mixture in a crucible by a red heat, reducing the fused mass to powder, boiling it with water, and straining. As the strained liquor cools the kermes is deposited. The rationale of its formation is nearly the same with that of the formation of the second variety of kermes. An inferior kermes, prepared in the dry way, and intended for use in veterinary medicine, is directed in the French Codex to be prepared by fusing together, well mixed, 500 parts of tersulphuret of antimony, 1000 of carbonate of potassa, and 30 of washed sulphur, reducing the fused mass to powder, and boiling it with 10,000 parts of water. The liquor, upon cooling, lets fall the kermes, which must be washed with care and dried.

Kermes mineral is an insipid, inodorous powder, of different shades of brown. By the action of air and light it gradually becomes lighter coloured, and at last yellowish-white. It is sometimes adulterated with sesquioxide of iron. In Paris, in 1849, a number of the shops contained a spurious kermes of very handsome appearance, which was little else than this oxide. (*Journ. de Pharm.*, Oct. 1849.) Kermes mineral first came into use as a remedy in France about the beginning of the last century. Its mode of preparation was possessed as a secret by a French surgeon named La Ligerie. In 1720, the recipe was purchased by the French government and made public.

Golden sulphur is formed by the addition of an acid to the liquor which remains after the precipitation of the kermes. According to the directions of the French Codex, acetic acid is employed for this purpose. The liquor, when caustic potassa has been used, consists *at first* chiefly of tersulphuret of antimony dissolved in solution of sulphuret of potassium, but in part also of teroxide, dissolved in solution of potassa. By the action of the oxygen of the air on the liquor, however, the sulphuret of potassium has part of its potassium gradually converted into potassa, and thus passes to a higher state of sulphuration; and, consequently, the addition of an acid, while it throws down the tersulphuret and teroxide of antimony with disengagement of sulphuretted hydrogen, will precipitate at the same time the excess of sulphur which the sulphuret of potassium has gained. Agreeably to this explanation, golden sulphur is a mixture of tersulphuret and teroxide of antimony, containing more or less free sulphur. It is in the form of a powder of a golden-yellow colour. As it is partially decomposed by light, it should be kept in opaque vessels. It may be worth while to mention that the kermes liquor, left after the use of the carbonated alkalies in solution, gives but little golden sulphur; while the liquors, resulting from the two other processes, yield it in abundance.

From the explanations above given, the reader is prepared to understand that the method of preparing the precipitated sulphuret of antimony of the U. S., London, and Edinburgh Pharmacopœias, combines the process for forming the kermes mineral by means of a *caustic alkali*, with that for obtaining golden sulphur; for, while the refrigeration of the solution acting alone would cause the precipitation of the variety of kermes, which contains little or no antimonial oxide, the sulphuric acid added would throw down more or less of the golden sulphur. But the question here arises how far this golden sulphur would be identical with that obtained from the mother liquor of kermes which has been kept for some time. From the explanations above given in relation to golden sulphur, it may be inferred as probable that the precipitate by acids, if thrown down immediately, while the solution is hot, as directed by the Pharmacopœias, and before the air has had time to act, would consist exclusively of tersulphuret

and teroxide; but, if thrown down from the kermes mother liquor, would contain more or less free sulphur, according as the liquor had been more or less subject to the influence of the air. If these views be admitted, it follows that the so-called golden sulphur must be a variable preparation as to the free sulphur it contains, dependent upon the greater or less change which the kermes liquor may have undergone before being used for furnishing the precipitate.

Formerly, all the Pharmacopœias noticed in this work used a solution of caustic potassa in preparing precipitated sulphuret of antimony; but at present the London College employs a solution of caustic soda, and the Dublin, carbonate of potassa in the dry way. These changes were made in the recently revised Pharmacopœias of those Colleges. The use of soda does not alter the theory of the process. The Dublin College, in the use of carbonate of potassa, proceeds, at first, precisely as if kermes by the third method was to be obtained (see *page* 880); but, instead of collecting the strained liquor in an empty vessel, allows it to drop into water, acidulated with sulphuric acid.

Properties of the Precipitated Sulphuret of Antimony. This substance is a reddish-brown insoluble powder, tasteless when pure, but having usually a slightly styptic taste. When treated with twelve times its weight of muriatic acid of the sp. gr. 1·16, with the aid of heat, it is nearly all dissolved, with effervescence of sulphuretted hydrogen. The residue burns with the characters of sulphur, and leaves a scanty ash. The solution obtained, when added to water, is decomposed, giving rise to a white powder of oxychloride of antimony (powder of Algaroth). The solution, filtered from the powder, yields an orange-red, precipitate with hydrosulphate of ammonia, proving the presence of a small quantity of antimony, not thrown down by the water. A dark-coloured precipitate, produced by this test, shows the presence of contaminating metals, probably lead and copper. Water in which this preparation has been boiled, should not yield a white precipitate with chloride of barium or oxalate of ammonia. The non-action of these tests shows the absence of sulphuric acid and lime. When pure, precipitated sulphuret of antimony is completely soluble in a hot solution of potassa, but as it is found in the shops, a white matter is usually left undissolved. When boiled with a solution of cream of tartar, about 12 per cent. of teroxide is dissolved; but, according to H. Rose, this method of determining the proportion of the teroxide cannot be relied on. Exposed to heat it takes fire, burning with a greenish-blue flame and giving off sulphurous acid, while the metal remains behind in the state of a grayish oxide.

The London precipitated sulphuret of antimony, as analyzed by Mr. Phillips, consists, in the 100 parts, of tersulphuret 76·5, teroxide 12, and water 11·5; proportions corresponding nearly with five eqs. of tersulphuret, one of teroxide, and fifteen of water. It usually contains a portion of free sulphur, as shown by the action of muriatic acid. Its active ingredient is the teroxide; and, in reference to its presence, the London College calls the preparation *oxysulphuret of antimony*. The Edinburgh College names it incorrectly *golden sulphuret of antimony;* this name being properly applicable to the precipitate produced by the sole action of acids, and not to that obtained by the action of acids and refrigeration conjointly.

Medical Properties. The precipitated sulphuret of antimony is alterative, diaphoretic, and emetic. It is, however, an uncertain medicine, as well from the want of uniformity in its composition, as from its liability to vary in its action with the state of the stomach. It is seldom given alone, but generally in combination with calomel and guaiac, in the form of Plummer's pill, as an alterative in secondary syphilis and cutaneous eruptions, or conjoined with henbane or hemlock in chronic rheumatism. (See *Pilulæ Calomelanos Compositæ.*) During its use the patient should abstain from acidulous drinks. Its dose as an

alterative is from one to two grains twice a day, in the form of pill; as an emetic, from five grains to a scruple. The kermes, obtained by means of the carbonated alkalies in the moist way, as it contains between two and three times as much teroxide as the precipitated sulphuret, is a more active preparation, and must be used in a smaller dose. Kermes mineral is sometimes given in large doses as an antiphlogistic remedy in peripneumony and other inflammations of the chest.

Off. Prep. Pilulæ Calomelanos Compositæ. B.

PULVIS ANTIMONIALIS. *Ed., Dub.* PULVIS ANTIMONII COMPOSITUS. *Lond. Antimonial Powder. Compound Powder of Antimony.*

"Take of Tersulphuret of Antimony, powdered, *a pound;* Horn shavings *two pounds.* Mix, and throw them into a red-hot crucible, and stir constantly until vapour ceases to arise. Rub the residue to powder, and put it into a crucible. Then apply heat, and raise it gradually to redness, and keep it so for two hours. Rub the remaining powder until it is as fine as possible." *Lond.*

"Take of Sulphuret of Antimony, in coarse powder, Hartshorn shavings, *equal weights.* Mix them, put them into a red-hot iron pot, and stir constantly till they acquire an ash-gray colour, and vapours no longer arise. Pulverize the product, put it into a crucible with a perforated cover, and expose this to a gradually increasing heat till a white heat is produced, which is to be maintained for two hours. Reduce the product, when cold, to fine powder." *Ed.*

"Take of Tartarized Antimony, Phosphate of Soda, each, *four ounces* [avoirdupois]; Chloride of Calcium *two ounces* [avoird.]; Solution of Ammonia *four fluidounces* [Imp. meas.]; Distilled Water *one gallon and a half* [Imp. meas.], or *a sufficient quantity.* Dissolve the Tartarized Antimony in half a gallon, and the Phosphate of Soda and Chloride of Calcium, each, in a quart of the Water. Mix the solutions of the Tartarized Antimony and Phosphate of Soda when cold, and then pour in the solution of Chloride of Calcium, having first added to the latter the Water of Ammonia. Boil now for twenty minutes, and, having collected the precipitate, which will have then formed, on a calico filter, wash it with hot distilled water until the liquid which passes through ceases to give a precipitate with a dilute solution of nitrate of silver. Finally, dry the product by a steam or water heat, and reduce it to a fine powder." *Dub.*

This preparation, made according to the London and Edinburgh formulæ, consists mainly of bone-phosphate of lime, or calcined bone, mixed with antimonious acid, and is intended to furnish a substitute for the celebrated nostrum of Dr. James, an English physician who died in 1776, and after whom the original composition was called *James's powder.* Dr. Pearson, of London, found the genuine powder, on analysis, to consist of phosphate of lime and oxidized antimony, and, guided by his results, devised the formula adopted by the London and Edinburgh Colleges. By burning the materials directed by these Colleges, the sulphur is expelled in the form of sulphurous acid, and the antimony oxidized; while the horn, which is of the nature of bone, has its animal matter converted into charcoal. By the subsequent calcination, the charcoal is dissipated, leaving only the phosphate of lime mixed with the oxidized antimony. This mixture constitutes the antimonial powder. The only material difference between the processes is that the London College uses two parts of horn shavings to one of sulphuret; while the Edinburgh employs equal weights, which are also the proportions adopted in the French Codex. The use of the larger proportion of horn is said to obviate the inconvenience of the vitrification of part of the antimony; but the late Dr. Duncan alleged that the product thus obtained does not correspond so well with James's powder as analyzed by Dr. Pearson, as when the smaller proportion is employed.

The third formula quoted is a new one of the Dublin Pharmacopœia of 1850. By this formula the liquid, resulting from mixing aqueous solutions of tartar emetic and phosphate of soda, is precipitated by a solution of chloride of calcium, previously mixed with water of ammonia. The water of ammonia throws down teroxide of antimony from the tartar emetic; and the chloride of calcium, phosphate of lime from the phosphate of soda; and the mixed precipitate from these two sources, washed, dried, and reduced to fine powder, constitutes the new Dublin antimonial powder. As phosphate of lime is generally considered to be inert, it is questionable whether this powder will have any other therapeutic effect than that produced by the teroxide of antimony alone.

Properties, Composition, and Tests. Antimonial powder, as made by the old formula, is a tasteless, inodorous, gritty powder, of a dull-white colour. As often prepared it is insoluble in water; but usually a small portion, consisting of antimonite and superphosphate of lime, dissolves in boiling distilled water. Its composition varies exceedingly, a circumstance which forms a strong objection to it as a medicine. When entirely insoluble in boiling water, it probably contains nothing but antimonious acid and phosphate of lime; for, when its soluble constituents are absent, the teroxide is absent also. The best samples, as stated by the Edinburgh College, are formed of "a mixture chiefly of antimonious acid and phosphate of lime, with some sesquioxide [teroxide] of antimony, and a little antimonite of lime." To these ingredients may be added superphosphate of lime, which was found in small quantity by Dr. D. Maclagan, of Edinburgh. This writer obtained in his experiments about 50 per cent. of antimonious acid, 45 of phosphate of lime, nearly 4 of teroxide, and not quite 1 of antimonite and superphosphate of lime. The antimonial powder, sold by the representatives of Dr. James, is more active, and more uniform in its effects, than the imitation powder of the Pharmacopœias; its greater activity being explained by the presence of a greater proportion of teroxide, which Dr. Maclagan found to vary from four to ten per cent. In analyzing antimonial powder, the first step is to act on it with boiling distilled water. If any antimonite should be dissolved, the solution will form with sulphuretted hydrogen an orange-coloured precipitate of quadrisulphuret of antimony; if superphosphate be present, nitrate of silver will throw down phosphate of silver. What remains of the powder, unacted on by the distilled water, is next digested with muriatic acid, which will dissolve the phosphate of lime, and also teroxide of antimony if present, and leave a residue which is the antimonious acid. If teroxide be present in the muriatic solution, it will be precipitated by sulphuretted hydrogen, as an orange-coloured tersulphuret, and from the filtered solution, water of ammonia will throw down the phosphate of lime. In this way all the ingredients of antimonial powder may be detected and separated. It might be supposed that the muriatic solution would be more readily tested for the presence of teroxide by the action of water, which is known to cause a white precipitate of teroxide in this solution; but there appears to be some ambiguity in relation to the action of water. The Edinburgh College, in its formula of tests, states that the muriatic solution of the residue, left after the exhaustion by water, does not become turbid by dilution; but, according to Dr. Barker and Dr. Pereira, this effect sometimes takes place. These different results may be explained by the different qualities of the preparation. A small quantity of teroxide may be in the muriatic solution, and yet not be precipitated by water; while a larger quantity will be so precipitated. On the other hand a precipitate may be produced with water, without the fact proving the presence of teroxide; for, unless the antimonial powder be most carefully exhausted by the distilled water before being subjected to the acid, the muriatic solution may contain antimonite of lime, which, like the teroxide, gives it the property of becoming turbid with water.

Medical Properties and Uses. This preparation is stated to be alterative, diaphoretic, purgative, or emetic, according to the dose in which it is given. Until within a few years it was frequently used in febrile diseases, with a view to its diaphoretic effect. According to the late Dr. A. T. Thomson, it is advantageously given in acute rheumatism, conjoined with camphor, calomel, and opium, and with calomel and guaiac in several cutaneous affections. The estimation in which this preparation is held is very various. The late Dr. Duncan characterized it as one of the best antimonials we possess; yet he acknowledged that its effects are very unequal, either from idiosyncrasy in the patient, or variations in its composition. Dr. Thomson found it sometimes to answer his expectations, but as often to disappoint them. Mr. Brande admits its activity sometimes, and entire inertness at others; differences which he attributes to the presence or absence of *teroxide* of antimony. Upon the whole it appears that, whatever may be the occasional efficacy of this medicine, it is too variable in its composition, from circumstances in its preparation scarcely within the control of the pharmaceutical chemist, to make it a safe remedy. No therapeutical effect can be expected from it, which may not be more certainly and safely produced by tartar emetic; and it seems to be the sentiment of some of the best practitioners, that antimonial powder may very well be dispensed with as a remedy. Considerations of this kind caused it to be omitted from the U. S. Pharmacopœia, upon the revision of 1830.

The dose of antimonial powder, as a diaphoretic, is from three to eight grains every third or fourth hour, given in the form of pill. In larger doses it is purgative or emetic. It is impossible, however, to give precise directions as to the dose; as it sometimes proves violently emetic in moderate doses, and at other times produces no obvious effect, even in doses of one hundred grains. B.

AQUA.

Water.

AQUA DESTILLATA. *U. S., Lond., Ed., Dub. Distilled Water.*

"Take of Water *ten gallons.* First distil *two pints,* and throw them away; then distil *eight gallons.* Keep the Distilled Water in glass bottles." *U. S.*

"Take any convenient quantity of Spring Water; distil it from a proper vessel, rejecting the first twentieth part, and preserving the first half of the remainder." *Ed.*

"Take of Spring or River Water *any convenient quantity.* Having introduced it into a copper still, connected with a block-tin worm, or a Liebig's condenser, draw over about one-fortieth by distillation; this being rejected, continue the process until only one-fifth of the original volume of the Water remains in the still. Let the Distilled Water be preserved in well stopped bottles." *Dub.*

The *London* College has placed distilled water in the list of the Materia Medica.

The purest natural water is not sufficiently pure for some pharmaceutical purposes; and hence the necessity of the above processes for its distillation. It is best to reject the first portion which comes over, as this may contain carbonic acid and other volatile impurities; and the last portion of the water ought not to be distilled, lest it should pass over with an empyreumatic taste. The distillation is usually performed with the ordinary still and condenser, and such an apparatus is evidently contemplated in the United States formula. Mr. Brande states that distilled water often derives from the still a foreign flavour, which it is difficult to avoid. He, therefore, recommends that a still and condenser be kept exclusively for distilling water; or where this cannot be done, that steam be driven through the condensing pipe for half an hour, for the purpose of washing it out before it is used, the worm-tub having been previously emptied.

Properties, &c. Distilled Water, as usually obtained, has a vapid and disagreeable taste, and is not perfectly pure; water, to be rendered so, requiring to be distilled in silver vessels. The properties of pure water have already been given under the head of *Aqua*. Distilled water should undergo no change by sulphuretted hydrogen, or on the addition of tincture of soap, subacetate of lead, chloride of barium, oxalate of ammonia, nitrate of silver, or lime-water, and should evaporate without residue. It is uselessly employed in some formulæ, but is essential in others. As a general rule, when small quantities of active medicines are to be given in solution, and in the preparation of collyria, distilled water should be directed. The following list contains the chief substances which require distilled water as a solvent;—tartar emetic, corrosive sublimate, nitrate of silver, the chlorides of barium and calcium, acetate and subacetate of lead, the sulphates of iron and zinc, sulphate of quinia, and the sulphate, muriate, and acetate of morphia. Distilled water is used in preparing the officinal diluted acids, for absorbing gaseous ammonia, and for forming nearly all the officinal aqueous solutions. B.

AQUÆ MEDICATÆ. *U. S.*

Medicated Waters.

Under this head are included, in the United States Pharmacopœia, all those preparations consisting of water impregnated with some medicinal substance, which are not arranged in any other class. Among them are the "Waters" and "Distilled Waters" of the British Pharmacopœias, which therefore require some notice in the present place.

AQUÆ. *Lond.* WATERS. *Dub.* DISTILLED WATERS. *Ed.*

"Distilled waters may be prepared from fresh, and generally also from dried vegetables. In the latter case only half the weight of material should be used. They may also be prepared, for the most part, by agitating the volatile oils of the plants with water, and filtering the solution. But distilled waters obtained in this way have seldom so fine a flavour as those obtained from the plants themselves." *Ed.*

Many vegetables impart to water distilled from them their peculiar flavour, and more or less of their medical properties. The distilled waters chiefly used are those prepared from aromatic plants, the volatile oil of which rises with the aqueous vapour, and is condensed with it in the receiver. But as water is capable of holding but a small proportion of the oil in solution, these preparations are generally feeble, and are employed chiefly as pleasant vehicles or corrigents of other medicines.

In the preparation of the distilled waters, dried plants are sometimes used, because the fresh are not to be had at all seasons; but the latter, at least in the instance of herbs and flowers, should be preferred if attainable. Flowers which lose their odour by desiccation may be preserved by incorporating them intimately with one-third of their weight of common salt, and in this state afford distilled waters of delicate flavour.

It is necessary to observe certain practical rules in conducting the process of distillation. When the substance employed is dry, hard, and fibrous, it should be mechanically divided, and macerated in water for a short time previously to the operation. The quantity of materials should not bear too large a proportion to the capacity of the alembic, as the water might otherwise boil over into the receiver. The water should be brought quickly to the state of ebullition, and continued in that state till the end of the process. Care should be taken to leave sufficient water undistilled to cover the whole of the vegetable matter; lest

a portion of the latter, coming in contact with the sides of the vessel, might be decomposed by the heat, and yield empyreumatic products. Besides, when the operation is urged too vigorously or carried too far, a slimy matter is apt to form, which adheres to the sides of the alembic above the water, and is thus exposed to igneous decomposition. To obviate these disadvantages, the heat may be applied by means of an oil-bath regulated by a thermometer, or of a bath of solution of chloride of calcium, by which any temperature may be obtained between 212° and 270°, according to the strength of the solution; or, when the process is conducted upon a large scale, by means of steam introduced under pressure into a space around the still. A convenient mode of applying heat by steam, is by means of a coil of leaden tube placed in the bottom of the still, having one end connected with a boiler, and the other passing out beneath or at the side, and furnished with a stop-cock, by which the pressure may be increased, or the condensed water drawn off at will. If any volatile oil float upon the surface of the distilled water, it should be separated.

But, however carefully the process may be conducted, the distilled waters prepared from plants always have at first an unpleasant smoky odour. They may be freed from this by exposure for a short time to the air, before being enclosed in well stopped bottles, in which they should be preserved. When long kept, they are apt to form a viscid ropy matter, and to become sour. This result has been ascribed to other principles, which rise with the oil in distillation, and promote its decomposition. To prevent this decomposition, the *Edinburgh College* orders rectified spirit to be added to the water employed in the process of distillation. But this addition is inadequate to the intended object, and is in fact injurious, as the alcohol by long exposure to the air appears to undergo the acetous fermentation. The *London College*, which formerly directed a spirituous addition, has abandoned it. A better plan is to redistil the waters. When thus purified, it is said that they may be kept for several years unchanged.

Robiquet considers the mucosity which forms in distilled waters as the result of a vegetative process, to which the presence of air is essential. He has found that, so long as the water is covered with a layer of essential oil, it undergoes no change; but that the oil is gradually altered by exposure to the air, and, as soon as it disappears, the water begins to be decomposed. He states that camphor exercises the same preservative influence over the distilled waters by resisting the vegetation, and that those in which the odour of camphor is developed keep better on that account. Finally, he has observed that the more distilled water is charged with volatile oil, the more abundant is the mucosity, when it has begun to form. Robiquet unites with Henry and Guibourt, and with Virey, in recommending that all these waters, when intended to be kept for a considerable time, should be introduced, immediately after distillation, into bottles of a size proportionate to the probable consumption of the water when brought into use; and that the bottles should be quite filled, and then sealed or otherwise well stopped, so as entirely to exclude the air. Thus treated, they may be preserved without change for many years. (*Journ. de Pharm.*, xxi. 402.)

Another mode of preparing the distilled waters is to substitute the volatile oil previously separated from the plant, for the plant itself in the process. This mode was directed in former editions of the *London* and *Dublin* Pharmacopœias, in several instances, but has been omitted in the last editions. It is said to afford a more permanent product than the preceding; but does not always preserve the flavour of the plant.

In relation to most of the aromatics, the United States Pharmacopœia discards altogether the process by distillation, and directs that water should be impregnated with the volatile oil by trituration with carbonate of magnesia, and subsequently filtered. This is by far the most simple and easy process. The resulting solution is pure and permanent, and is perfectly transparent, the car-

bonate of magnesia being separated by the filtration. Carbonate of magnesia is preferable to the pure earth; as the latter sometimes gives a brownish colour to the liquid, and requires to be used in larger proportion. But both these substances are dissolved in minute quantities, and are apt to occasion a slight flocculent precipitate. They may also possibly prove injurious by decomposing certain substances given in very small doses, as sulphate of morphia, bichloride of mercury, and nitrate of silver. The object of the magnesia or its carbonate is simply to enable the oil to be brought to a state of minute division, and thus presented with a larger surface to the action of the solvent. According to Mr. Robert Warington, this object may be better accomplished by porcelain clay, finely powdered glass, or pumice stone, which are wholly insoluble (*Chem. Gaz.*, March, 1845, p. 113); and the London College now employs finely powdered silica for the purpose. (See *Silex Contritus.*) Chalk and sugar answer the same end; but the latter, by being dissolved with the oil, renders the preparation impure. The *Dublin College* prepares its waters by agitating an alcoholic solution of the oil with distilled water and filtering. They consequently contain alcohol, and are liable to the objection already mentioned against the medicated waters thus impregnated. They are besides feeble in the properties of their respective oils. In the preparation of the aromatic waters by these processes, it is very important that the water should be pure. The presence of a sulphate causes a decomposition of the oil, resulting in the production of sulphuretted hydrogen and a carbonate; and the aromatic properties are quite lost. (See *Am. Journ. of Pharm.*, xix. 303.) Hence the propriety of the officinal direction to employ distilled water. W.

AQUA ACIDI CARBONICI. *U. S. Carbonic Acid Water. Artificial Seltzer Water.*

"By means of a forcing pump, throw into a suitable receiver, nearly filled with Water, a quantity of carbonic acid equal to five times the bulk of the Water. Carbonic acid is obtained from Marble by means of dilute sulphuric acid." *U. S.*

This preparation, which is peculiar to the United States Pharmacopœia, consists of water highly charged with carbonic acid. Water is found to take up its volume of this acid under the pressure of the atmosphere; and Dr. Henry ascertained that precisely the same *volume* of the compressed gas is absorbed under a higher pressure. From this law, the bulk taken up is constant, the quantity being different in proportion as there is more or less driven into a given space. As the space occupied by a gas is inversely as the compressing force, it follows that the quantity of the acid forced into the water will be directly as the pressure. A double pressure will force a double quantity into a given space, and, therefore, cause a double quantity to be absorbed; a treble pressure will drive a treble quantity into the same space, and cause its absorption; and so on for higher pressures, the *bulk* of the *compressed* gas absorbed always remaining the same. From the principles above laid down, it follows that, to saturate water with five times its volume of carbonic acid, as directed in the formula, it must be subjected to a pressure of five atmospheres.

Carbonic acid water is familiarly called in this country "mineral water," and "soda water;" the latter name, originally applied to the preparation when it contained a small portion of carbonate of soda, being from habit continued since the alkali has been omitted. As it is largely consumed both as an agreeable beverage and as a medicine, it will be proper to give a sketch of the apparatus employed in its preparation. This consists of a strong egg-shaped copper vessel, about eighteen inches long, called a generator, fixed upright in a wooden frame, and surmounted by another upright vessel of similar shape, about nine inches long, communicating with the generator by a short neck, and intended to contain the sulphuric acid. Connected with the generator by a copper tube, and placed

by its side, is a strong cylindrical vessel for washing the gas, about fifteen inches long and three and a half in diameter, two-thirds filled with water, and to near the bottom of which the connecting tube passes. Severally communicating with the washing vessel are a mercurial gauge to indicate the pressure, and a strong vessel, called the reservoir or fountain, of about the capacity of eighteen gallons, three-fourths filled with water, the connexion of the latter being by a lead or gutta percha tube, commanded by a stop-cock. The charge of whiting or marble dust, say eight pounds, and the requisite water are added through an opening in the generator, in front of the sulphuric acid vessel, and closed by a screw stopper. The communication between the acid vessel and generator is commanded by a vertical square rod, reaching within the vessel to about two-thirds of its height, and terminating at its lower end in a screw. This rod, when unscrewed, opens a communication between the acid vessel and the generator. The requisite sulphuric acid is added to the acid vessel through an opening at its top, capable of being closed by a screw stopper. Through the axis of this stopper, and revolving within it, but without having any vertical motion on it, passes the key, the lower end of which has a square hole to fit on the square rod. When the acid vessel is to be closed, the screw stopper, with its key, is placed over the opening, in which situation the lower end of the key reaches down a sufficient distance to embrace loosely the square rod. The stopper is now screwed in, and the key, without revolving with the stopper, descends so as duly to embrace the square rod. By turning the handle of the key in the proper direction, the rod is partially unscrewed, the passage to the generator opened, and the acid gradually flows in. From time to time, when the acid is allowed to enter the generator, its contents are briskly mixed by means of an agitator, attached to a horizontal axis, passing air-tight through the short diameter of the generator, and turned by a crank. The stop-cock between the washing vessel and fountain is now partially opened, and the impregnation of the water with the gas begins. As it proceeds, the sulphuric acid is gradually allowed to enter the generator until it is expended, and the stop-cock is from time to time turned, until it is entirely opened. Finally, after the water is fully charged with gas, and the whiting wholly decomposed, the fountain is detached, and the generator freed from the pulpy sulphate of lime by the assistance of water and the agitator, and its contents allowed to escape through an opening in its most depending part. In the apparatus of the size above described, a single fountain only is charged by one operation, and the carbonic acid water formed contains between nine and ten times its volume of the gas. In this improved mode of making carbonic acid water, it is perceived that the requisite pressure is obtained by generating the carbonic acid in a confined space, instead of by a forcing pump.

Carbonic acid water is dispensed in many of the apothecary shops in the United States. The fountain is usually placed in the cellar, and the tube proceeding from the fountain is made to pass through the floor and counter of the shop, and to terminate in a stop-cock, by means of which the carbonic acid water may be drawn off at pleasure. In order to have the liquid cool in summer, the tube from the cellar generally terminates in a strong metallic vessel of convenient shape, placed under the counter and surrounded with ice, and from this vessel a separate tube penetrating the counter proceeds.

Properties. Carbonic acid water is a sparkling liquid, possessing an agreeable, pungent, acidulous taste. It reddens litmus deeply from its state of concentration, and is precipitated by lime-water. Being impregnated with a large quantity of the acid gas under the influence of pressure, it effervesces strongly when freed from restraint. Hence, to preserve its briskness, it should be kept in strong well-corked bottles, placed inverted in a cool place. Several natural waters are of a similar nature; such as those of Seltzer, Spa, and Pyrmont; but the artificial water has the advantage of a stronger impregnation with the acid

gas. Carbonic acid water, when pure, is not discoloured by sulphuretted hydrogen or solution of ammonia, nor precipitated by sulphate of soda or ferrocyanuret of potassium. It should be made with every precaution to avoid metallic impurity. Hence the necessity of having the reservoir or fountain well tinned on the inner surface. Even with this precaution, a slight metallic impregnation is not always avoided, especially in the winter season, when the water is less consumed as a drink, and, therefore, allowed to remain longer in the reservoir. Glass fountains are sometimes used with advantage at this season; and a patent has been taken out for a stoneware fountain, enclosed in tinned copper, which has been found to answer a good purpose. When leaden tubes are employed to convey the water, it is liable to be contaminated with this metal, which renders it deleterious. A case of colica pictonum was treated by one of the authors, arising from the daily use of the first draught of carbonic acid water from a fountain furnished with tubes of lead. Tin tubes are sometimes employed, enclosed in lead ones to give them strength.

Carbonic acid, formerly called *fixed air*, is a colourless gas, of a slightly pungent odour and acid taste. It reddens litmus feebly, and combines with salifiable bases, forming salts called carbonates, from which it is expelled by all the strong acids. It extinguishes flame, and is quickly fatal to animals when respired. All kinds of fermented liquors which are brisk or sparkling, such as champagne, cider, porter, &c., owe these properties to its presence. Its sp. gr. is 1·52. In 1823 it was liquefied by Faraday by a pressure of 36 atmospheres, and in 1836 solidified by Thilorier, by taking advantage of the cold generated by the sudden gasefaction of the liquid acid, when freed from pressure. It is composed of one eq. of carbon 6, and two of oxygen 16=22.

Medical Properties and Uses. Carbonic acid water is diaphoretic, diuretic, and anti-emetic. It forms a grateful drink to febrile patients, allaying thirst, lessening nausea and gastric distress, and promoting the secretion of urine. The quantity taken need only be regulated by the reasonable wishes of the patient. It also forms a very convenient vehicle for the administration of magnesia, the carbonated alkalies, sulphate of magnesia, and the saline cathartics generally; rendering these medicines less unpleasant to the palate, and, in irritable states of the stomach, increasing the chances of their being retained. When used for this purpose, six or eight fluidounces will be sufficient.

Carbonic acid gas has been used by Professor Mojon, of Geneva, as an injection in dysmenorrhœa with the most soothing effects. It is applied by means of a flexible tube, inserted into the vagina, and proceeding from a bottle containing pieces of chalk and dilute sulphuric acid. The application is continued for five minutes, and repeated several times a day. (*Am. Journ. of the Med. Sci.*, xxii. 469, from the *Bull. Gén. de Thérap.*) B.

AQUA AMYGDALÆ AMARÆ. *U. S. Bitter Almond Water.*

"Take of Oil of Bitter Almonds *sixteen minims;* Carbonate of Magnesia *a drachm;* Water *two pints.* Proceed in the manner directed for Cinnamon Water." *U. S.*

This preparation has the effects of hydrocyanic acid on the system, and may be used as a vehicle of other medicines in nervous coughs, and various spasmodic affections. It is, however, liable to spontaneous change, and is consequently more or less uncertain. A drop of sulphuric acid added to a pint of it will contribute to its preservation; as will also complete exclusion from the light and air. But the better plan is to prepare it in small quantities, as wanted for use. The dose of it, to begin with, when of full strength, should not exceed half a fluidounce. Under the same name, a preparation has been considerably used on the continent of Europe, prepared by distilling bitter almonds with water. This when fresh is much stronger than the preparation of the U. S. Pharmacopœia,

containing, according to an analysis of Geiger, in 1000 parts, 1·2 parts of anhydrous hydrocyanic acid. It has been prescribed with fatal effects (*Pharm. Journ. and Trans.*, vi. 439); and the greatest caution, therefore, should be observed by the apothecary not to put up the distilled water instead of the officinal. W.

AQUA ANETHI. *Lond., Ed. Dill Water.*

"Take of Dill [fruit], bruised, *a pound and a half;* Water *two gallons* [Imperial measure]. Distil a gallon." Or, "Take of Oil of Dill *two fluidrachms;* Pulverized Silex *two drachms;* Distilled Water *a gallon* [Imp. meas.]. Rub the oil diligently, first with the Silex, afterwards with the Water, and filter the solution." *Lond.*

The *Edinburgh College* takes the same quantity of dill and of water, with *three fluidounces* of rectified spirit, mixes, and distils a gallon.

This is seldom if ever used in the United States. W.

AQUA ANISI. *Dub. Anise Water.*

"Take of Essence of Anise *one fluidounce;* Distilled Water *half a gallon* [Imperial measure]. Mix with agitation, and filter through paper." *Dub.*

This preparation is seldom used in the United States. W.

AQUA CAMPHORÆ. *U.S.* MISTURA CAMPHORÆ. *Lond., Ed., Dub. Camphor Water.*

"Take of Camphor *two drachms;* Alcohol *forty minims;* Carbonate of Magnesia *four drachms;* Distilled Water *two pints.* Rub the Camphor first with the Alcohol, afterwards with the Carbonate of Magnesia, and lastly with the Water gradually added; then filter through paper." *U. S.*

The *London College* takes *half a drachm* of camphor, *ten minims* of rectified spirit, and *a pint* [Imperial measure] of distilled water; rubs the camphor first with the spirit, and then with the water gradually added; and strains through linen. The *Edinburgh College* directs *a scruple* of camphor and *half an ounce* of sugar, well rubbed together, to be beat, with *half an ounce* of blanched sweet almonds, into a smooth pulp; *a pint* [Imp. meas.] of water to be gradually added, and the mixture to be strained. The *Dublin College* takes *a fluidounce* of tincture of camphor, and *three pints* [Imp. meas.] of water; shakes the tincture and water together in a bottle, and, after the mixture has stood twenty-four hours, filters through paper.

In all these processes the object is to effect a solution of the camphor. Water is capable of dissolving but a small proportion of this principle; but the quantity varies with the method employed. The London and Dublin preparations are very feeble. Made according to the Edinburgh process, one pint of the water contains less than twenty grains of camphor; while our own officinal preparation contains about fifty grains to the pint, or more than three grains to the fluidounce. (*Journ. of the Phil. Col. of Pharm.*, iv. 13.) The difference is attributable, at least in part, to the minute division effected in the camphor by trituration with the carbonate of magnesia, which is afterwards separated by filtration. The use of the alcohol is simply to break down the cohesion of the camphor, and enable it to be more easily pulverized. The process of the U. S. Pharmacopœia is much preferable to the others, as it affords a permanent solution, of sufficient strength to be employed with a view to the influence of the camphor on the system; while the British preparations have little more than the flavour of the narcotic, and are fit only for vehicles of other medicines. The camphor is separated by a solution of pure potassa, and, according to Dr. Paris, by sulphate of magnesia and several other salts. Sir J. Murray proposes a solution of camphor and bicarbonate of magnesia, which contains three grains of the former and six grains of the latter in each fluidounce. (See *Am. Journ. of Pharm.*, xx. 195.)

Camphor water is chiefly employed in low fevers and typhoid diseases, attended with restlessness, slight delirium, or other symptoms of nervous derangement or debility. It is used also to allay uterine after-pains. It has this advantage over camphor in substance, that the latter is with difficulty dissolved by the liquors of the stomach; but it is not applicable to cases where very large doses of the medicine are required. It is usually given in the dose of one or two tablespoonfuls repeated every hour or two hours. W.

AQUA CARUI. *Lond., Dub. Caraway Water.*

The *London College* prepares this in the same manner as *Dill Water*. (See *Aqua Anethi.*) The *Dublin College* takes *a fluidounce* of the essence of caraway, and *half a gallon* [Imperial measure] of distilled water, mixes with agitation, and filters through paper.

Caraway water has the flavour and pungency of the seeds, but is not used in this country. W.

AQUA CASSIÆ. *Ed. Water of Cassia.*

"Take of Cassia-bark, bruised, *eighteen ounces;* Water, two *gallons* [Imperial measure]; Rectified Spirit *three fluidounces.* Mix them together, and distil off one gallon." *Ed.*

The distinction between cassia and cinnamon is not recognised in our Pharmacopœia; so that this preparation would rank as a variety of cinnamon water. (See *Aqua Cinnamomi.*) W.

AQUA CINNAMOMI. *U.S., Lond., Ed., Dub. Cinnamon Water.*

"Take of Oil of Cinnamon *half a fluidrachm;* Carbonate of Magnesia *a drachm;* Distilled Water *two pints.* Rub the Oil of Cinnamon first with the Carbonate of Magnesia, then with the Water gradually added, and filter through paper." *U. S.*

The *London College* prepares this in the same manner as Dill Water; the *Edinburgh*, as the Water of Cassia. The *Dublin College* takes *a fluidounce* of essence of cinnamon, and *half a gallon* [Imperial measure] of distilled water, mixes with agitation, and filters through paper.

Of these processes, we prefer that of the U. S. Pharmacopœia or the second London process, as easier than the others, or affording a better product. Cinnamon water is much used as a vehicle for other less agreeable medicines; but should be given cautiously in inflammatory affections. For ordinary purposes it is sufficiently strong when diluted with an equal measure of water.

Off. Prep. Mistura Cretæ; Mistura Guaiaci; Mistura Spiritûs Vini Gallici. W.

AQUA FŒNICULI. *U. S., Ed., Dub. Fennel Water.*

The U. S. Pharmacopœia directs this to be prepared from oil of fennel, in the same manner as cinnamon water. (See *Aqua Cinnamomi.*)

The *Edinburgh College* prepares it in the same manner as dill water (see *Aqua Anethi*). The *Dublin College* takes *a fluidounce* of the essence of fennel, and *half a gallon* [Imperial measure] of distilled water, mixes with agitation, and filters through paper.

Fennel water is an agreeable vehicle for other medicines, and useful when a mild aromatic is indicated. W.

AQUA LAURO-CERASI. *Ed., Dub. Cherry-laurel Water.*

"Take of Fresh Leaves of Cherry-laurel, *a pound;* Water *two pints and a half* [Imperial measure]; Compound Spirit of Lavender *an ounce.* Chop down the Leaves, mix them with the Water, distil off one pint [Imp. meas.], agitate the distilled liquid well, filter it if any milkiness remain after a few seconds of rest, and then add the Lavender Spirit." *Ed.*

"Take of Fresh Leaves of the Common Laurel, *one pound;* Water *two pints and a half* [Imperial Measure]. Upon the Leaves, chopped, and crushed in a mortar, macerate the Water for twenty-four hours, and then draw over a pint of liquid by distillation, using a Liebig's condenser, and chloride of zinc bath. Filter the product through paper, and preserve it in a well-stopped bottle." *Dub.*

The leaves yield a larger product of hydrocyanic acid when cut and bruised than when distilled whole. According to M. Garot, the proportion of the acid in cherry-laurel water depends upon the time of year at which the distillation is performed; the leaves yielding not more than half as much in April, as in the middle of July. (*Annuaire de Thérap.*, 1843, p. 45.) The use of compound spirit of lavender, in the Edinburgh formula, instead of alcohol, is in order to impart colour to the preparation, and thus prevent it from being mistaken for common water. The proportion of hydrocyanic acid in the water diminishes with time. It has been ascertained by M. Deschamps, that if a drop of sulphuric acid be added to a pint of the preparation, it will keep unchanged for at least a year. It is best preserved by the entire exclusion of air and light. M. Lepage found that, preserved in full and perfectly air-tight bottles, both this and bitter almond water remained unchanged at the end of a year; while freely exposed to the air, they lost all their hydrocyanic acid and essential oil in two or three months. (*Journ. de Pharm. et de Chim.*, xvi. 346.) Cherry-laurel water is employed in Europe as a sedative narcotic, identical in its properties with a dilute solution of hydrocyanic acid; but it is of very uncertain strength. The dose is from thirty minims to a fluidrachm. W.

AQUA MENTHÆ PIPERITÆ. *U. S., Lond., Ed., Dub. Peppermint Water.*

This is prepared, according to the U. S. Pharmacopœia, from the oil of peppermint, in the manner directed for cinnamon water. (See *Aqua Cinnamomi.*)

"Take of Peppermint, dried, *two pounds;* Water *two gallons* [Imperial measure]. Distil *a gallon.* When the fresh herb is used the quantity should be doubled. This Water may be more quickly prepared from the Oil of Peppermint in the same manner as Dill Water." *Lond.*

The *Edinburgh College* mixes *four pounds* of fresh or *two* of dry peppermint, *two gallons* [Imp. meas.] of water, and *three fluidounces* of rectified spirit, and distils a gallon. The *Dublin College* mixes, with agitation, *a fluidounce* of essence of peppermint with *half a gallon* [Imp. meas.] of distilled water, and filters through paper. W.

AQUA MENTHÆ VIRIDIS. *U. S., Lond., Ed., Dub. Spearmint Water.*

This is prepared, according to the U. S. Pharmacopœia, from the oil of spearmint, in the manner directed for cinnamon water. (See *Aqua Cinnamomi.*)

By the British Colleges it is prepared in the manner directed by them for peppermint water.

The two mint waters are among the most grateful and most employed of this class of preparations. Together with cinnamon water, they are used in this country, almost to the exclusion of all others, as the vehicle of medicines given in the form of mixture. They serve not only to conceal or qualify the taste of other medicines, but also to counteract their nauseating properties. Peppermint water is generally thought to have a more agreeable flavour than that of spearmint, but some prefer the latter. Their effects are the same. W.

AQUA PIMENTÆ. *Lond., Ed., Dub. Pimento Water.*

"Take of Pimento, bruised, *a pound;* Water *two gallons* [Imperial measure]. Distil a gallon. This Water may be more quickly prepared from Oil of Pimento in the same manner as Dill Water." *Lond.*

The *Edinburgh College* mixes *a pound* of bruised pimento, *two gallons* [Imp. meas.] of water, and *three fluidounces* of rectified spirit, and distils a gallon. The *Dublin College* agitates *a fluidounce* of essence of pimento with *half a gallon* [Imp. meas.] of distilled water, and filters through paper.

Pimento water is brownish when first distilled, and upon standing deposits a brown resinous sediment. It is used as a carminative in the dose of one or two fluidounces. W.

AQUA PULEGII. *Lond., Ed.* AQUA MENTHÆ PULEGII. *Dub. Pennyroyal Water.*

This is prepared from European pennyroyal or its oil, precisely in the manner directed by the British Colleges for peppermint water. It is not used in this country, as we have not the plant. A water prepared from *Hedeoma pulegioides*, or American pennyroyal, might be substituted.

Pennyroyal water is employed for the same purposes as those of peppermint and spearmint. W.

AQUA ROSÆ. *U. S., Lond., Ed., Dub. Rose Water.*

"Take of Fresh Hundred-leaved Roses *eight pounds;* Water *two gallons.* Mix them and distil a gallon." *U. S.*

The *London College* takes *ten pounds* of roses and *two gallons* [Imperial measure] of water, and distils a gallon. The *Edinburgh College* mixes *ten pounds* of roses, *two gallons* [Imp. meas.] of water, and *three fluidounces* of rectified spirit, and distils off *a gallon;* adding the following notice. "The petals should be preferred when fresh; but it also answers well to use those which have been preserved by beating them with twice their weight of muriate of soda." The *Dublin College* agitates *twenty minims* of oil of roses with *half a gallon* [Imp. meas.] of distilled water, and filters through paper.

It should be observed that, in the nomenclature of the U. S. Pharmacopœia, the term "Roses" implies only the petals of the flower. These are directed in the recent state; but it is said that, when preserved by being incorporated with one-third of their weight of common salt, they retain their odour, and afford a water equally fragrant with that prepared from the fresh flower. It is not uncommon to employ the whole flower including the calyx, but the product is less fragrant than when the petals only are used, as officinally directed. Rose water is sometimes made by distilling together water and the oil of roses.

When properly prepared, it has the delightful perfume of the rose in great perfection. It is most successfully made on a large scale. Like the other distilled waters it is liable to spoil when kept; and the alcohol which is sometimes added to preserve it is incompatible with some of the purposes to which the water is applied, and is even said to render it sour through acetous fermentation. It is best, therefore, to avoid this addition, and to substitute a second distillation. This distilled water is chiefly employed, on account of its agreeable odour, in collyria and other lotions. It is wholly destitute of irritating properties, unless when it contains alcohol.

Off. Prep. Confectio Rosæ; Mistura Ferri Composita; Unguentum Aquæ Rosæ. W.

AQUA SAMBUCI. *Lond., Ed. Elder Water.*

"Take of Elder Flowers *ten pounds;* Water *two gallons* [Imperial measure]. Distil a gallon." *Lond.*

The *Edinburgh College* mixes *ten pounds* of the fresh flowers, two gallons [Imp. meas.] of water, and *three fluidounces* of rectified spirit, and distils a gallon.

Elder flowers yield very little oil upon distillation; and if the water be needed, it may be best prepared from the flowers. In this country it is not used. W.

CHLORINII LIQUOR. *Dub.* CHLORINEI AQUA. *Ed.* *Solution of Chlorine. Chlorine Water.*

"Take of Peroxide of Manganese, in fine powder, *half an ounce* [avoirdupois]; Muriatic Acid of Commerce *three fluidounces* [Imp. meas.]; Distilled Water *twenty-four ounces* [avoird.]. Introduce the Peroxide of Manganese into a gas bottle, and having poured upon it the Muriatic Acid diluted with two ounces of [the] Water, apply a gentle heat, and, by suitable tubes, cause the gas, as it is developed, to bubble through two additional ounces of the Water placed in an intermediate small vial, and then to pass to the bottom of an [Imperial] three-pint bottle, containing the remainder of the Water, and whose mouth is loosely plugged with tow. When the air has been entirely displaced by the chlorine, let the bottle be disconnected from the apparatus in which the gas is generated, corked loosely, and shaken until the chlorine is absorbed. It should be now transferred to an [Imperial] pint bottle with a well-ground glass stopper, and preserved in a cool and dark place." *Dub.*

"Take of Muriate of Soda [chloride of sodium] *sixty grains;* Sulphuric Acid (commercial) *two fluidrachms* [Imp. meas.]; Red Oxide of Lead *three hundred and fifty grains;* Water *eight fluidounces* [Imp. meas.]. Triturate the Muriate of Soda and Oxide together; put them into the Water contained in a bottle with a glass stopper; add the Acid; agitate occasionally till the Red Oxide becomes almost all white. Allow the insoluble matter to subside before using the liquid." *Ed.*

In order to understand the Dublin process for making chlorine water, it is necessary to recollect that twenty-four avoirdupois ounces of water are equal to twenty-four Imperial fluidounces, and that the Imperial pint contains twenty fluidounces. The three-pint bottle used, therefore, has the capacity of sixty fluidounces. Four fluidounces of the water are appropriated in diluting the acid and in absorbing impurities in the intermediate vial. The remaining twenty fluidounces, or an Imperial pint, is placed in the three-pint bottle, which it only one-third fills. The chlorine gas is extricated from the muriatic acid by the deutoxide of manganese separating the hydrogen, and is passed into the three-pint bottle, loosely stopped, until the vacant part, having the capacity of two pints, is filled with it to the exclusion of atmospheric air. The bottle, being then corked, is shaken, so as to cause the absorption of the gas by the water. The product is an Imperial pint of chlorine water, which is transferred to a bottle just sufficient in capacity to contain it.

By the Edinburgh process the solution is formed in the liquid way. The red oxide of lead oxidizes the sodium, converting it into soda, and is itself reduced to the state of protoxide. The chlorine set free is dissolved by the water, and the sulphuric acid forms with the soda, sulphate of soda which remains in solution, and with the protoxide of lead, sulphate of protoxide of lead which is precipitated. The action is completed in the course of a few hours, and the sulphate of lead having subsided, the supernatant liquid forms an aqueous solution of chlorine, containing a little sulphate of soda, which does not interfere with its medicinal properties.

Properties. The Dublin chlorine water has a pale yellowish-green colour, an astringent taste, and the peculiar odour of the gas. Like gaseous chlorine it destroys vegetable colours. When cooled to about the freezing point, it forms deep-yellow crystalline plates, consisting of hydrate of chlorine. As prepared by the Dublin College, it is intended to contain twice its volume of the gas. It is decomposed by light, with the production of muriatic acid, and the evolution of oxygen, and hence must be kept in a dark place. According to MM. Riegel and Waltz, chlorine water, containing two and a half volumes of the gas at 54°, keeps best.

Chlorine is an elementary gaseous fluid, of a greenish-yellow colour, and characteristic smell and taste. It is a supporter of combustion. Its specific gravity is 2·47, and equivalent number 35·42. When the attempt is made to breathe it, even much diluted, it excites cough and a sense of suffocation, and causes a discharge from the nostrils like coryza. Breathed in considerable quantities, it produces spitting of blood, violent pains, and sometimes death.

Medical Properties and Uses. Chlorine water is stimulant and antiseptic. It has been used in typhus, and chronic affections of the liver; but the diseases in which it has been most extolled are scarlatina and malignant sorethroat. Externally it may be used, duly diluted, as a gargle in smallpox, scarlatina, and putrid sorethroat, as a wash for ill-conditioned ulcers and cancerous sores, and as a local bath in diseases of the liver. It has been used with advantage as an application to buboes and large abscesses, promoting the absorption of the matter. As it depends upon chlorine for its activity, its medical properties coincide generally with those of chlorinated lime, chlorinated soda, and nitromuriatic acid, under which heads they are more particularly given. The dose of chlorine water is from one to four fluidrachms, properly diluted.

Gaseous chlorine has been recommended in minute doses, by Gannal, in chronic bronchitis and pulmonary consumption, exhibited by inhalation four or six times a day. Its first effect is to produce some dryness of the fauces, with increased expectoration for a time, followed ultimately with diminution of the sputa and amendment. Dr. Christison states that he has repeatedly observed these results in chronic catarrh; and in consumption, both he and Dr. Elliotson have witnessed the temporary melioration of the symptoms from chlorine inhalations, such as they never obtained by any other means. The liquid in the inhaler may be formed either of water containing from ten to thirty drops of chlorine water, or of chlorinated lime dissolved in forty parts of water, to which a drop or two of sulphuric acid must be added, each time the inhalation is practised. The inhaler should be placed in water, heated to about 100°. B.

ARGENTUM.

Preparations of Silver.

ARGENTI CYANURETUM. *U. S. Cyanuret of Silver. Cyanide of Silver.*

"Take of Nitrate of Silver, Ferrocyanuret of Potassium, each, *two ounces;* Sulphuric Acid *an ounce and a half;* Distilled Water *a sufficient quantity.* Dissolve the Nitrate of Silver in a pint of Distilled Water, and pour the solution into a tubulated glass receiver. Dissolve the Ferrocyanuret of Potassium in ten fluidounces of Distilled Water, and pour the solution into a tubulated retort, previously adapted to the receiver. Having mixed the Sulphuric Acid with four fluidounces of Distilled Water, add the mixture to the solution in the retort, and distil by means of a sand-bath, with a moderate heat, until six fluidounces pass over, or until the liquid that passes produces no longer a precipitate in the receiver. Finally, wash the precipitate with distilled water, and dry it." *U. S.*

This preparation was originally introduced into the U.S. Pharmacopœia for the purpose of being used in the extemporaneous preparation of diluted hydrocyanic acid. (See *page* 805.) By the formula adopted in the Pharmacopœia of 1840, the officinal hydrocyanic acid was added to a solution of nitrate of silver. The expenditure in this way of the officinal acid, which is very weak, and at the same time nicely adjusted to a given strength, was injudiciously directed; and, accordingly, that formula has been abandoned, and a new process adopted

in the Pharmacopœia of 1850, in which all the silver contained in a given weight of nitrate of silver, placed in a receiver in solution is converted into cyanuret, by hydrocyanic acid, extricated from ferrocyanuret of potassium by the action of sulphuric acid. By a double decomposition between the oxide of silver of the nitrate and the hydrocyanic acid, water and cyanuret of silver are formed in the receiver, the latter of which precipitates. The materials in the retort are sufficient to produce a little more hydrocyanic acid than is necessary to convert the whole of the silver in the receiver into cyanuret; so that the complete decomposition of the nitrate of silver is insured.

According to Messrs. Glassford and Napier, the best way of obtaining cyanuret of silver is to add cyanuret of potassium to a solution of nitrate of silver, so long as a precipitate is formed.

Properties. Cyanuret of silver is a tasteless white powder, insoluble in water and cold nitric acid, but readily soluble, with decomposition, in that acid when boiling hot. It is decomposed by muriatic acid, exhaling the odour of hydrocyanic acid. It is not soluble in potassa or soda, but readily so in ammonia. Its best solvent is cyanuret of potassium. When heated it is decomposed, cyanogen being evolved, and metallic silver left. It consists of one eq. of cyanogen 26, and one of silver 108=134. It has no medical uses.

Off. Prep. Acidum Hydrocyanicum Dilutum. B.

ARGENTI NITRAS. *U. S. Nitrate of Silver. Nitrate of Silver in Crystals.*

"Take of Silver, in small pieces, *an ounce;* Nitric Acid [sp. gr. 1·42] *seven fluidrachms;* Distilled Water *two fluidounces.* Mix the acid with the Water, and dissolve the Silver in the mixture, on a sand-bath, with a gentle heat. Pour off the clear solution into a porcelain capsule, and, having evaporated it to one-half, allow it to cool that crystals may form. Pour off the supernatant liquid, and, after due evaporation, put it aside for the formation of fresh crystals. Again pour off the liquid, and evaporate for a third crop of crystals. Lastly, place the crystals in a glass funnel, in order that they may drain, and, when they are dry, put them into a bottle, which is to be well stopped, and protected from the light. The silver remaining in the mother water of the last crystallization may be obtained by introducing into it a plate of copper, which will precipitate the whole of the silver in the form of a gray powder, which, when washed with water, will be perfectly pure." *U. S.*

During the solution of silver in nitric acid, part of the acid is decomposed into nitric oxide which is given off and becomes red fumes by contact with the atmosphere, and oxygen which oxidizes the silver. The oxide formed then combines with the remainder of the acid, and generates the nitrate of silver in solution, which, by due evaporation, furnishes crystals of the salt. The silver should be pure, and the acid diluted for the purpose of promoting its action. If the silver contain copper, the solution will have a greenish tint, not disappearing on the application of heat; and if a minute portion of gold be present, it will be left undissolved as a black powder. The acid also should be pure. The commercial nitric acid, as it frequently contains both muriatic and sulphuric acids, should never be used in this process. The muriatic acid gives rise to an insoluble chloride, and the sulphuric, to the sparingly soluble sulphate of silver.

Properties. Nitrate of silver is in colourless transparent crystals, having the form of rhomboidal plates, sometimes of considerable size. Its taste is intensely metallic and bitter. It is soluble in its own weight of cold water, and in four parts of boiling alcohol. When perfectly pure, it is wholly soluble in distilled water. The solution stains the skin of an indelible black colour, and is itself discoloured by the most minute portion of organic matter, of which it forms a delicate test. The affinity of this salt for animal matter is evinced by its form-

ing definite compounds with albumen and fibrin. The solution also stains linen and muslin in a similar manner; and hence its use in making the so-called indelible ink. To remove these stains, Mr. W. B. Herapath advises to let fall on the moistened spots a few drops of tincture of iodine, which converts the silver into iodide of silver. The iodide is then dissolved by a solution of hyposulphite of soda, made of the strength of half a drachm to a fluidounce of water, or by a moderately dilute solution of caustic potassa, and the spots are washed out with warm water. Stains may be removed from the skin by the same reagents. When exposed to heat nitrate of silver fuses at 426°, and upon concreting forms the fused nitrate, which is officinal under the name of *Argenti Nitras Fusus*. At about 600° it undergoes decomposition with evolution of oxygen and nitrous acid, and the metal is revived. This statement explains the necessity of guarding against the application of too high a heat during the fusion of the salt. Nitrate of silver is incompatible with almost all spring and river water, on account of the common salt usually contained in it; with soluble chlorides; with sulphuric, hydrosulphuric, muriatic, and tartaric acids, and their salts; with the alkalies and their carbonates; with lime-water; and with astringent vegetable infusions. It is an anhydrous salt, and consists of one eq. of nitric acid 54, and one of protoxide of silver 116=170.

Impurities and Tests. A solution of chloride of sodium, when added in excess to one of nitrate of silver, should throw down the whole of the silver as a white curdy precipitate, and nothing besides. This precipitate should be entirely soluble in ammonia. If not entirely soluble, the insoluble part is probably chloride of lead. If the supernatant liquid, after the removal of the above-mentioned precipitate, be discoloured or precipitated by sulphuretted hydrogen, the fact shows the presence of metallic matter, which is probably copper or some remains of lead, or both. After all, the best test of nitrate of silver is the characteristic appearance of the crystals of the pure salt. For further tests of nitrate of silver, see *Argenti Nitras Fusus*.

Medical Properties. Nitrate of silver, as an internal remedy, is deemed tonic and antispasmodic. The principal diseases in which it has been employed are epilepsy, chorea, angina pectoris, and other spasmodic affections. In epilepsy it forms our most reliable remedy; but the kind of cases to which it is particularly applicable and its modus operandi are not understood. It is said to produce most good in this disease when it acts upon the bowels. Dr. James Johnson and other practitioners have found it useful, as a palliative and sedative, in chronic disease of the stomach attended with pain and vomiting. Dr. J. F. Peebles, of Petersburgh, Va., bears testimony to its efficacy in jaundice connected with gastric irritation, given preferably on an empty stomach. (*Am. Journ. of the Med. Sciences*, July 1849.) Dr. Boudin, of Marseilles, has employed it in typhoid fever as a remedy for the inflammation and ulceration of the ileum, which constitute the most constant lesion in that disease. When the gastric symptoms predominate, he gives the nitrate in pill, in doses of from the fourth to the half of a grain. When diarrhœa is the principal symptom, he administers, night and morning by injection, a solution of the salt containing three or four grains to six fluidounces of water. The injections appear to be useful by promoting the cicatrization of the intestinal ulcers, and were found to extend their operation as high up as the small intestines. M. Delioux, of Rochefort, has proposed albuminous injections of nitrate of silver in diarrhœa, formed of half a pint of water, containing the white of one egg, from two to four grains of the nitrate, and an equal weight of common salt. Nitrate of silver is soluble in an excess of an albuminous solution, and when thus prepared is more readily absorbed than when dissolved in water. The common salt promotes its solution without decomposing it. (*Journ. de Pharm.* xx. 149.) In chronic

diarrhœa, especially in that kind attendant on phthisis, Dr. Macgreggor, of Dublin, has found the nitrate of silver, conjoined with opium, a valuable remedy. Whatever may be the remedial value of this salt internally administered, its occasional effect of producing a slate-coloured discoloration of the skin, which is seldom removed, is a great objection to its use. This effect proves the absorption of the medicine, and is alleged to show itself first on the tongue and fauces. According to Dr. Branson, an indication of the approach of discoloration is furnished by the occurrence of a dark blue line on the edges of the gums, very similar to that produced by lead, but somewhat darker. The discoloration of the skin is said to be removed by a steady course of cream of tartar.

Externally, nitrate of silver is occasionally employed in solution as a stimulant and escharotic; but the *fused nitrate*, which is not so pure as the officinal *nitrate* (pure salt in crystals), is generally used for making solutions. In all cases requiring nicety, the officinal nitrate (crystals) should be directed to be dissolved, and distilled water should be selected as the solvent. A solution made in the proportion of half a grain of the crystals to a fluidounce of distilled water, forms a good mouth wash for healing ulcers produced by mercury. In the inflammation of the mouth from mercurial salivation, M. Bouchacourt found a concentrated solution of the salt, applied to the gums, base of the tongue, &c. with a camel's hair brush, very useful. A solution containing two grains of the crystals to a fluidounce of distilled water is an excellent application in ophthalmia with ulcers of the cornea, in fetid discharges from the ear, aphthous affections of the mouth, and spongy gums.

The dose of nitrate of silver (crystals) is the fourth of a grain, gradually increased to four or five grains, three times a day. For internal exhibition, the physician should always prescribe the crystals, which are meant by the name Argenti Nitras, in the revised nomenclature of the U. S. Pharmacopœia of 1850, and never direct the fused nitrate (Argenti Nitras Fusus), which is often impure. Nitrate of silver should always be given in pill, in which form, according to Dr. Powell, the system bears a dose three times as large as when given in solution. In the treatment of epilepsy, this physician recommends the exhibition at first of grain doses, to be gradually increased to six grains, three times a day. Its effects vary very much, owing no doubt to the salt being more or less decomposed by the substances used in preparing it in pill, or with which it comes in contact in the stomach. It should not be made up into pill with crumb of bread, as this contains common salt, but with some vegetable powder and mucilage. Considering that chloride of sodium is used in food, and exists, together with phosphates, in the secretions, and that free muriatic acid and albuminous fluids are present in the stomach, it is almost certain that, sooner or later, the whole of the nitrate of silver will be converted into the chloride, phosphate, and albuminate, compounds far less active than the original salt. The experiments of Keller, who analyzed the feces of patients under the use of this salt, confirm this view. Such being the inevitable result when the nitrate is given, the question arises how far it would be expedient to anticipate the change, and give the silver as a chloride ready formed. One of the authors of this work has tried the chloride in large doses, in two very unpromising cases of epilepsy, but without advantage.

According to Mialhe, nitrate of silver is immediately changed into the chloride upon entering the stomach, and this chloride is quickly converted into a soluble and readily absorbable double chloride, by combining with the chloride of sodium or potassium.

Nitrate of silver, in an over-dose, produces the effects of the corrosive poisons. The proper antidote is common salt, which acts by converting the poison into the insoluble chloride of silver.

Off. Prep. Argenti Cyanuretum. Argenti Oxidum. B.

ARGENTI NITRAS FUSUS. *U. S.* Argenti Nitras Fusum. *Dub.* Argenti Nitras. *Lond., Ed. Fused Nitrate of Silver. Lunar Caustic. Lapis Infernalis.*

"Take of Silver, in small pieces, *an ounce;* Nitric Acid [sp. gr. 1·42] *seven fluidrachms;* Distilled Water *two fluidounces.* Mix the Acid with the Water, and dissolve the silver in the mixture, on a sand-bath, with a gentle heat; then gradually increase the heat, and evaporate to dryness. Melt the resulting salt in a crucible over a gentle fire, and continue the heat until ebullition ceases; then immediately pour it into suitable moulds." *U. S.*

"Take of pure Silver *an ounce and a half;* Pure Nitric Acid [sp. gr. 1·5] *one fluidounce* [Imp. meas.]; Distilled Water *two fluidounces* [Imp. meas.]. Mix the Acid and Water, add the Silver, and dissolve it with the aid of a gentle heat; increase the heat gradually till a dry salt be obtained; fuse the salt in an earthenware or porcelain crucible, and pour the fused matter into iron moulds, previously heated, and greased slightly with tallow. Preserve the product in glass vessels." *Ed.*

"Take of Refined Silver *three ounces* [avoirdupois]; Pure Nitric Acid [sp. gr. 1·5] *two fluidounces* [Imp. meas.]; Distilled Water *five ounces* [avoird.]. Place the Silver in a flask, and, having poured upon it the Acid and Water, apply a gentle heat until the metal is dissolved. Transfer the solution to a porcelain capsule, decanting it off a heavy black powder which appears at the bottom of the flask, and, having evaporated it to dryness, raise the heat (in a dark room) until liquefaction is produced. Pour the melted Nitrate of Silver into a brass mould, furnished with cylindric cavities of the size of a goose quill, and which admits of being opened by a hinge, and, when the salt has concreted, remove it, and preserve it in well stopped vessels, rendered impervious to light." *Dub.*

The *London College* places fused nitrate of silver in the list of the Materia Medica.

The first step in the process for making fused nitrate of silver is the same as that for preparing the crystallized nitrate, namely, the solution of silver in nitric acid; but, instead of concentrating the solution so that crystals may form, it is at once evaporated to dryness, and the dry mass fused, and cast in cylindrical moulds. As the salt sinks into a common crucible, the fusion should be performed in one of porcelain, as recommended by the Edinburgh College, the size of which should be sufficient to hold five or six times the quantity of the dry salt operated on, in order to prevent its overflowing in consequence of the ebullition. Sometimes small portions of the liquid are spirted out, and the operator should be on his guard against this occurrence. When the mass flows like oil, it is completely fused, and ready to be poured into the moulds. These should be warmed, but not greased as directed by the Edinburgh College; as grease furnishes organic matter which partially decomposes the fused salt.

Properties. Fused nitrate of silver, as prepared by the above processes, is in the form of hard brittle sticks, of the size of a goose quill, at first white, but becoming gray or more or less dark under the influence of light, owing to the reduction of the silver, effected probably by organic matter, or sulphuretted hydrogen contained in the atmosphere. That the change, however, does not depend on the sole action of light has been proved by Mr. Scanlan, who finds that nitrate of silver, in a clean glass tube hermetically sealed, undergoes no change by exposure to light. The sticks often become dark-coloured and nearly black on the surface, and, when broken across, exhibit a crystalline fracture with a radiated surface. Fused nitrate of silver, when pure, is wholly soluble in distilled water; but even good samples of the fused salt will not totally dissolve, a very scanty black powder being left of reduced silver, arising probably from the salt having been exposed to too high a heat in fusion.

Impurities and Tests. Fused nitrate of silver is liable to contain free silver from having been exposed to too high a heat, the nitrates of lead and copper from the impurity of the silver dissolved in the acid, and nitrate of potassa from fraudulent admixture. Free silver will be left undissolved as a black powder, after the action of distilled water. A very slight residue of this kind is hardly avoidable; but, if there be much free silver, it will be shown by the surface of a fresh fracture of one of the sticks presenting an unusually dark-gray colour. (*Christison.*) The mode of detecting lead and copper is given under nitrate of silver. (See *Argenti Nitras.*) In order to detect nitre, a solution of the suspected salt should be precipitated by muriatic acid in excess, and sulphuretted hydrogen, to remove the silver, and other metals if they happen to be present. The filtered solution, if the salt be pure, will entirely evaporate by heat; if it contain nitre, this will be left, easily recognizable by its properties as a nitrate. This impurity sometimes exists in fused nitrate of silver in large amount, varying, according to different statements, from 10 to 75 per cent. According to Dr. Christison, it may be suspected if the sticks present a colourless fracture. A mode is given in the Edinburgh Pharmacopœia for testing fused nitrate of silver for impurity, without determining its nature. It depends upon the fact, that the pure salt requires for its conversion into chloride, a given quantity of a muriate or chloride; and that if a little less than this quantity be used to precipitate it, the supernatant liquid will be precipitable by more of the test. Now this will not be the case with the impure salt. In applying this test, the Edinburgh College directs that 29 grains of the salt should be dissolved in a fluidounce of distilled water acidulated with nitric acid, precipitated with a solution of 9 grains of muriate of ammonia, briskly agitated for a few seconds, and then allowed to rest. If the salt be impure, it will not be precipitated on the addition of more of the test. The similar test of the London Pharmacopœia of 1851 proceeds on the principle that a given weight of chloride of sodium is *fully* precipitated by an equivalent weight of the *pure* nitrate, and, consequently, that an equivalent weight of *impure* nitrate is not competent to produce a full precipitation. With this explanation, the following details of the test will be understood. A solution of six grains of chloride of sodium, after having been precipitated by seventeen grains of nitrate of silver and filtered, furnishes a solution which is not precipitated by more of the nitrate. The chief test of the U. S. Pharmacopœia is founded on the quantity of the chloride of silver which a given weight of the pure nitrate should furnish, when fully decomposed by chloride of sodium. Thus, it is stated that a solution, containing twenty-five grains of fused nitrate of silver, yields with chloride of sodium about twenty-one grains of a white precipitate, totally soluble in ammonia.

Medical Properties. Fused nitrate of silver should be restricted to external use. The medical properties of the salt, as an internal remedy, are given under the head of the *crystallized* nitrate. (See *Argenti Nitras.*) Externally applied the fused nitrate acts variously as a stimulant, vesicant, and escharotic, and may be employed either dissolved in water, or in the solid state. Dissolved to the extent of from one to five grains in a fluidounce of water, it is used for the purpose of stimulating indolent ulcers, and as an injection for fistulous sores. It is, in general, most conveniently applied to ulcers by means of a camel's hair brush. A drachm of the fused salt, dissolved in a fluidounce of water, forms an escharotic solution, which may often be resorted to with advantage. But fused nitrate of silver is most frequently employed in the solid state; and, as it is not deliquescent nor apt to spread, it forms the most manageable caustic that can be used. When thus employed, it is useful to coat the caustic, as recommended by M. Dumeril, by dipping it into melted engravers' sealing wax, which strengthens the stick, protects it from change, prevents it from staining the fingers, and

affords facilities for limiting the action of the caustic to particular spots. If it is desired, for example, to touch a part of the throat with the caustic, it is prepared by scraping off the wax, with a penknife, to a suitable extent from one end. Another way to strengthen the stick is to cast it around a platinum wire, as recommended by M. Chassaignac; or around a wick of cotton, according to the plan of M. Blatin. By the latter plan the fragments of the stick remain attached to one another. If the fused nitrate be rubbed gently over the moistened skin until it becomes gray, it generally vesicates, causing usually less pain than is produced by cantharides. The fused nitrate is also employed to destroy strictures of the urethra, warts and excrescences, fungous flesh, incipient chancres, and the surface of other ulcers. Mr. Higginbottom considers its free application to ulcers, so as to cover them with an eschar, as an excellent means of expediting their cicatrization. He alleges that, if an adherent eschar be formed, the parts underneath heal before it falls off. The same writer recommends lunar caustic as a topical remedy in various external inflammations, but particularly in erysipelas, applied both to the inflamed and to the surrounding healthy parts. In some cases it is sufficient to blacken the cuticle; in others it is best to produce vesication. It has also been used with good effect, in the solid state, by Dr. Jewell in leucorrhœa, and by Ricord, Hannay, and others in the gonorrhœa of women. In these cases the pain produced is much less than would be expected. It has been recommended in gonorrhœa in the male, even in the acute stage, used in solution containing ten or twelve grains to the fluidounce; but, although some quick cures are well authenticated, the practice is hazardous. In smallpox it has been proposed by Bretonneau and Serres to cauterize each pustule after its top has been removed, on the first or second day of the eruption, in order to arrest its development and prevent pitting. The fused nitrate also forms an efficacious application to certain ulcerations of the throat, to different forms of porrigo of the scalp and other skin diseases, to punctured and poisoned wounds, and to chilblains, slowly rubbed over the moistened part. If, unexpectedly, the pain produced by its external use should be excessive, it may be immediately allayed by washing the parts with a solution of common salt, which acts by decomposing the caustic. The salt in impalpable powder, mixed with an equal weight of lycopodium, and used by inhalation, has been found beneficial in ulcerated sorethroat, laryngitis, bronchitis, and incipient phthisis, by Dr. W. M. Cornell, of Boston. (*Boston Med. and Surg. Journ.* Sept. 25, 1850.) It has also been used successfully in croup by Dr. Homans, of Boston, applied in solution to the larynx, either by injection or by means of a sponge. (*Am. Journ. of Med. Sci.*, April, 1854, p. 346.)

Pharm. Use. Fused nitrate of silver is employed by the Dublin College as a chemical agent for preparing Acidum Nitricum Purum.

Off. Prep. Argenti Oxydum. B.

ARGENTI OXIDUM. *U. S.* Argenti Oxydum. *Dub. Oxide of Silver.*

"Take of Nitrate of Silver *four ounces;* Distilled Water *half a pint;* Solution of Potassa *a pint and a half*, or a *sufficient quantity*. Dissolve the Nitrate of Silver in the Water, and to the solution add the Solution of Potassa, as long as it produces a precipitate. Wash the precipitate repeatedly with water until the washings are nearly tasteless. Lastly, dry the powder, and keep it in a well stopped bottle, protected from the light." *U. S.*

"Take of [fused] Nitrate of Silver *half an ounce* [avoirdupois]; Lime-water *half a gallon* [Imp. meas.], or *a sufficient quantity;* Distilled Water *half a pint* [Imp. meas.]. Dissolve the Nitrate of Silver in four ounces of the Distilled Water, and, having poured the solution into a bottle containing the Lime-water,

shake the mixture well, and then set it by till the sediment subsides. The supernatant solution being drawn off, let the sediment be placed upon a filter, and, when washed with the remainder of the Distilled Water, let it be dried at a heat not exceeding 212°, and preserved in a bottle." *Dub.*

Oxide of silver is a new officinal of the U. S. and Dublin Pharmacopœias. In the processes for making it, nitrate of oxide of silver is decomposed by potassa or lime, the oxide being precipitated, and nitrate of potassa or nitrate of lime, as the case may be, remaining in solution. When thus obtained the oxide is an olive-brown powder. If the potassa used is not wholly free from carbonic acid, the precipitated oxide of silver will be contaminated with some carbonate. According to Mr. Borland, of London, the carbonate is sometimes sold for the oxide. A third process for obtaining it is that of Gregory, which consists in boiling the moist, recently prepared chloride of silver with a very strong solution of caustic potassa (sp. gr. 1·25 to 1·30). In this case, by double decomposition, oxide of silver and chloride of potassium are formed. When thus prepared it is a very dense pure-black powder. Oxide of silver is very slightly soluble in water. Exposed to heat it gives out oxygen, and is wholly converted into metallic silver. It should not effervesce with acids. When its solution in nitric acid is precipitated by chloride of sodium in excess, the supernatant liquid is not discoloured by sulphohydrate of ammonia. The non-action of this test shows the absence of most foreign metals, especially copper and lead. Oxide of silver consists of one eq. of silver 108, and one of oxygen 8=116.

Medical Properties. This oxide has been proposed as a substitute for nitrate of silver, as having the therapeutic properties of the latter, without its escharotic effect, and objectionable power of discolouring the skin. It was first employed in medicine by Van Mons and Sementini. More recently it has been recommended by Mr. C. H. B. Lane, who considers it to act as a sedative. Mr. Lane has used it with more or less success in nausea, cardialgia, pyrosis, various painful affections of the stomach independent of organic lesion, dysentery, diarrhœa, night sweats without other obvious affection, dysmenorrhœa, menorrhagia, leucorrhœa, chronic enlargements of the uterus, attended with flooding, &c. The oxide appeared to exert a peculiar control over uterine fluxes. Some of the cases treated required the use of tonics, after the salutary influence of the oxide had been exerted. Dr. Golding Bird has also obtained favourable effects from the use of the oxide of silver, and confirms to a certain extent the results of Mr. Lane, especially as to its valuable powers in menorrhagia. Thus far no case of cutaneous discoloration has occurred, though Mr. Lane has given the oxide repeatedly for two months, and Dr. Bird in more than a hundred cases; in one for four months. Mr. Lane has observed one case in which repeated salivation occurred, and Dr. Bird several in which the gums were affected. But, in order to draw any inference from this result, the prescriber should be certain that the medicine is not contaminated with black oxide of mercury. In stomach disease, characterized by a glairy discharge instead of a watery one, this physician derived not the slightest benefit from the oxide, though he used it in thirty cases. In epilepsy it is supposed that the oxide will accomplish all that can be expected from the nitrate, with less risk to the stomach, and without incurring the danger of discolouring the skin. In tænia it has been used successfully in two cases by Mr. Whittel. The dose of oxide of silver is a grain, twice or thrice a day, given in pill. In no case did Mr. Lane carry the dose beyond six grains in the twenty-four hours. It has been used in the form of ointment, composed of from five to ten grains to the drachm of lard, as an application to venereal sores, and to the urethral membrane in gonorrhœa, smeared on a bougie. B.

ARSENICUM.

Preparations of Arsenic.

ACIDUM ARSENIOSUM PURUM. *Dub. Pure Arsenious Acid.*

"Take of Commercial White Oxide of Arsenic *any convenient quantity*. Place it in a Florence flask, the neck of which is made to pass into that of a second flask of larger size, and applying to the *former* a regulated heat, by suspending it beneath a semi-cylindric hood of sheet iron, a few inches above a small charcoal fire, cause the Arsenic to sublime into the *latter*. This sublimation should be conducted under a flue with a good draught, so as to protect the operator from inhaling any vapours which may escape being condensed." *Dub.*

The Dublin College, deeming the commercial white oxide of arsenic (*Acidum Arseniosum*, U. S., Lond.) not sufficiently pure for medicinal employment, has given the above formula for its purification. But, as the commercial oxide itself has undergone a second sublimation, this process is superfluous. The only precaution necessary to be taken, on the part of the apothecary, is to purchase the oxide in lump; for when in powder it is apt to be adulterated with chalk or sulphate of lime. The chemical, medical, and toxicological properties of this substance have been given under the head of *Acidum Arseniosum*.

Off. Prep. Liquor Arsenicalis. B.

LIQUOR ARSENICI CHLORIDI. *Lond. Solution of Chloride of Arsenic. De Valangin's Arsenical Solution.*

"Take of Arsenious Acid, broken into small pieces, *half a drachm;* Hydrochloric Acid *a fluidrachm and a half* [Imp. meas.]; Distilled Water *a pint* [Imp. meas.]. Boil the Arsenious Acid with the Hydrochloric Acid, mixed with an ounce of the Water, until it is dissolved; then add sufficient Water to make the solution accurately fill the measure of a pint [Imp. meas.]." *Lond.*

This new officinal of the London Pharmacopœia of 1851 is intended to be an imitation of De Valangin's arsenical solution, called by the inventor, who was a practitioner in London, *solutio solventis mineralis*. It was originally made by subliming three parts of arsenious acid with eight of common salt, and dissolving the product in a determinate quantity of diluted muriatic acid. The sublimation directed by De Valangin with common salt, had no effect on the arsenious acid, and, accordingly, his preparation may be considered to have been a solution of arsenious acid in muriatic acid, becoming probably terchloride of arsenic by the mutual decomposition of the acids.

In the London formula thirty grains of arsenious acid are dissolved in twenty Imperial fluidounces of the menstruum, that being the measure to which the preparation is ultimately brought. Hence each fluidounce contains a grain and a half of arsenious acid, or an equivalent quantity of terchloride.

Medical Properties. This arsenical solution appears to have considerable reputation in London as an alterative. It is chiefly employed in the treatment of chorea and lepra vulgaris. Dr. Farre, of London, states, as the result of his observation, that it effectually cures the worst forms of chorea. (Pereira, *Mat. Med.*, 3d ed., p. 670.) Dr. Pereira, who has used this solution on numerous occasions, bears testimony to its efficacy in the treatment of chorea and lepra, but has not satisfied himself of its superiority to Fowler's solution. It is said to be less apt to disturb the stomach; but it must be recollected that De Valangin's solution is only three-eighths as strong as that of Fowler, and yet is not given in larger doses. The average dose is five drops three times a day. Dr. Farre begins with three drops three times a day, increasing one drop each day,

until the dose reaches ten drops three times daily. Whenever the stomach becomes disordered, the medicine should be suspended; and when renewed, it must be given in the original dose. B.

ARSENICI IODIDUM. *U. S. Iodide of Arsenic.*

"Take of Arsenic *a drachm;* Iodine *five drachms.* Rub the Arsenic in a mortar until reduced to a very fine powder, free from metallic lustre; then add the Iodine, and rub them together till they are thoroughly mixed. Put the mixture into a small flask or a test-tube, loosely stopped, and heat it very gently until liquefaction occurs. Then incline the vessel in different directions, in order that any portion of the Iodine, which may have condensed on its inner surface, may be returned into the fused mass. Lastly, pour the melted Iodide on a porcelain slab, and, when it is cold, break it into pieces, and put it into a bottle, which is to be well stopped." *U. S.*

This iodide was introduced into the U. S. Pharmacopœia for the purpose of being used in preparing the solution of iodide of arsenic and mercury, described in the next article. It is made by the direct combination of its elementary constituents by the aid of a gentle heat.

Properties, &c. Iodide of arsenic is an orange-red, crystalline solid, entirely soluble in water, and wholly volatilized by heat. In composition it is considered to be a *teriodide*, consisting of one eq. of arsenic 75, and three of iodine 378·9=453·9. It has been used by Biett as an external application in corroding tubercular skin diseases. By the late Dr. A. T. Thomson it was given internally with advantage in lepra, impetigo, and diseases resembling cancer. Dr. F. C. Crane cured a case of what he considered cancer of the breast by its use for nearly eight months. The ointment used by Biett was composed of three grains of the iodide to an ounce of lard. The dose for internal exhibition is an eighth of a grain three times a day, given in pill or solution.

Off. Prep. Liquor Arsenici et Hydrargyri Iodidi. B.

LIQUOR ARSENICI ET HYDRARGYRI IODIDI. *U. S.* Arsenici et Hydrargyri Hydriodatis Liquor. *Dub. Solution of Iodide of Arsenic and Mercury. Solution of Hydriodate of Arsenic and Mercury. Donovan's Solution.*

"Take of Iodide of Arsenic, Red Iodide of Mercury, each, *thirty-five grains;* Distilled Water *half a pint.* Rub the Iodides with half a fluidounce of the Water, and, when they have dissolved, add the remainder of the Water, heat to the boiling point, and filter." *U. S.*

"Take of Pure Arsenic, in fine powder, *six grains;* Pure Mercury *sixteen grains;* Pure Iodine *fifty grains and a half;* Alcohol [sp. gr. 0·795] *half a fluidrachm* [Imp. meas.]; Distilled Water *nine ounces* [avoirdupois], or *a sufficient quantity.* Rub together the Arsenic, Mercury, Iodine, and Spirit, until a dry mass is obtained, and, having triturated eight ounces of the Water with this in successive portions, let the whole be transferred to a flask, and heated until it begins to boil. When cooled and filtered, let as much Distilled Water be added to it as will make the bulk of the solution exactly eight fluidounces and six drachms [Imp. meas.]." *Dub.*

This solution was introduced to the notice of the medical profession in 1839, by Mr. Donovan, of Dublin, as a therapeutic agent combining the medical virtues of its three ingredients, and has been adopted as an officinal preparation in the U. S. and Dublin Pharmacopœias of 1850. The formula of the U. S. Pharmacopœia is the simplified one of Prof. Procter, which consists essentially in dissolving equal weights of the teriodide of arsenic and biniodide (red iodide) of mercury in a measured quantity of distilled water. The proportion of equal weights corresponds nearly to single equivalents of the component iodides. The

Dublin formula is more complicated. In it the proper quantities of arsenic, mercury, and iodine are caused to unite by first rubbing them together with alcohol, and then boiling the product with distilled water, which is afterwards added, so as to give the whole a determinate bulk. The iodides of arsenic and mercury, formed by the trituration, are assumed by Mr. Donovan to become, by solution, hydriodates severally of arsenious acid (white oxide of arsenic), and of deutoxide of mercury (red precipitate); and the Dublin College name is formed on the supposition of this change.

Properties. This solution has a pale-yellow colour, and a slightly styptic taste. It is incompatible with laudanum, and the sulphate, muriate, and acetate of morphia. On the supposition that the preparation is an aqueous solution of iodides, it will contain them in the proportion of one eq. of teriodide of arsenic 453·9 to one of biniodide of mercury 454·6, which are nearly equal weights. On the theory of their conversion into hydriodates by solution, five eqs. of water 45 would be required, three for the arsenical teriodide, and two for the mercurial biniodide; and the result would be one eq. of arsenious acid 99, one of deutoxide of mercury 218, and five of hydriodic acid 636·5, the latter containing five eqs. of iodine 631·5. The solution here supposed would contain two and one-fifth times as much deutoxide of mercury as of arsenious acid.

Medical Properties. This preparation has been found decidedly useful as an alterative in the treatment of various diseases of the skin, such as the different forms of psoriasis, impetigo, porrigo, lepra, pityriasis, lupus, and venereal eruptions, both papular and scaly. In support of its efficacy in these affections, Mr. Donovan has adduced the testimony of a number of respectable practitioners, of Dublin and elsewhere, who have communicated to him the results of their experience. The disease in some of the cases cured had existed for a number of years. Dr. E. I. Taylor, of New York, has employed it in a number of cutaneous diseases, and finds that it produces more marked and prompt effects than the remedies usually resorted to in the treatment of lupus, rupia, psoriasis, and secondary venereal. (*Am. Journ. of Med. Sci., N. S.*, v. 319.) In two cases of uterine disease, characterized by patency of the os uteri and vascular turgescence of the cervix, and attended with lumbar and pelvic pains, Dr. Kirby of Dublin, afforded relief by the use of the solution. The dose is from five to twenty drops three times a day, given preferably in distilled water. The latter dose contains the twenty-fourth of a grain of arsenious acid, a little over the twelfth of a grain of deutoxide of mercury, and about a quarter of a grain of iodine. Dr. Taylor never exceeded the dose of five drops, three times a day. Sometimes the medicine deranges the stomach, confines the bowels, and produces headache, giddiness, and confusion of mind. When these effects are produced, it must be laid aside and a purgative administered. After an interval varying from ten days to three weeks, it may be resumed, but in a smaller dose. The treatment often requires to be persevered in for several months. Sometimes the medicine produces moderate salivation. By some practitioners, the solution, diluted with an equal bulk of water, was used with advantage as an external application to the ulcers or eruptions, at the same time that the medicine was given internally. For further information the reader is referred to the three papers of Mr. Donovan, contained in the *Dublin Journal of Med. Science*, for Nov. 1839, Sept. 1840, and Nov. 1842. B.

LIQUOR POTASSÆ ARSENITIS. *U. S., Lond.* Liquor Arsenicalis. *Ed., Dub. Solution of Arsenite of Potassa. Arsenical Solution. Fowler's Solution.*

"Take of Arsenious Acid, in small fragments, Pure Carbonate of Potassa, each, *sixty-four grains;* Distilled Water *a sufficient quantity;* Compound Spirit

of Lavender *half a fluidounce.* Boil the Arsenious Acid and Carbonate of Potassa in a glass vessel, with twelve fluidounces of Distilled Water, till the Acid is entirely dissolved. To the solution, when cold, add the Spirit of Lavender, and afterwards sufficient Distilled Water to make it fill exactly the measure of a pint." *U. S.*

"Take of Arsenious Acid, broken into small pieces, Carbonate of Potassa, each, *eighty grains;* Compound Tincture of Lavender *five fluidrachms* [Imp. meas.]; Distilled Water *a pint* [Imp. meas.]. Boil the Arsenious Acid and Carbonate of Potassa with half a pint of the Water, until they are dissolved. Add the Tincture to the cooled liquor, and, lastly, sufficient Distilled Water, that it may accurately fill a pint [Imp. meas.]." *Lond.*

The *Edinburgh* formula is substantially the same with the London, from which it injudiciously varies by ordering the arsenious acid in powder, and water instead of distilled water. In it the lavender preparation is misnamed "tincture," it being recognised as a "spirit" in the nomenclature of the Edinburgh College.

"Take of Pure Arsenious Acid; Pure Carbonate of Potash, each, *eighty-two grains;* Compound Tincture of Lavender, *half a fluidounce* [Imp. meas.]; Distilled Water *as much as is sufficient.* Introduce the Arsenious Acid and Carbonate of Potash into a flask containing half a pint of Water, and boil until a perfect solution is obtained. When this has cooled, add to it the Compound Tincture of Lavender, and as much Water as will make the bulk of the entire one pint [Imp. meas.]. The specific gravity of this Solution is 1·013." *Dub.*

This preparation originated with the late Dr. Fowler, of Stafford, England, and was intended as a substitute for the celebrated remedy, known under the name of "the *tasteless ague drop.*" It is an arsenite of potassa dissolved in water, and is formed by the combination of the arsenious acid with the potassa of the carbonate, the carbonic acid being evolved. The name, therefore, by which it is designated in the United States and London Pharmacopœias, is obviously the most correct. The spirit of lavender is added to give it taste, in order to prevent its being mistaken for simple water. The United States preparation is of about the same strength as those of the London and Edinburgh Colleges; for, although one-fourth more acid and alkali is taken in the London and Edinburgh than in the U. S. formula, yet it is to be recollected that the Imperial pint is nearly one-fourth larger than the wine pint. The solution, according to the formula of the Dublin Pharmacopœia of 1850, is one-fortieth stronger, by reason of the injudicious direction to take eighty-two grains instead of eighty, to dissolve in the Imperial pint of twenty fluidounces. This formula is an amended one, and it is to be regretted that the Dublin College did not perceive the propriety of making the strength of its arsenical solution conform with that established for this preparation, of four grains of arsenious acid to the fluidounce.

In making this preparation, care should be taken that the arsenious acid is pure. This object is best secured by using the acid in small pieces instead of in powder. Sulphate of lime is a common adulteration in the acid, and if present will remain undissolved, and cause the solution to be weaker than it should be. Hence, if the arsenious acid does not entirely dissolve, the preparation must be rejected.

Properties. Solution of arsenite of potassa is a transparent liquid, having the colour, taste, and smell of the spirit of lavender. It has a strong alkaline reaction. It is decomposed by the usual reagents for arsenic, such as nitrate of silver, the salts of copper, lime-water, and sulphuretted hydrogen; and is incompatible with infusions and decoctions of cinchona. Before sulphuretted hydrogen will act, the solution must be acidulated with some acid, as the muriatic or acetic. If very long kept in flint glass, it is apt to suffer partial decomposition, exhaling a garlicky odour, and giving the inner surface of the bottle a metallic

lustre, owing to the lead of the glass being revived. (Canavan, *N. Y. Journ. of Pharm.*, i. 131.)

Medical Properties and Uses. This solution has the general action of the arsenical preparations on the animal economy, already described under the head of *Arsenious Acid.* Its liquid form makes it convenient for exhibition and gradual increase; and it is the preparation generally resorted to, when arsenic is given internally. It has been much employed in intermittent fever. Dr. Thomas D. Mitchell, of Philadelphia, has given the result of his experience, as to its efficacy and safety in this disease, when exhibited in the large dose of fifteen or twenty drops three times a day. It is a valuable resource in the intermittents of children, who are with difficulty induced to swallow bark or even sulphate of quinia. The late Dr. Dewees relates the case of a child only six weeks old, affected with a severe tertian, in which this solution was given with success. A fluidrachm was diluted with twelve fluidrachms of water; and of this six drops were given every four hours.

Fowler's solution appears to be peculiarly adapted to the treatment of several diseases. It has been employed with great success in lepra and other inveterate cutaneous affections. The late Dr. S. Calhoun published an account of five cases of nodes, successfully treated by it; and, in consequence of his success, Dr. Baer, of Baltimore, and the late Dr. Eberle gave it a trial in this affection, and obtained satisfactory results. Several cases of chorea, cured by this remedy, are reported by Mr. Martin, Mr. Slater, and Dr. Gregory, in the *Medico-Chirurgical Transactions* of London. Two interesting cures of periodical headache, performed by the solution, are related by the late Dr. Otto, of Philadelphia, in the fourth and fifth volumes of the *North American Med. and Surg. Journal.* Mr. H. Hunt found it useful in menorrhagia, but prefers the use of arsenious acid, as less apt to produce unpleasant effects, requiring the discontinuance of the remedy. (See *page* 23.) A diluted solution, in the proportion of a fluidrachm to the fluidounce of water, has been used with advantage as a topical application to foul ulcers.

Each fluidrachm of the solution contains half a grain of arsenious acid. The average dose for an adult is ten drops two or three times a day. For the peculiar effects which it produces in common with the other arsenical preparations, the reader is referred to the article on *Arsenious Acid.*

Duflos's antidote to the poisonous effects of Fowler's solution, and of the salts of the acids of arsenic generally, is the acetate of the sesquioxide of iron with excess of base, made by dissolving freshly precipitated sesquioxide in acetic acid to saturation, adding an equal quantity of the oxide to the solution, and diluting the whole with water to the consistence of cream. (See *page* 29.) B.

ATROPIA.

Preparation of Atropia.

ATROPIÆ SULPHAS. *Lond. Sulphate of Atropia.*

"Take of Diluted Sulphuric Acid *two fluidrachms;* Atropia *seven scruples and a half,* or *a sufficient quantity;* Distilled Water *half a fluidounce.* To the Acid previously mixed with the Water add gradually the Atropia to saturation. Filter the solution, and evaporate with a gentle heat so that crystals may form." *Lond.*

The London College prepares this salt exclusively for external use. Its properties and uses are those of its alkaline base, and are described under Belladonna. W.

BARYTA.

Preparations of Baryta.

BARII CHLORIDUM. *U. S., Dub.* BARYTÆ MURIAS. *Ed. Chloride of Barium. Muriate of Baryta.*

"Take of Carbonate of Baryta, in small fragments, *a pound;* Muriatic Acid *twelve fluidounces;* Water *three pints.* Mix the Acid with the Water, and gradually add the Carbonate of Baryta. Towards the close of the effervescence apply a gentle heat, and, when the action has ceased, filter the liquor, and evaporate so that crystals may form when it cools." *U. S.*

The *Edinburgh College* gives two processes for obtaining this chloride; one in which the native carbonate of baryta, the other in which the native sulphate is employed. The process with the sulphate is as follows.

"Take of Sulphate of Baryta *two pounds;* Charcoal, in fine powder, *four ounces;* Pure Muriatic Acid *a sufficiency.* Heat the sulphate to redness, reduce it to fine powder, mix the charcoal with it thoroughly, heat the mixture in a covered crucible for three hours at a low white heat. Pulverize the product, put it gradually into five pints [Imp. meas.] of boiling water; boil for a few minutes; let it rest for a little over a vapour-bath; pour off the clear liquor, and filter it if necessary, keeping it hot. Pour three pints [Imp. meas.] of boiling water over the residuum, and proceed as before. Unite the two liquids; and, while they are still hot, or, if cooled, after heating them again, add Pure Muriatic Acid gradually so long as effervescence is occasioned. In this process the solutions ought to be as little exposed to the air as possible; and in the last step the disengaged gas should be discharged by a proper tube into a chimney or the ash-pit of a furnace. Strain the liquor, concentrate it, and set it aside to crystallize." *Ed.*

The *Dublin College* also obtains chloride of barium severally from the native carbonate and native sulphate, and by processes which are in principle the same as those above quoted.

When the carbonate of baryta is employed for obtaining chloride of barium, the reactions are exceedingly simple. The muriatic acid displaces the carbonic acid with effervescence; and, by reacting with the baryta, forms chloride of barium and water. A solution of chloride of barium being thus obtained, it yields crystals of the chloride by concentration and cooling. The reactions occurring in the process in which the sulphate is used are more complicated. The ignition with carbonaceous matter deoxidizes its constituents, converting it into sulphuret of barium, the oxygen escaping in combination with the carbon as carbonic oxide and acid. The sulphuret of barium, when dissolved in water, is decomposed on the addition of muriatic acid, sulphuretted hydrogen being evolved in large quantities, and chloride of barium formed in solution, from which, in the usual manner, the solid salt is obtained. The direction to discharge the sulphuretted hydrogen into a chimney, or the ash-pit of a furnace, is intended to provide for its decomposition by smoke; for if the gas is not disposed of in this or some similar way, it becomes exceedingly annoying to the operator.

Of the officinal processes, that in which the native carbonate is used is the simplest and most convenient; but the carbonate is comparatively a rare mineral; and as the sulphate in fine powder is a cheap article of commerce, being extensively used in the adulteration of white lead, it is almost always used for obtaining chloride of barium and the other barium compounds.

Properties. Chloride of barium is a permanent white salt, possessing a bitter and disagreeable taste. It crystallizes in rhombic tables with beveled edges. It

dissolves in about two and a half times its weight of cold water, and in a little more than its own weight at 222°, the boiling point of a saturated solution. It is scarcely soluble in absolute alcohol, but dissolves in rectified spirit. Alcohol, impregnated with it, burns with a yellow flame. When exposed to heat, it decrepitates and loses its water of crystallization, and at a red heat fuses. It is decomposed by the sulphates, oxalates, and tartrates, and the alkaline phosphates, borates, and carbonates; also by nitrate of silver, acetate and phosphate of mercury, and acetate of lead. When pure it does not deliquesce. Its solution is not affected by ammonia, which proves the absence of alumina and sesquioxide of iron, or by sulphuretted hydrogen, which shows that neither copper nor lead is present. After the whole of the barium has been precipitated by an excess of sulphuric acid, the supernatant liquid is shown to be free from lime by the non-action of carbonate of soda. Lime may be separated by the process of Dr. Wolcott Gibbs, which consists in adding to the solution of the chloride a small portion of the solution of hydrate of baryta, and then passing through it a current of carbonic acid, when the whole of the lime will be thrown down as a carbonate. (Wurtz, *N. Y. Journ. of Pharm.*, i. 164.) If strontia be present, an alcoholic solution of the salt will burn with a red flame. Like all the soluble salts of barium it is poisonous. It consists of one eq. of chlorine 35·42, one of barium 68·7, and two of water 18=122·12. It is used in medicine only in solution.

Off. Prep. Liquor Barii Chloridi; Quinæ Murias. B.

LIQUOR BARII CHLORIDI. *U.S.* Solutio Barytæ Muriatis. *Ed.* Barii Chloridi Liquor. *Dub. Solution of Chloride of Barium. Solution of Muriate of Baryta.*

"Take of Chloride of Barium *an ounce;* Distilled Water *three fluidounces.* Dissolve the Chloride of Barium in the Water and filter." *U. S.*

"Take of Muriate of Baryta *one drachm;* Distilled Water *one fluidounce* [Imp. meas.]. Dissolve the Salt in the Water." *Ed.*

The Dublin College dissolves the chloride in eight times its weight of distilled water, forming a solution having the sp. gr. 1·088, which is a little weaker than that of the Edinburgh College.

Chloride of barium, not being used in the solid state, is here dissolved for convenient exhibition. The U.S. solution is nearly a saturated one, and is probably too strong for convenient use. The Edinburgh and Dublin preparations are much weaker. The solution should be limpid and colourless; and, to make it so, the salt in crystals, and not in powder, should be employed.

Medical Properties and Uses. This solution is deobstruent and anthelmintic, and in large doses poisonous; its action, according to some, being analogous to that of arsenic. It was introduced into practice by Dr. Crawford as a remedy for cancer and scrofula. Its value in the latter disease has been particularly insisted on by Hufeland. This physician considers it to act more particularly on the lymphatic system, in the irritated states of which he esteems it a valuable remedy. Hence he recommends it in the scrofulous affections of delicate and irritable organs, such as the eyes, lungs, &c. In the commencement of scrofulous phthisis, he views it as one of the best remedies to which we can have recourse. It is employed also in diseases of the skin, in ulcers, and ophthalmia. The dose for an adult of the U.S. solution is about five drops, given twice or thrice a day, and gradually but cautiously increased, until it produces nausea, or some other sensible impression. When taken in an overdose it causes violent vomiting and purging, vertigo, and other dangerous symptoms. To combat its poisonous effects, recourse must be had immediately to a weak solution of sulphate of magnesia, which acts by converting the poison into the insoluble sulphate of baryta. If vomiting does not come on, it should be induced by tickling

the fauces, or by the administration of an emetic. A case of poisoning by three drachms of the solid salt taken by mistake for sulphate of magnesia, which was successfully treated with dilute sulphuric acid and castor oil, is reported by Dr. C. Wolf, a German physician. The chief symptoms were tormina and vomiting, weak and irregular pulse, cold extremities, weak voice, want of muscular power in the hands and feet, and paralysis of the left eyelid. B.

BISMUTHUM.

Preparation of Bismuth.

BISMUTHI SUBNITRAS. *U. S., Dub.* BISMUTHI NITRAS. *Lond.* BISMUTHUM ALBUM. *Ed. Subnitrate of Bismuth. Nitrate of Bismuth. White Bismuth. Trisnitrate of Bismuth. White Oxide of Bismuth.*

"Take of Bismuth, in fragments, *an ounce;* Nitric Acid [sp. gr. 1·42] *two fluidounces;* Distilled Water *a sufficient quantity.* Mix a fluidounce of Distilled Water with the Nitric Acid, and dissolve the Bismuth in the mixture. When the solution is complete, pour the clear liquor into three pints of Distilled Water, and set the mixture by, that the powder may subside. Lastly, having poured off the supernatant liquid, wash the Subnitrate of Bismuth with Distilled Water, wrap it in bibulous paper, and dry it with a gentle heat." *U. S.*

"Take of Bismuth *an ounce;* Nitric Acid [sp. gr. 1·42] *a fluidounce and a half* [Imp. meas.]; Distilled Water *three pints* [Imp. meas.]. Mix a fluidounce of the Water with the Acid, and, having added the Bismuth, apply heat until it is dissolved. Add the solution to the rest of the Water, and strain the mixture through a cloth, in order to separate the powder. Wash this with distilled water, and dry it with a gentle heat." *Lond.*

"Take of Bismuth, in fine powder, *an ounce;* Nitric Acid [of commerce?] (D. 1·380) *a fluidounce and a half* [Imperial measure]; Water *three pints* [Imp. meas.]. Add the metal gradually to the acid, favouring the action with a gentle heat, and adding a very little Distilled Water so soon as crystals or a white powder may begin to form. When the solution is complete, pour the liquor into the Water. Collect the precipitate immediately on a calico filter, wash it quickly with cold water, and dry it in a dark place." *Ed.*

"Take of Bismuth, in small fragments, *two ounces* [avoirdupois]; Pure Nitric Acid *three fluidounces* [Imp. meas.]; Distilled Water *one gallon* [Imp. meas.]. Into the Acid, first diluted with three ounces of the Water, introduce the Bismuth in successive portions; and having, when the spontaneous action has ceased, applied for ten minutes a heat approaching that of ebullition, decant the solution off any particles of metal which may remain undissolved. Evaporate the solution at a gentle heat until it is reduced to two fluidounces, and then pour it into half a gallon of the Water. When the precipitate which forms has subsided, decant the supernatant liquid, and agitate the sediment with the remainder of the Water. After twelve hours again decant, and, having placed the precipitate on a filter, dry it at a temperature of 212°, and reduce it to powder." *Dub.*

When bismuth is added to dilute nitric acid, red fumes are copiously given off, and the metal, oxidized by the decomposition of part of the nitric acid, is dissolved by the remainder, so as to form a solution of the ternitrate of teroxide of bismuth. It is unnecessary to have the metal in powder, as it dissolves with great facility when added to the acid in fragments. When the solution is completed, the liquor should be added to the water, which should be distilled, and not the water to the solution, which is not so eligible a plan. Immediately on the contact of the solution with the water, four eqs. of the ternitrate are re-

solved into three eqs. of neutral nitrate of bismuth (generally called subnitrate) which precipitates, and one eq. of the 9-nitrate which remains in solution. $4(BiO_3,3NO_5)=3(BiO_3,NO_5)$ and $BiO_3,9NO_5$. In order to have a smooth light powder which is most esteemed, the precipitate should be washed and dried as speedily as possible.

Properties. Subnitrate of bismuth is a tasteless, inodorous, heavy powder, of a pure-white colour. It is slightly soluble in water, and readily so in the strong acids, from which it is precipitated by water. The fixed alkalies dissolve it sparingly, and ammonia more readily. It is darkened by hydrosulphuric acid gas, but not by exposure to light, unless it contains a little silver, or is subjected to the influence of organic matter. If it dissolves in nitric acid without effervescence, it contains no carbonate, and, if the nitric solution is not precipitated by dilute sulphuric acid, it is free from lead. It sometimes contains arsenic, which may be detected by acting on it with pure sulphuric acid, evaporating to dryness, dissolving in hot distilled water, and testing a part of the solution by Marsh's apparatus. By this method Lassaigne detected one-sixth of one per cent. of arsenic in a sample of subnitrate sold in Paris. By the earlier chemists it was called *magistery of bismuth.* The perfumers, by whom it is sold as a paint for the complexion, denominate it *pearl white.* It consists of one eq. of nitric acid 54, one of teroxide of bismuth 237, and one of water 9=300.

Medical Properties and Uses. This preparation is tonic and antispasmodic. It was originally introduced into practice by Dr. Odier, of Geneva, and has been subsequently employed with advantage both in this country and in Europe. It has been used in epilepsy, palpitation of the heart, and spasmodic diseases generally; but more particularly in various painful affections of the stomach, dependent on disordered digestion, such as cardialgia, pyrosis, and gastrodynia. Rayer employed it with great advantage in the diarrhœa occurring in phthisis and in typhus, and Aran recommends it in the obstinate diarrhœa which sometimes follows typhoid fever. Its use always blackens the stools, from the effect of the intestinal gases. The dose is five grains, gradually increased to twelve or fifteen, twice or thrice a day, and may be taken in pill, or mixed with an equal weight of aromatic powder. Dr. Pereira seldom commences with less than a scruple, and has repeatedly exhibited half a drachm. M. Monneret, who praises this remedy in gastro-intestinal affections attended with diarrhœa, never gives less than two or three drachms a day. He conceives that its operation is entirely local; but this view is combatted by Dr. Lussana, who believes it is sometimes absorbed. It never passes into the urine. In an over-dose it produces alarming gastric distress, nausea, vomiting, diarrhœa or constipation, colic, heat in the breast, slight rigors, vertigo, and drowsiness. The remedies are bland and mucilaginous drinks, and, in case of inflammation, bleeding by leeches or venesection, enemata, and emollient fomentations. B.

CALX.

Preparations of Lime.

LIQUOR CALCIS. *U.S., Lond., Dub.* AQUA CALCIS. *Ed. Lime-water.*

"Take of Lime *four ounces;* Distilled Water *a gallon.* Upon the Lime, first slaked with a little of the Water, pour the remainder of the Water, and stir them together; then immediately cover the vessel, and set it aside for three hours. Keep the solution, together with the undissolved Lime, in stopped glass bottles, and pour off the clear liquor when wanted for use. Water free from saline or

other obvious impurity may be employed in this process, though not distilled." *U. S.*

The *London College* takes *half a pound* of lime, and *twelve pints* [Imperial measure] of distilled water, and proceeds as above directed.

"Take any convenient quantity of Water, pour a little of it over about a twentieth of its weight of Lime; when the Lime is slaked, add to it the rest of the Water in a bottle; agitate well; allow the undissolved matter to subside; pour off the clear liquor when it is wanted, replacing it with more water, and agitating briskly as before." *Ed.*

"Take of Fresh-burned Lime *two ounces* [avoirdupois]; Distilled Water *half a gallon* [Imperial measure]. Having slaked the Lime with a [fluid]ounce and a half of the Water, introduce it into a well-stopped bottle containing the remainder of the Water, and shake well for the space of five minutes. After twelve hours the excess of Lime will have subsided, and the clear Lime-water may be drawn off with a syphon as it may be required. When the entire of the solution has been withdrawn, it may be renewed by shaking the sediment at the bottom of the bottle with another half gallon of Water; and, if the Lime be pure, and the bottle be accurately stopped, this process may be successfully repeated three or four times." *Dub.*

A solution of lime in water is the result of these processes. By the slaking of the lime it is reduced to powder, and rendered more easily diffusible through the water. According to all the Pharmacopœias, the solution is to be kept in bottles with a portion of undissolved lime, which causes it always to be saturated, whatever may be the temperature, and to whatever extent it may be exposed to the air. If care be taken to have a considerable quantity of the solution in the bottle, and to avoid unnecessary agitation, the upper portion will always remain sufficiently clear for use. The direction of the Edinburgh College to replace by more water the clear liquid poured off, cannot, of course, be carried into effect indefinitely. By the absorption of carbonic acid, the lime is gradually converted into the carbonate, and thus rendered insoluble. The employment of distilled water as the solvent may seem a useless refinement; and it certainly is unnecessary when pure spring or river water is attainable; but in many places the common water is very impure, and wholly unfit for a preparation, one of the most frequent uses of which is to allay irritation of stomach. Water dissolves but a minute proportion of lime, and, contrary to the general law, less when hot than cold. Hence the propriety of employing cold water in the process. According to Mr. Phillips, a pint of water (the wine pint of the U. S. Ph.) at 212° dissolves 5·6 grains of lime, at 60°, 9·7 grains, and at 32°, 11·0 grains. When a cold saturated solution is heated, a deposition of lime takes place.

Properties. Lime-water is colourless, inodorous, and of a disagreeable alkaline taste, changes vegetable blues to green, and forms an imperfect soap with oils. Exposed to the air it attracts carbonic acid, and becomes covered with a pellicle of insoluble carbonate of lime, which, subsiding after a time, is replaced by another, and so on successively till the whole of the lime is exhausted. Hence the necessity of keeping lime-water either in closely corked bottles which should be full, or, what is more convenient, in bottles with an excess of lime.

Medical Properties and Uses. Lime-water is antacid, tonic, and astringent, and is very usefully employed in dyspepsia with acidity of stomach, diarrhœa, diabetes, and gravel attended with superabundant secretion of uric acid. Mixed with an equal measure of milk, which completely covers its offensive taste, it is one of the best remedies in our possession for nausea and vomiting dependent on irritability of stomach. We have found a diet exclusively of lime-water and milk to be more effectual than almost any other plan of treatment in dyspepsia accompanied with vomiting of food. In this case, one part of the solution to two or three parts of milk is usually sufficient. Lime-water is also thought to

be useful by dissolving the intestinal mucus in cases of worms, and in other complaints connected with an excess of this secretion. Externally it is employed as a wash in tinea capitis and scabies, as an application to foul and gangrenous ulcers, as an injection in leucorrhœa and ulceration of the bladder or urethra, and, mixed with linseed or olive oil, as a liniment in burns and scalds. The dose is from two to four fluidounces taken several times a day. When employed to allay nausea, it is usually given in the dose of a tablespoonful mixed with the same quantity of new milk, and repeated at intervals of half an hour, an hour, or two hours. If too long continued it debilitates the stomach. Lime-water is used by the Dublin College in the preparation of Oxide of Silver.*

Off. Prep. Linimentum Calcis. W.

CALCIS CARBONAS PRÆCIPITATUS. *U. S.* CALCIS CARBONAS PRÆCIPITATUM. *Dub. Precipitated Carbonate of Lime.*

"Take of Solution of Chloride of Calcium *five pints and a half;* Carbonate of Soda *six pounds;* Distilled Water *a sufficient quantity.* Dissolve the Carbonate of Soda in six pints of Distilled Water. Heat this solution and the solution of Chloride of Calcium, separately, to the boiling point, and mix them. After the precipitate has subsided, pour off the supernatant liquid, wash the precipitate repeatedly with Distilled Water, and dry it on bibulous paper." *U. S.*

"Take of Chloride of Calcium *five ounces* [avoirdupois]; Crystals of Commercial Carbonate of Soda *thirteen ounces* [avoirdupois]; Boiling Water *two quarts* [*half a gallon*, Imperial measure]. Dissolve each salt in a quart of the Water, mix the two solutions, and, when the precipitate has subsided, draw off the supernatant liquor. Transfer the sediment to a calico filter, and wash it with boiling hot distilled water, until the washings cease to give a precipitate with nitrate of silver. Finally, dry the product at a temperature not exceeding 212°." *Dub.*

These processes do not essentially differ. In each a mutual interchange of principles takes place, resulting in the production of chloride of sodium which remains in solution, and carbonate of lime which is deposited. Any peculiar advantage which the preparation may possess must depend on the minute division of its particles. According to Dr. Bridges, this effect is best obtained by employing the solutions at the boiling temperature, a precaution which is observed in both the present officinal processes. (*Am. Journ. of Pharm.*, xvi. 163.) When properly made, it is a very pure carbonate of lime, in the form of a very fine white powder, free from grittiness, insoluble in water, but wholly soluble in dilute muriatic acid with copious effervescence. These properties serve to distinguish it from sulphate of lime, with which it is sometimes adulterated. For ordinary use, it probably has no such superiority over prepared chalk as to counterbalance its greater expensiveness. It is said to be preferred by some to chalk in the preparation of tooth-powders. It is frequently sold in the shops under the name of *creta præcipitata.* W.

* *Syrup of Lime.—Saccharate of Lime.* Under the latter name a preparation has been introduced into notice, made by saturating pure syrup with lime, and filtering. The sugar forms a soluble compound with the lime, large quantities of which are dissolved by the syrup. The syrup remains perfectly transparent, and is in no degree disturbed by dilution with water. It has a decidedly alkaline and even caustic taste, and should always be largely diluted when administered. It was first prepared by M. Beral; and its practical use was originally suggested by Dr. Capitaine, of Paris. Trousseau has employed it in the chronic diarrhœa of infants, and recommends it as an addition, in very small proportion, to the milk employed as a diet for children liable to this complaint. For this purpose he adds about eight grains of the syrup to the quart of milk. He gives the saturated syrup of lime to a child in the quantity of fifteen or thirty grains in the course of the day; to an adult, in five times the quantity. (*Trait. de Thérap.*, 4e ed., i. 317, and 321.)—*Note to the tenth edition.*

CRETA PRÆPARATA. *U. S., Lond., Ed., Dub. Prepared Chalk.*

"Take of Chalk *a convenient quantity*. Add a little water to the Chalk, and rub it into a fine powder. Throw this into a large vessel nearly full of water, stir briskly, and, after a short interval, pour the supernatant liquor, while yet turbid, into another vessel. Repeat the process with the chalk remaining in the first vessel, and set the turbid liquor by, that the powder may subside. Lastly, pour off the water, and dry the powder." *U. S.*

The *London College* places this preparation in the Materia Medica catalogue. The process of the *Edinburgh College* is essentially the same as that of the United States Pharmacopœia. The College directs the chalk to be powdered in a mortar, and orders it, after having been prepared, to be dried on a filter of linen or calico.

"Take of Chalk *one pound;* Water *a sufficient quantity*. Reduce the Chalk to a fine powder, and, having triturated this in a large mortar with as much water as will give it the consistence of cream, fill the mortar with water, and stir well, giving the whole a circular motion. Allow the mixture to stand for fifteen seconds, and then decant the milky liquid into a large vessel. Triturate what remains in the mortar, adding as much water as was previously used, and, after allowing it to settle for fifteen seconds, again decant, and let this process be repeated several times. Let the fine sediment which subsides from the decanted liquids be transferred to a calico filter, and dried at a temperature not exceeding 212°." *Dub.*

The object of these processes is to reduce chalk to a very fine powder. The mineral, previously pulverized, is rubbed with a little water upon a porphyry slab, by means of a rubber of the same material, and, having been thus very minutely divided, is agitated with water, which upon standing a short time deposits the coarser particles, and, being then poured off, slowly lets fall the remainder in an impalpable state. The former part of the process is called *levigation*, the latter *elutriation*. The soft mass which remains after the decanting of the clear liquor, is made to fall upon an absorbent surface in small portions, which when dried have a conical shape. Practically, prepared chalk is generally made on the large scale from *whiting* by the manufacturer. For the particulars of the process the reader is referred to the *Pharmaceutical Journal and Transactions*, viii. 416.

Medical Properties and Uses. This is the only form in which chalk is used in medicine. It is an excellent antacid; and, as the salts which it forms in the stomach and bowels, if not astringent, are at least not purgative, it is admirably adapted to diarrhœa accompanied with acidity. It is also sometimes used in acidity of stomach attending dyspepsia and gout, when a laxative effect is to be avoided; is one of the best antidotes for oxalic acid; and has been recommended in rachitis. In scrofulous affections it may sometimes do good by forming soluble salts with acid in the primæ viæ, and thus finding an entrance into the blood-vessels. It is frequently employed as an application to burns and ulcers, which it moderately stimulates, while it absorbs the ichorous discharge, and thus prevents it from irritating the diseased surface, or the sound skin. It is given internally in the form of powder, or suspended in water by the intervention of gum Arabic and sugar. (See *Mistura Cretæ.*) The dose is from ten to forty grains or more.

Pharm. Uses. Prepared chalk is used by one or another of the Pharmacopœias in the preparation of Citric Acid, Tartaric Acid, Chloride of Zinc, Solution of Chloride of Zinc, and Sulphate of Zinc.

Off. Prep. Confectio Aromatica; Hydrargyrum cum Cretâ; Mistura Cretæ; Pulvis Cretæ Compositus; Trochisci Cretæ; Unguentum Plumbi Compositum.

W.

TESTA PRÆPARATA. *U. S. Prepared Oyster-shell.*

"Take of Oyster-shell *a convenient quantity.* Free it from extraneous matter, wash it with boiling water, and reduce it to powder; then prepare it in the manner directed for chalk." *U. S.*

Prepared oyster-shell differs from prepared chalk in containing animal matter, which, being very intimately blended with the carbonate of lime, is supposed by some physicians to render the preparation more acceptable to a delicate stomach. It is given as an antacid in diarrhœa, in the dose of from ten to forty grains or more, frequently repeated. A preparation has been introduced, within a few years, into use in this country under the name of *Castillon's powders*, consisting of sago, salep, and tragacanth, each, in powder, *a drachm*, prepared oyster-shell *a scruple*, and sufficient cochineal to give colour to the mixture. A drachm of this is boiled in a pint of milk, and the decoction used *ad libitum* as a diet in chronic bowel affections. W.

LIQUOR CALCII CHLORIDI. *U. S. Dub.* CALCIS MURIATIS SOLUTIO. *Ed. Solution of Chloride of Calcium. Solution of Muriate of Lime.*

"Take of Marble, in fragments, *nine ounces;* Muriatic Acid *a pint;* Distilled Water *a sufficient quantity.* Mix the Acid with half a pint of the Distilled Water, and gradually add the Marble. Towards the close of the effervescence apply a gentle heat, and, when the action has ceased, pour off the clear liquor and evaporate to dryness. Dissolve the residue in its weight and a half of Distilled Water, and filter the solution." *U. S.*

The *Edinburgh College* dissolves *eight ounces* of muriate of lime (chloride of calcium) in *twelve fluidounces* (Imp. meas.) of water. The *Dublin College* dissolves *three ounces* (avoirdupois) of the salt in *twelve fluidounces* of distilled water, filters, and states the sp. gr. of the solution at 1·225.

By the U. S. process chloride of calcium is first formed, and then, as in the other processes, is dissolved in a certain proportion of water. The U. S. and Edinburgh preparations agree very nearly in strength, containing 1 part of the chloride in about 2·5 parts of the solution. That of the Dublin College is only half as strong, containing 1 part of the chloride in 5 of the solution.

The solution of chloride of calcium has a disagreeable, bitter, acrid taste. It is decomposed by sulphuric acid and the soluble sulphates; by potassa, soda, and their carbonates; by carbonate of ammonia, tartrate of potassa and soda, nitrate of silver, nitrate and acetate of mercury, and acetate of lead. The mode of preparing chloride of calcium, and its chemical properties, are detailed under the head of *Calcii Chloridum* in the first part of this work.

Medical Properties and Uses. Chloride of calcium is considered tonic and deobstruent, and is said to promote the secretion of urine, perspiration, and mucus. It was first brought into notice as a remedy by Fourcroy, and was at one time much used in scrofulous diseases and goitre. It still continues to be a favourite with some physicians, but is less employed than formerly. It has been especially recommended in tabes mesenterica. Cazenave has employed it advantageously in chronic eczema and impetigo, when connected with a lymphatic temperament. When too largely taken it sometimes occasions nausea, vomiting, and purging, and in excessive doses may even produce fatal effects; but it is a much safer remedy than chloride of barium, which has been recommended in the same complaints. The dose of the solution is from thirty minims or drops to a fluidrachm, to be repeated twice or three times a day, and gradually increased to two, three, or even four fluidrachms. It may be given in milk or sweetened water.

Off. Prep. Calcis Carbonas Præcipitatus. W.

CALCIS CHLORINATÆ LIQUOR. *Dub. Solution of Chlorinated Lime.*

"Take of Chlorinated Lime *half a pound* [avoirdupois]; Water *half a gallon* [Imperial measure]. Blend well the Water and Chlorinated Lime by trituration in a large mortar, and, having transferred the mixture to a stoppered bottle, let it be well shaken several times for the space of three hours. Pour out now the contents of the bottle on a calico filter, and let the solution which passes through be preserved in a well-stopped bottle. The sp. gr. of this liquid is 1·035." *Dub.*

For the properties and uses of this preparation see *Calx Chlorinata, page* 154. Its strength must vary, according to the quality of the chlorinated lime employed. It is one of the best antidotes for hydrosulphuric acid, hydrosulphate of ammonia, sulphuret of potassium, and hydrocyanic acid. The dose for internal use is from twenty minims to a fluidrachm. For external application it may be diluted with twice its bulk of water, or may be used of the full strength in some cutaneous affections.

The Dublin College uses it in the preparation of Acetate of Zinc and Solution of Chloride of Zinc. W.

CALCIS PHOSPHAS PRÆCIPITATUM. *Dub. Precipitated Phosphate of Lime.*

"Take of Ox-bones, burned to whiteness in a clear fire, *four ounces* [avoirdupois]; Pure Muriatic Acid *six fluidounces;* Distilled Water *one quart* [two pints, Imperial measure]; Solution of Ammonia *eleven fluidounces*, or *as much as may be sufficient.* Reduce the Calcined Bones to a fine powder, and digest upon this the Acid, diluted with a pint of the Water, until it is dissolved. To the solution, first cleared (if necessary) by filtration, add the remainder of the water, and then the Solution of Ammonia, until the mixture acquires an alkaline reaction, and, having collected the precipitate upon a calico filter, let it be washed with boiling distilled water as long as the liquid which passes through gives rise to a precipitate, when permitted to drop into a solution of nitrate of silver acidulated with nitric acid. The washed product should now be dried by exposing it for some days on porous bricks to a warm atmosphere." *Dub.*

The muriatic acid dissolves the phosphate of lime of the bones, and lets it fall on the addition of ammonia, in a state of minute division. The ablution is intended to free it from any adhering muriate of ammonia. The salt thus obtained is, for the sake of distinction, called *bone-phosphate of lime.* It is in the form of a white powder, without taste or smell, insoluble in water, but very soluble in nitric, muriatic, and acetic acids, from which it is precipitated unchanged on the addition of ammonia. By an intense heat it is fused, but is not otherwise changed. It consists, according to Mitscherlich, of one equivalent of phosphoric acid and three of lime.

The chemical characteristics of bone-phosphate of lime, besides those mentioned, are that with its solution in dilute nitric acid, oxalate of ammonia produces a white precipitate of oxalate of lime, and acetate of lead a white precipitate of phosphate of lead; and, if the nitric solution be neutralized as far as possible without causing a permanent precipitate of phosphate of lime, ammoniacal nitrate of silver throws down from it a lemon-yellow precipitate of phosphate of silver. (*Christison's Dispensatory.*)

Medical Uses. In the form of burnt hartshorn, phosphate of lime formerly enjoyed a brief popularity in the treatment of rickets, and mollities ossium, in which its use seemed to be indicated upon obvious chemical grounds. It has recently been again brought into notice, in consequence of the suggestion by Benecke (*London Lancet*, July, 1851), that, as it is essential in animals as well as plants to the formation of cells, it might be found useful in certain pathological

states of the system characterized by defective nutrition, such as the scrofulous affections. Upon considerations of this kind, the late Dr. W. Stone, of New Orleans, was induced to employ it in cases of scrofulous ulceration, phthisis, &c., and with considerable supposed advantage. (See *St. Louis Med. and Surg. Journ.*, x. 38.) Subsequently, it has been used by other practitioners, and, in connexion with other phosphates, as those of iron, soda, and potassa, has acquired no little reputation in different forms of scrofula and phthisis. When, however, it is considered that, in ordinary food, there is more of the phosphates than the system has need of, so that they are constantly escaping with the stools; and that in those very disorders in which they are supposed to be indicated they are not unfrequently in excess in the blood and urine, in consequence probably of the rapid disintegration of the tissues, it would seem doubtful whether the want, in scrofulous cases, is as much that of materials for cells as that of due power to appropriate those materials. In the reported cases, the phosphate of lime has generally been administered in connexion with cod-liver oil or other tonics; to which, there is reason to believe, any benefit experienced is more truly ascribable than to the phosphate. In two of Dr. Stone's cases the good effects began to be experienced at the period when they might have been expected from the oil alone. Phosphate of lime, though insoluble in water, is probably in general more or less soluble in the gastric liquids, in consequence of the acid present in them; and, if desirable, it may readily be administered in solution by the addition of one of the acids mentioned in the above account of its chemical properties. The dose is from ten to thirty grains. W.

CARBO ANIMALIS.

Preparation of Animal Charcoal.

CARBO ANIMALIS PURIFICATUS. *U.S., Ed., Dub. Purified Animal Charcoal.*

"Take of Animal Charcoal *a pound;* Muriatic Acid, Water, each, *twelve fluid-ounces.* Pour the Muriatic Acid, previously mixed with the Water, gradually upon the Charcoal, and digest with a gentle heat for two days, occasionally stirring the mixture. Having allowed the undissolved portion to subside, pour off the supernatant liquor, wash the charcoal frequently with water until it is entirely free from acid, and dry it." *U. S.*

The *Edinburgh* formula is essentially the same as that of the U. S. Pharmacopœia.

"Take of Ivory Black *five pounds* [avoirdupois]; Muriatic Acid of Commerce *three pints* [Imp. meas.]; Water *three gallons and three pints* [Imp. meas.]; Distilled Water *as much as is necessary.* To the Acid, diluted with three pints of Water, gradually add the Ivory Black, and digest, with repeated stirring, at a gentle heat for twenty-four hours. Pour on now a gallon of Water, and when, after the mixture has been well agitated, the insoluble matters have subsided, remove the clear solution by decantation, or the syphon. Let this be done a second and a third time. Place now the black sediment on a calico filter, and wash it with Distilled Water, until the washings cease to give a precipitate with nitrate of silver. Finally, let the product be dried in a stove or oven, a gentle heat being at first applied, which must be finally raised to between 300° and 400°." *Dub.*

Animal charcoal, as it is made by charring bones, necessarily contains bone-phosphate and carbonate of lime, the presence of which does no harm in some decolorizing operations; but, in delicate chemical processes, these salts would be dissolved or decomposed, and thus be a source of impurity. It is on this account

that animal charcoal requires to be purified from the calcareous salts which it contains; and this is accomplished by dilute muriatic acid, which dissolves the phosphate and decomposes the carbonate.

Purified animal charcoal is a dark brownish-black powder. If it contain carbonate of lime, muriatic acid will cause effervescence, and the solution obtained will give a precipitate with carbonate of ammonia; and if phosphate of lime be present, the acid will dissolve this salt and yield it as a precipitate on the addition of ammonia. The Edinburgh College directs purified animal charcoal to be tested by incinerating it with its volume of red oxide of mercury; when, if good, it will be dissipated with the exception of a scanty ash.

It has been shown by Mr. Warington that bitter vegetable substances, including the organic alkalies, are removed from solution by passing through *purified* animal charcoal, especially when the action is assisted by heat. M. Weppen finds that a similar effect is produced by it in removing resins from tinctures, tannic acid and bitter principles from astringent and bitter infusions, and certain metallic salts from their solutions. Purified animal charcoal, thus employed, has been resorted to by M. Lebourdais as a means of obtaining the active principles of plants. A decoction or infusion of the plant is either boiled with or filtered through the charcoal, which takes up, more or less completely, the bitter and colouring principles. The charcoal is then washed and dried, and treated with boiling alcohol, which dissolves the principles taken up. Finally, the alcohol is distilled off, and the principles are obtained in a separate state. In this way digitalin, ilicin, scillitin, colombin, colocynthin, arnicina, strychnia, quinia, and other principles have been obtained by M. Lebourdais. (*Chem. Gaz.*, Nov. 15, 1848.) In relation to the method of M. Lebourdais for extracting the active principles of plants, see a paper by Mr. J. S. Cobb, in the *Am. Journ. of Pharm.* for July 1851, from the London *Pharm. Journ. and Trans.* Dr. A. B. Garrod has proposed purified animal charcoal as an antidote to vegetable and animal poisons, with which it appears to combine. According to his experiments, common bone-black has not one-fifth of the power of the purified substance; and vegetable charcoal and lamp-black are nearly or quite useless in counteracting the effects of poisons. The amount of the antidote proposed by Dr. Garrod is half an ounce for each grain of a vegetable organic alkali. Dr. Alfred Taylor deems the results of Dr. Garrod inconclusive. Dr. B. H. Rand, of Philadelphia, has made some interesting observations in relation to the antidotal powers of purified animal charcoal, and has proved by experiment that poisonous doses of the strongest vegetable poisons may be swallowed with impunity, if taken mixed with that substance. (*Med. Exam.*, Sept. 1848.)

Pharm. Uses. It is employed as a decolorizing agent in preparing Aconitia, Morphia, Morphiæ Hydrochloras, Quinæ Sulphas, Strychnia, and Veratria. When used for this purpose, its power of absorbing the vegetable organic bases should not be overlooked; as it may be a source of considerable loss. B.

CATAPLASMATA.

Cataplasms.

Cataplasms or poultices are moist substances intended for external application, of such a consistence as to accommodate themselves accurately to the surface to which they are applied, without being so liquid as to spread over the neighbouring parts, or so tenacious as to adhere firmly to the skin. As they are in this country scarcely ever prepared by the apothecary, they were not deemed by the compilers of the United States Pharmacopœia proper objects for officinal direction. W.

CATAPLASMA CARBONIS. *Lond.* *Charcoal Cataplasm.*

"Take of boiling Water *ten fluidounces;* Bread *two ounces;* powdered Flaxseed *ten drachms;* powdered Charcoal *three drachms.* Macerate the Bread with the Water for a little while near the fire; then mix, and gradually add the flaxseed, stirring so as to make a soft cataplasm. With this mix two drachms of the Charcoal, and sprinkle the rest upon the surface." *Lond.*

Charcoal, recently prepared, has the property of absorbing those principles upon which the offensive odour of putrefying animal substances depends. In the form of poultice, it is an excellent application to foul and gangrenous ulcers, correcting their fetor, and improving the condition of the sore. It should be frequently renewed. W.

CATAPLASMA CONII. *Lond.* *Hemlock Cataplasm.*

"Take of boiling Water *ten fluidounces;* powdered Flaxseed *four ounces and a half,* or *a sufficient quantity;* Extract of Hemlock *an ounce.* To the Water gradually add the Flaxseed, constantly stirring, so as to make a Cataplasm. Upon this spread the Extract previously softened with water." *Lond.*

This cataplasm may be advantageously employed as an anodyne application to cancerous, scrofulous, syphilitic, and other painful ulcers: but its liability to produce narcotic effects, in consequence of the absorption of the active principle of the hemlock, should not be overlooked. W.

CATAPLASMA FERMENTI. *Lond.* *Yeast Cataplasm.*

"Take of Yeast, Water heated to 100°, each, *five fluidounces;* Wheat Flour *a pound.* Mix the Yeast with the Water, and add the Flour, stirring so as to make a Cataplasm. Place this near the fire until it begins to swell up." *Lond.*

By exposing a mixture of yeast and flour to a gentle heat, fermentation takes place, and carbonic acid gas is extricated, which causes the mixture to swell, and is the source of its peculiar virtues. The yeast cataplasm is gently stimulant, and is sometimes applied with much benefit to foul and gangrenous ulcers, the fetor of which it corrects, while it is supposed to hasten the separation of the slough. W.

CATAPLASMA LINI. *Lond.* *Flaxseed Cataplasm.*

"Take of boiling Water *ten fluidounces;* Flaxseed, powdered, *four ounces and a half,* or *a sufficient quantity.* Add gradually the Flaxseed to the Water, constantly stirring, so as to make a Cataplasm." *Lond.*

The flaxseed meal which remains after the expression of the oil has sometimes been employed; but that which has not been submitted to pressure is decidedly preferable, and answers an excellent purpose when mixed with boiling water, without other addition, as in the London cataplasm. Fresh lard or olive oil, spread upon the surface of the poultice, serves to prevent its adhesion to the skin, and to preserve its softness.

The use of this and other emollient cataplasms is to relieve the tense condition of the vessels in inflammation, and to promote suppuration. They act simply by their warmth and moisture. The one most extensively employed, perhaps because its materials are always at hand, is that prepared by heating together milk and the crumb of bread. The milk should be quite sweet, and fresh lard should be incorporated with the poultice. Mush made with the meal of Indian corn also forms an excellent emollient cataplasm. W.

CATAPLASMA SINAPIS. *Lond.* *Mustard Cataplasm.*

"Take of boiling Water *ten fluidounces;* Flaxseed, Mustard [seed], each in powder, *two ounces and a half,* or *a sufficient quantity.* Add the powders, previously mixed together, gradually to the Water, stirring so as to make a cataplasm." *Lond.*

The simplest and most effectual mode of preparing a mustard poultice, is to mix the powdered mustard of the shops with a sufficient quantity of warm water to give it a due consistence. When a weaker preparation is required, an equal portion or more of rye or wheat flour should be added. Vinegar never increases its efficiency, and, in the case of the black mustard seed, has been ascertained by MM. Trousseau and Blanc to diminish its rubefacient power. A boiling temperature is also injurious by interfering with the development of the volatile oil or acrid principle. (See *Sinapis.*)

These poultices are frequently called *sinapisms.* They are powerfully rubefacient, exciting a sense of warmth in a few minutes, and usually becoming insupportably painful in less than an hour. When removed, they leave the surface intensely red and burning; and the inflammation frequently terminates in desquamation, or even blistering, if the application has been too long continued. Obstinate ulcers and gangrene also sometimes result from the protracted action of mustard, especially on parts possessed of little vitality. As a general rule, the poultice should be removed when the patient complains much of the pain; and in cases of insensibility should not, unless greatly diluted, be allowed to remain longer than one, or at most two hours; as violent inflammation, followed by obstinate ulceration, is apt to occur upon the establishment of reaction in the system. In children also particular care is necessary to avoid this result. The poultice should be thickly spread on linen, and may be covered with gauze or unsized paper in order to prevent its adhesion to the skin. If hairs are present they should be removed by the razor. Sinapisms may be employed in all cases in which it is desirable to produce a speedy and powerful rubefacient impression. W.

CATAPLASMA SODÆ CHLORINATÆ. *Lond. Cataplasm of Chlorinated Soda.*

"Take of boiling Water *six fluidounces;* Flaxseed, in powder, *four ounces and a half;* Solution of Chlorinated Soda *two fluidounces.* Add the Flaxseed gradually to the Water, constantly stirring; then mix in the Chlorinated Soda." *Lond.*

This is an excellent application to sloughing and other fetid ulcers, to correct the smell, and afford a moderate stimulation. W.

CERATA.

Cerates.

These are unctuous substances consisting of oil or lard, mixed with wax, spermaceti, or resin, to which various medicaments are frequently added. Their consistence, which is intermediate between that of ointments and of plasters, is such that they may be spread at ordinary temperatures upon linen or leather, by means of a spatula, and do not melt or run when applied to the skin. In preparing them, care should usually be taken to select the oil or lard perfectly free from rancidity. The liquefaction should be effected by a very gentle heat, which may be applied by means of a water-bath; and during the refrigeration the mixture should be well stirred, and the portions which solidify on the sides of the vessel should be made to mix again with the liquid portion, until the whole assumes the proper consistence. When a large quantity is prepared, the mortar, or other vessel into which the mixture may be poured for cooling, should be previously heated by means of boiling water. W.

CERATUM CALAMINÆ. *U. S., Lond., Ed. Calamine Cerate, Turner's Cerate.*

"Take of Prepared Calamine, Yellow Wax, each, *three ounces;* Lard *a pound.*

Melt the Wax and Lard together, and, when upon cooling they begin to thicken, add the Calamine, and stir the mixture constantly until cool." *U. S.*

The *London College* orders of prepared calamine and wax, each, *seven ounces and a half*, and of olive oil *a pint* [Imperial measure]; the *Edinburgh*, *one part* of prepared calamine, and *five parts* of simple cerate (*Ceratum Cetacei*, U.S.).

This is the *Ceratum Zinci Carbonatis* of the former U. S. Pharmacopœia, and is an imitation of the cerate recommended by Turner. It is mildly astringent, and is used in excoriations and superficial ulcerations, produced by the chafing of the skin, irritating secretions, burns, or other causes. W.

CERATUM CANTHARIDIS.* *U. S.* EMPLASTRUM CANTHARIDIS. *Lond., Ed., Dub.* EMPLASTRUM EPISPASTICUM. *Cerate of Spanish Flies. Blistering Plaster.*

"Take of Spanish Flies, in very fine powder, *a pound;* Yellow Wax, Resin, each, *seven ounces;* Lard *ten ounces.* To the Wax, Resin, and Lard, previously melted together and strained, add the Spanish Flies, and, by means of a water-bath, keep the mixture in a fluid state for half an hour, stirring occasionally; then remove it from the bath, and stir it constantly until cool." *U. S.*

The *London College* orders of Spanish flies, in very fine powder, *a pound;* wax, suet, each, *seven ounces and a half;* resin *three ounces*, and lard *six ounces;* adds to the wax, suet, and lard, melted together, the resin previously melted; then removes from the fire, and a little before cooling, sprinkles in the flies, and mixes. The *Edinburgh College* orders *two ounces*, each, of flies, resin, yellow wax, and suet; the *Dublin*, *six ounces* of flies, and *four ounces*, each, of yellow wax, resin, and prepared lard.

This is the common *blistering plaster* of the shops. As it can be readily spread without the aid of heat, it is properly a cerate, and is therefore correctly named in the U. S. Pharmacopœia. Though essentially the same in character as prepared by the different processes, it varies somewhat in strength. The U. S., London, and Dublin preparations have the same proportion of flies, but are stronger than that of the Edinburgh College. One of the former, therefore, is preferable. Care has usually been considered requisite, in making the cerate, not to injure the flies by heat. It has, therefore, been recommended that they should not be added to the other ingredients, until immediately before these begin to stiffen after having been removed from the fire. But from the experiments of Mr. Donovan (*Dublin Med. Press*, Aug. 1840), and those of Professor Procter (*Am. Journ. of Pharm.*, xiii. 302, and xxiv. 296), it may be inferred that the vesicating principle of Spanish flies is not injured or dissipated by a heat under 300° F., and that an elevated temperature, instead of being hurtful, is positively advantageous in the preparation of the blistering cerate. The cantharidin is thus more thoroughly dissolved by the oleaginous matter, and consequently brought more efficiently into contact with the skin, than when retained in the interior of the tissue of the fly. Another advantage, stated by Donovan, is that the moisture which usually exists to a certain extent in all the ingredients of the cerate is thus dissipated, and the preparation is less apt to become mouldy, or otherwise to undergo decomposition. Instead, therefore, of waiting until the melted wax, resin, and lard begin to stiffen, it is better to add the powder before the vessel is removed from the fire. Mr. Donovan recommends that, as soon as the other ingredients are melted, the powdered flies should be added, and the mixture stirred until the heat is shown by a thermometer to have risen to 250°, when the vessel is to be removed from the fire, and the mixture stirred constantly until cool. At the heat mentioned, ebullition takes place in

* This is a different preparation from the London *Ceratum Cantharidis*, for an account of which see *Unguentum Cantharidis, Ed.*

consequence of the escape of the moisture contained in the materials. In the cerate thus prepared, the active matter has been dissolved by the lard, and the powder may be separated, if deemed advisable, by straining the mixture before it solidifies. Care should be taken that the temperature be not so high as to decompose the ingredients; and it would be better to keep it within 212° by means of a water-bath, than to incur any risk from its excess. Violent irritation and even vesication of the face of the operator are stated to have resulted from exposure to the vapours of the liquid, at a temperature of 250°. (*Pharm. Journ. and Trans.*, ii. 391.) From an experiment, however, of Prof. Procter, it appears that, though cantharides begin to volatilize slightly at 250°, and rapidly rise in vapour and sublime at from 402° to 412°, yet they are not decomposed unless by increasing the heat considerably above the last mentioned point. (*Am. Journ. of Pharm.*, xxiv. 296 and 298.) It is desirable that the flies should be very finely pulverized. Powdered euphorbium is said to be sometimes fraudulently substituted for a portion of the flies.

The cerate will always raise a blister in ordinary conditions of the system, if the flies are good, and not injured in the preparation. It should be spread on soft leather, though linen or even paper will answer the purpose when that is not to be had. An elegant mode of preparing it for use is to spread a piece of leather, of a proper size, first with adhesive plaster, and afterwards with the cerate, leaving a margin of the former uncovered, in order that it may adhere to the skin. Heat is not requisite, and should not be employed in spreading the cerate. Some sprinkle powdered flies upon the surface of the plaster, press them lightly with a roller, and then shake off the portion which has not adhered; but, if the flies originally employed were good, this addition is superfluous. Prof. Procter is in the habit of applying over the surface with a brush an ethereal tincture of cantharides, which leaves a thin coating of extract, and renders the preparation more certain.

Upon the application of the plaster, the skin should be moistened with warm vinegar or other liquid; and a good rule is to cover the surface of the plaster closely with very thin gauze or unsized paper, which prevents any of the cerate from adhering to the cuticle, and is thought by some to diminish its liability to occasion strangury. In the cases of adults, when the full action of the flies is desired, and the object is to produce a permanent effect, the application should be continued for twelve hours, and on the scalp for twenty-four hours. In very delicate persons, however, or those subject to strangury, or upon parts of a loose texture, or when the object is merely to produce a blister to be healed as quickly as possible, the plaster should remain no longer than is necessary for the production of full redness of the skin, which generally occurs in five or six hours, or even in a shorter time. It should then be removed, and followed by a bread and milk poultice, or some other emollient dressing, under which the cuticle rises, and a full blister is usually produced. By this management the patient will generally escape strangury, and the blister will very quickly heal after the discharge of the serum.* In young children, cantharides sometimes produce

* Dr. M. B. Smith, of Philadelphia, informed us that he had frequently employed uva ursi, as a preventive of strangury from blisters, and had never found it to fail. He gave a small wineglassful of the officinal decoction (see *Decoctum Uvæ Ursi*) every hour, commencing two hours after the application of the blister. Camphor is sometimes incorporated with the blistering cerate to prevent strangury, though with doubtful effect. A plan proposed by M. Vée is to spread over the surface of the plaster, when ready for delivery, by means of the finger, a saturated solution of camphor in ether. The ether evaporates, leaving a thin coating of camphor uniformly diffused. (*Journ. de Pharm.*, 3e *sér.*, viii. 68.) The late Dr. Joseph Hartshorne, of Philadelphia, was in the habit, in cases where he apprehended strangury, of directing four grains of opium and twenty of camphor to be mixed with the cerate of a blister of large size, and experienced the happiest effects from the addition.

alarming and even fatal ulceration, if too long applied. From two to four hours are usually sufficient for any desirable purpose. When the head, or other very hairy part is to be blistered, an interval of ten or twelve hours should, if possible, be allowed between the shaving of the part and the application of the plaster; so that the abrasions may heal, and some impediment be offered to the absorption of the active principles of the flies. After the blister has been formed, it should be opened at the most depending parts, and, the cuticle being allowed to remain, should be dressed with simple cerate; but, if it be desirable to maintain the discharge for a short time, resin cerate should be used, and the cuticle removed, if it can be done without inconvenience. When it is wished that the blistered surface should heal as soon as possible, and with the least inconvenience to the patient, Dr. Maclagan recommends a dressing of cotton wadding; an emollient poultice being first applied for two hours after the removal of the blistering cerate, the cuticle then cut, and the surface afterwards covered with the cotton, with its raw surface next the skin. Should the dressing become soaked with the serous discharge, so much of the cotton may be removed as can be done without disturbing the cuticle, and a new batch applied. The cotton is to be allowed to remain until the old cuticle spontaneously separates. The effects of an issue may be obtained by employing savine ointment, or the ointment of Spanish flies, as a dressing. If much inflammation take place in the blistered surface, it may be relieved by emollient poultices, or weak lead-water. Where there is an obstinate indisposition to heal, we have found nothing so effectual as the cerate of subacetate of lead, mixed with an equal weight of simple cerate. When deep and extensive ulceration occurs in consequence of general debility, bark or sulphate of quinia should be used, with nutritious aliment.

Various preparations of cantharides have been proposed and employed as substitutes for the cerate. They consist for the most part of cantharidin, more or less pure, either dissolved in olive oil and applied to the skin by means of a piece of paper saturated with it, or incorporated with wax and spread in a very thin layer upon fine waxed cloth, silk, or paper, constituting the *blistering cloth*, *blistering paper*, *vesicating taffetas*, *&c.*, of the shops. The advantages of these preparations are that they occupy less space, are more portable, and, being very pliable, are more easily adapted to irregularities of the surface. Absolutely pure cantharidin is expensive and not requisite; as extracts of cantharides, made with ether, alcohol, or boiling water, will answer every purpose. Henry and Guibourt give the following formula. Digest powdered cantharides in sulphuric ether, distil off the ether, evaporate the residue by means of a salt-water bath until ebullition ceases, melt the oily mass which remains with twice its weight of wax, and spread the mixture upon waxed cloth. The *waxed cloth* may be prepared by spreading upon linen or muslin a mixture composed of 8 parts of white wax, 4 of olive oil, and 1 of turpentine, melted together. An extract of cantharides, of a buttery consistence, said to act very efficiently when applied by means of paper greased with it, is prepared by digesting 4 parts of flies with 1 part of strong acetic acid and 16 of alcohol, straining, filtering, and evaporating at a moderate heat. A preparation which has received the favourable report of a committee of the Society of Pharmacy, at Paris, is the following, proposed by M. Dubuison. Four parts of a hydro-alcoholic extract of the flies made by maceration, is mixed with an aqueous solution of one part of pure gelatin, so as to obtain a solution of suitable consistence, which is then applied upon a piece of extended waxed cloth, care being taken that the brush should always have the same direction. When the first layer has dried, a second, and a third are to be applied in the same manner. The gelatin renders the cloth more adhesive and less deliquescent. The hydro-alcoholic extract is preferred to the alcoholic, because it contains less of the green oil, which does not readily mix with the

other ingredients. The committee, however, prefer the aqueous extract, as cheaper and more active. This taffeta has been tried, and found to raise blisters in four hours. (*Journ. de Pharm.*, 3e *sér.*, viii. 67.) A strong decoction of the flies in olive oil, applied by means of paper, would probably answer a similar purpose with these more elaborate preparations. But none of them is likely to supersede the officinal cerate. For very speedy vesication, an infusion of the flies in strong acetic acid is sometimes employed. (See *Acetum Cantharidis.*)

A preparation, called *cantharidal collodion*, has recently been introduced into use. It was originally proposed by M. Ilisch, of St. Petersburg, Russia, and is made in the following manner. Exhaust, by percolation, a pound of cantharides, with a mixture consisting of a pound of sulphuric ether and three ounces of acetic ether; and in two ounces of this liquid dissolve 25 grains of gun cotton. Professor Procter states that it has been found more advantageous to exhaust the flies with ether, distil off the ether, and mix the oily residue with collodion already prepared of the proper consistence. (*Am. Journ. of Pharm.*, xxiv. 303.) Mr. Charles S. Rand, in a communication to the *American Journal of Pharmacy* (xxii. 18), states that Ilisch's preparation made with double the proportion of ether vesicates equally well, and proposes the addition of about one per cent. of Venice turpentine, which he has found to prevent the disagreeable, and sometimes painful contraction of the preparation upon drying. The preparation may be kept indefinitely in a glass-stoppered bottle without change. It may be applied to the surface by means of a camel's hair brush, and, after the evaporation of the ether, which takes place in less than a minute, may be reapplied if the surface should not be well covered. It produces a blister in about the same time as the ordinary cerate, and has the advantage that it is applied with greater facility, is better adapted to cover uneven surfaces, and retains its place more certainly. According to Mr. Rand, if the evaporation of the ether be restrained by a piece of oiled silk immediately after its application, it will act much more speedily.

It is said that the flies, by ebullition with water, are deprived of their property of producing strangury, while their vesicating powers remain unaltered. (*Paris's Pharmacologia.*) Dr. Theophilus Beasly, of Philadelphia, was in the habit of employing a cerate made with cantharides prepared in this manner, and never knew it to produce strangury in more than two or three instances. (*Journ. of the Phil. Col. of Pharm.*, iv. 185.) In a letter addressed to one of the authors by Dr. James Couper, of Newcastle, Delaware, a similar method of preparing the flies is recommended as an expedient against strangury, both from his own experience and that of the late Dr. Groom, of Elkton, Maryland, from whom he derived his knowledge of the plan. Yet there can be no doubt that boiling water extracts cantharidin from the flies; and the cerate made as here recommended must be somewhat weaker in the blistering principle than the officinal.

Off. Prep. Emplastrum Picis cum Cantharide. W.

CERATUM CETACEI. *U. S.*, *Lond.* Ceratum Simplex. *Ed.* Unguentum Cetacei. *Dub.* *Spermaceti Cerate.*

"Take of Spermaceti *an ounce;* White Wax *three ounces;* Olive Oil *six fluidounces.* Melt together the Spermaceti and Wax; then add the Oil previously heated, and stir the mixture until cool." *U. S.*

The *London College* directs *two ounces* of spermaceti, *eight ounces* of white wax, and *a pint* [Imp. meas.] of olive oil; the *Edinburgh*, *six parts* of olive oil, *three parts* of white wax, and *one part* of spermaceti; the *Dublin*, *half a pound* of white wax, *a pound* of spermaceti, and *three pounds* of lard.

The direction to heat the oil before adding it to the other ingredients is peculiar to the U. S. and Edinburgh Pharmacopœias. If added cold, it is apt to produce an irregular congelation of the wax and spermaceti, and thus to render

the preparation lumpy. This cerate is employed as a dressing for blisters, excoriated surfaces, and wounds, and as the basis of more active preparations. When the ingredients are pure and sweet, it is perfectly free from irritating properties.

Off. Prep. Ceratum Cantharidis; Ceratum Calaminæ. W.

CERATUM HYDRARGYRI COMPOSITUM. *Lond. Compound Cerate of Mercury.*

"Take of Mercurial Ointment, Compound Soap Cerate, each, *six ounces;* Camphor *an ounce and a half.* Rub them together." *Lond.*

This cerate is used as a discutient application to indolent tumours. W.

CERATUM PLUMBI SUBACETATIS. *U. S.* CERATUM PLUMBI COMPOSITUM. *Lond. Cerate of Subacetate of Lead. Goulard's Cerate.*

"Take of Solution of Subacetate of Lead *two fluidounces and a half;* White Wax *four ounces;* Olive Oil *nine fluidounces;* Camphor *half a drachm.* Mix the Wax, previously melted, with eight fluidounces of the Oil; then remove the mixture from the fire, and, when it begins to thicken, gradually pour in the Solution of Subacetate of Lead, stirring constantly with a wooden spatula till it becomes cool. Lastly, add the Camphor dissolved in the remainder of the Oil, and mix." *U. S.*

The *London College* takes *six fluidounces* of the solution of subacetate of lead, *eight ounces* of wax, *a pint* [Imperial measure] of olive oil, and *a drachm* of camphor, and proceeds in the manner above directed.

This cerate becomes so speedily rancid that but little should be prepared at once, when the demand is not great. It received the name by which it is commonly known from M. Goulard, by whom it was employed and recommended. It is used to dry up excoriations, to relieve the inflammation of burns, scalds, and chilblains, and to remove cutaneous eruptions. We have found it more effectual than any other application to blistered surfaces indisposed to heal; and, on the recommendation of the late Dr. Parrish, have used it in the following combination with advantage in various cutaneous eruptions of a local character. Take of cerate of subacetate of lead, simple cerate, each, *half an ounce;* calomel, powdered opium, each, *a drachm;* mix them. The same preparation, without the opium, was a favourite remedy with the late Dr. Wistar in similar complaints. W.

CERATUM RESINÆ. *U. S., Lond.* UNGUENTUM RESINOSUM. *Ed.* UNGUENTUM RESINÆ. *Dub. Resin Cerate. Basilicon Ointment.*

"Take of Resin *five ounces;* Lard *eight ounces;* Yellow Wax *two ounces.* Melt them together, strain through linen, and stir them constantly until cool." *U. S.*

The proportions directed by the *Edinburgh College* are the same as the above. The *London College* orders of resin and wax, each *fifteen ounces*, and of olive oil *a pint* [Imperial measure]. The resin and wax are melted together over a slow fire, the oil then added, and the mixture while hot strained through linen. By the *Dublin* process *half a pound* [avoirdupois] of resin, in coarse powder, *four ounces* [avoird.] of yellow wax, and *a pound* [avoird.] of prepared lard, are melted, strained while hot through flannel, and stirred constantly till they concrete.

The straining is directed in consequence of the impurities which resin often contains. Resin cerate, commonly called *basilicon ointment*, is much used as a gently stimulant application to blistered surfaces, indolent ulcers, burns, scalds, and chilblains. We have found no application more effectual in disposing the ulcers which follow burns to heal.

Off. Prep. Ceratum Sabinæ; Linimentum Terebinthinæ; Unguentum Cantharidis; Unguentum Æruginis. W.

CERATUM RESINÆ COMPOSITUM. *U. S. Compound Resin Cerate.*

"Take of Resin, Suet, Yellow Wax, each, *a pound;* Turpentine *half a pound;* Flaxseed Oil *half a pint.* Melt them together, strain through linen, and stir them constantly until cool." *U. S.*

This is somewhat more stimulating than the preceding, but is applicable to similar purposes, particularly to the treatment of indolent ulcers. Under the name of *Deshler's salve*, it is popularly employed in some parts of the United States. It should be kept well protected from the air, in consequence of its liability when exposed to acquire a tough consistence. W.

CERATUM SABINÆ. *U. S., Ed.* Unguentum Sabinæ. *Lond., Dub. Savine Cerate.*

"Take of Savine, in powder, *two ounces;* Resin Cerate *a pound.* Mix the Savine with the Cerate previously softened." *U. S.*

The *London College* orders *half a pound* of fresh savine, bruised, to be mixed with *three ounces* of white wax and *a pound* of lard previously melted together, and the whole to be strained through linen. The *Edinburgh College* directs the same ingredients, in the same proportions, to be boiled together till the leaves become friable, and then strained. The *Dublin College* rubs intimately together *a drachm* of savine, in fine powder, and *seven drachms* of ointment of white wax.

As the savine used in this country is generally brought from Europe in the dried state, we are compelled to resort to the mode of preparing the cerate directed in the U. S. Pharmacopœia. Nor have we found the preparation thus made to be "intolerably acrid and almost caustic," as Dr. Duncan describes it. On the contrary, it answers very well the purpose for which it is used, that of maintaining the discharge from blistered surfaces. A cerate prepared in the same manner from the leaves of the red cedar (*Juniperus Virginiana*) is sometimes substituted for that of savine, but is less efficient.

Prepared according to the processes of the *London and Edinburgh* Colleges, savine cerate has a fine deep-green colour, and the odour of the leaves. It should be kept in closely covered vessels.

Savine cerate is preferable to the ointment of Spanish flies as a dressing for perpetual blisters, from the circumstance that it has no tendency to produce strangury. The white coating which forms during its use upon the blistered surface should be occasionally removed, as it prevents the contact of the cerate. It is sometimes applied to seton cords, with the view of increasing the discharge. W.

CERATUM SAPONIS. *U. S.* Ceratum Saponis Compositum. *Lond. Soap Cerate.*

"Take of Solution of Subacetate of Lead *two pints;* Soap *six ounces;* White Wax *ten ounces;* Olive Oil *a pint.* Boil the Solution of Subacetate of Lead with the Soap, over a slow fire, to the consistence of honey; then transfer to a water-bath, and evaporate until all the moisture is dissipated; lastly add the Wax previously melted with the Oil, and mix." *U. S.*

"Take of Soap *ten ounces;* Wax *twelve ounces and a half;* Oxide of Lead [litharge], in powder, *fifteen ounces;* Olive Oil *a pint* [Imperial measure]; Vinegar *a gallon* [Imp. meas.]. Boil the Vinegar with the Oxide of Lead over a slow fire, constantly stirring until they unite; then add the Soap, and again boil in a similar manner, until all the moisture is dissipated; lastly, with these mix the Wax previously dissolved in the Oil." *Lond.*

The present U. S. formula is that of Mr. Durand, given in the *American Journal of Pharmacy* (vol. viii. p. 27), and was substituted, in the U. S. Pharmacopœia of 1840, for the London formula, which had been adopted in the pre-

vious editions. It has the advantages of being more precise in the directions, more easy of execution, and more uniform in its results. It yields a perfectly white cerate, having the same properties as the London, and a finer appearance. The solution of subacetate of lead, which in the U. S. process is taken already prepared, results, in the London, from the action of the vinegar upon the litharge. In both processes, the subacetate of lead is decomposed by the soap, the soda of which unites with the acetic acid, and the oleaginous acids with the oxide of lead, in the same manner as in the formation of Emplastrum Plumbi. The wax and oil subsequently added merely serve to give due consistence to the preparation. Soap cerate is thought to be cooling and sedative; and is sometimes used in scrofulous swellings and other instances of chronic external inflammation. It was formerly employed by Mr. Pott as a dressing for fractured limbs; but answers no other purpose in these cases than to yield mechanical support.

Off. Prep. Ceratum Hydrargyri Compositum. W.

CERATUM SIMPLEX. *U. S.* Ceratum. *Lond.* *Simple Cerate.*

"Take of Lard *eight ounces;* White Wax *four ounces.* Melt them together, and stir them constantly until cool." *U. S.*

The *London College* directs that *a pint* [Imperial measure] of olive oil be mixed with *twenty ounces* of wax previously melted.

We prefer the U. S. formula. Lard is preferable to olive oil, as it may always be had perfectly sweet, and is the mildest application which can be made to irritated surfaces. In the preparation of this cerate, peculiar care should be taken that the oleaginous ingredient be entirely free from rancidity, and that the heat employed be not sufficient to produce the slightest decomposition; for the value of the preparation depends on its perfect blandness. To avoid change, it should be put up in small jars, and covered closely with tin foil so as to exclude the air. It is used for dressing blisters, wounds, &c., in all cases in which the object is to prevent the contact of air and preserve the moisture of the part, and at the same time to avoid all irritation. It is sometimes improperly employed as the vehicle of substances to be applied by inunction. For this purpose lard should be used in winter, and simple ointment in summer; the cerate having too firm a consistence. W.

CERATUM ZINCI CARBONATIS. *U. S.* *Cerate of Carbonate of Zinc.*

"Take of Precipitated Carbonate of Zinc *two drachms;* Simple Ointment *ten drachms.* Mix them." *U. S.*

This cerate was intended as a substitute for the former Ceratum Zinci Carbonatis of the U. S. Pharmacopœia, now Ceratum Calaminæ, as being more to be depended on in consequence of the frequent falsification of calamine. For its uses, see *Ceratum Calaminæ.* W.

CONFECTIONES. *U. S., Lond.*

Confections.

Confections. *Dub.* Conserves and Electuaries. *Ed.*

Under the general title of Confections, the Pharmacopœias of the United States, London, and Dublin, include all those preparations having the form of a soft solid, in which one or more medicinal substances are incorporated with saccharine matter, with a view either to their preservation or more convenient administration. The Edinburgh College retains the old division into Conserves and Electuaries; and, as there is some ground for the distinction, we shall make

a few general remarks upon each division, before proceeding to the consideration of the individual preparations.

Conserves consist of recent vegetable substances and refined sugar beat into a uniform mass. By means of the sugar, the vegetable matter is enabled to resist for some time the decomposition to which it would otherwise be exposed in the undried state, and the properties of the recent plant are thus retained to a certain extent unaltered. But, as active medicines even thus treated undergo some change, and those which lose their virtues by desiccation cannot be long preserved, the few conserves now retained are intended rather as convenient vehicles of other substances than for separate exhibition. The sugar used in their preparation should be reduced to a fine powder by pounding and sifting, as otherwise it will not mix uniformly with the other ingredient.

Electuaries are mixtures consisting of medicinal substances, especially dry powders, combined with syrup or honey, in order to render them less unpleasant to the taste, and more convenient for internal use. They are usually prepared extemporaneously; and it is only when their complex nature renders it convenient to keep them ready made in the shops, or some peculiarity in the mode of mixing the ingredients requires attention, that they become proper objects for pharmaceutic direction. Their consistence should not be so soft, on the one hand, as to allow the ingredients to separate, nor so firm, on the other, as to prevent them from being swallowed without mastication. Different substances require different proportions of syrup. Light vegetable powders usually require twice their weight, gum-resins two-thirds of their weight, resins somewhat less, mineral substances about half their weight, and deliquescent salts not more than one-tenth. Should the electuary be found, after having been kept for a short time, to swell up and emit gas, it should be beat over again in a mortar, so that any portion of the sugar which may have crystallized may be again accurately incorporated with the other ingredients. Should it, on the contrary, become dry and hard from the mutual reaction of its constituents, more syrup should be added, so as to give it the requisite consistence. If the dryness result from the mere evaporation of the aqueous part, water should be added instead of syrup, and the same remark is applicable to the conserves. To prevent the hardening of electuaries, the French writers recommend the use of syrup prepared from brown sugar, which is less apt to crystallize than that made from the refined. Molasses would answer the same purpose; but its taste might be considered objectionable. Some persons employ honey, but this is not always acceptable to the stomach. W.

CONFECTIO AMYGDALÆ. *Lond.* Conserva Amygdalarum. *Ed.* *Almond Confection.*

"Take of [sweet] Almonds *eight ounces;* Gum Arabic, in powder, *an ounce;* Sugar *four ounces.* Having macerated the Almonds in cold water, and deprived them of their external coat, bruise them, and rub them through a fine metallic sieve; then, having added the other ingredients, beat altogether till they are thoroughly incorporated. The confection may be kept longer, if the Almonds, previously denuded, dried, and rubbed to a very fine powder, should be mixed with the gum Arabic and sugar separately powdered, and the mixed powder preserved in a stopped bottle." *Lond.*

The directions of the *Edinburgh College* are essentially the same as the above, except that this College does not admit the alternative of having the ingredients separately rubbed, and afterwards mixed.

This preparation is intended to afford a speedy method of preparing the almond mixture, which, when made immediately from the Almonds, requires much time, and which cannot be kept ready made in the shops. But, from its liability to

be injured by keeping, it was omitted from our Pharmacopœia, which directs the almond mixture to be made immediately from the ingredients.

Mistura Amygdalæ. W.

CONFECTIO AROMATICA. *U. S.*, *Lond.*, *Dub.* ELECTUARIUM AROMATICUM. *Ed.* *Aromatic Confection.*

"Take of Aromatic Powder *five ounces and a half;* Saffron, in powder, *half an ounce;* Syrup of Orange Peel *six ounces;* Clarified Honey *two ounces.* Rub the Aromatic Powder with the Saffron; then add the Syrup and Honey, and beat the whole together until thoroughly mixed." *U. S.*

"Take of Cinnamon, Nutmegs, each, *two ounces;* Cloves *an ounce;* Cardamom *half an ounce;* Saffron *two ounces;* Prepared Chalk *sixteen ounces;* Sugar *two pounds;* Distilled Water *a sufficient quantity.* Rub the dry ingredients together to a very fine powder, and keep them in a closed vessel. But when the confection is to be used, to every ounce of the powder add *two fluidrachms* of the Water, and mix all together until incorporated." *Lond.*

The *Dublin College* rubs *five ounces* [avoirdupois] of aromatic powder with *half an ounce* of saffron in powder; then adds *five fluidounces* of simple syrup, and *two ounces* [avoirdupois] of clarified honey, and beats them together till thoroughly mixed; and lastly adds *half a fluidrachm* of oil of cloves. The *Edinburgh College* directs *one part* of its aromatic powder, and *two parts* of syrup of orange peel to be mixed, and triturated into a uniform pulp.

The preparation of the U. S. Pharmacopœia contains cinnamon, ginger, cardamom, and nutmeg, without prepared chalk, which appears to us to be an unnecessary if not improper ingredient; as it is not always indicated in cases which call for the use of the confection, and may be added extemporaneously when required. The aromatic confection affords a convenient method of administering the spices which enter into its composition, and an agreeable vehicle for other medicines. It is given in debilitated states of the stomach, alone or as an adjuvant to other substances. The dose is from ten to sixty grains.

Off. Prep. Pilulæ Digitalis et Scillæ. W.

CONFECTIO AURANTII CORTICIS. *U. S.* CONFECTIO AURANTII. *Lond.* CONSERVA AURANTII. *Ed.* *Confection of Orange Peel.*

"Take of Orange Peel, recently separated from the fruit by grating, *a pound;* Sugar [refined] *three pounds.* Beat the Orange Peel with the Sugar gradually added, till they are thoroughly mixed." *U. S.*

The directions of the *London* and *Edinburgh Colleges* correspond with the above. The rind of the bitter orange is intended by these Colleges, that either of the bitter or sweet by the U. S. Pharmacopœia. By the London process, the beating is performed in a stone mortar with a wooden pestle.

This confection is sometimes used as a grateful aromatic vehicle or adjunct of tonic and purgative powders. W.

CONFECTIO CASSIÆ. *Lond.* *Confection of Cassia.*

"Take of Prepared Cassia *half a pound;* Manna *two ounces;* Prepared Tamarinds *an ounce;* Syrup of Roses *eight fluidounces.* Bruise the Manna, and dissolve it in the Syrup; then mix in the Cassia and Tamarinds, and evaporate to the proper consistence." *Lond.*

The confection of cassia is slightly laxative; but is seldom if ever prepared in this country, and might very properly be expunged from the catalogue of preparations, as it is both feeble and expensive. W.

CONFECTIO CATECHU COMPOSITA. *Dub.* ELECTUARIUM CATECHU. *Ed.* *Compound Confection of Catechu.*

"Take of Compound Powder of Catechu *five ounces* [avoirdupois]; Simple

Syrup *five fluidounces.* Add the Syrup gradually to the Powder, and mix them well together." *Dub.*

"Take of Catechu and Kino, of each, *four ounces;* Cinnamon and Nutmeg, of each, *one ounce;* Opium, diffused in a little Sherry, *one drachm and a half;* Syrup of Red Roses, reduced to the consistence of honey, *one pint and a half* [Imperial measure]. Pulverize the solids, mix the opium and syrup, then the powders, and beat them thoroughly into a uniform mass." *Ed.*

The Edinburgh Confection is aromatic and astringent, containing one grain of opium in about two hundred grains of the mass; and may be advantageously given in diarrhœa and chronic dysentery, in the dose of half a drachm or a drachm more or less frequently repeated. It may be taken in the form of bolus, or diffused in water. The Dublin Confection contains no opium, but is similar in other respects. W.

CONFECTIO OPII. *U. S., Lond.* Electuarium Opii. *Ed. Confection of Opium.*

"Take of Opium, in powder, *four drachms and a half;* Aromatic Powder *six ounces;* Clarified Honey *fourteen ounces.* Rub the Opium with the Aromatic Powder, then add the Honey, and beat the whole together until thoroughly mixed." *U. S.*

"Take of Opium, in powder, *six drachms;* Long Pepper *an ounce;* Ginger, in powder, *two ounces;* Caraway *three ounces;* Tragacanth, in powder, *two drachms;* Syrup *sixteen fluidounces* [Imperial measure]. Rub the dry ingredients together to a very fine powder, and keep it in a covered vessel. But when the Confection is to be used, add the powder gradually to the Syrup previously heated, and mix." *Lond.*

"Take of Aromatic Powder *six ounces;* Senega, in fine powder, *three ounces;* Opium, diffused in a little Sherry, *half an ounce;* Syrup of Ginger *a pound.* Mix them together, and beat them into an electuary." *Ed.*

This confection was intended as a substitute for those exceedingly complex and unscientific preparations which were formerly known by the names of *theriaca* and *mithridate*, and which have been expelled from modern pharmacy. The *seneka*, directed in the last edition of the Edinburgh Pharmacopœia, was probably put inadvertently for *serpentaria*, directed in the old Latin edition. The former medicine has no property which adapts it to this position. The preparation is a combination of opium with spices, which render it more stimulant, and more grateful to a debilitated stomach. It is given in atonic gout, flatulent colic, diarrhœa unattended with inflammation, and in various other diseases requiring the use of a stimulant narcotic. Added to Peruvian bark or sulphate of quinia, it increases considerably the efficacy of this remedy in obstinate cases of intermittent fever. One grain of opium is contained in about thirty-six grains of the U. S. and London confections, and in forty-three of the Edinburgh. W.

CONFECTIO PIPERIS. *Lond.* Confectio Piperis Nigri. *Dub.* Electuarium Piperis. *Ed. Confection of Black Pepper.*

"Take of Black Pepper, Elecampane, each, *a pound;* Fennel [seeds] *three pounds;* Honey, Sugar [refined], each, *two pounds.* Rub the dry ingredients together into a very fine powder, and keep them in a covered vessel. But whenever the confection is to be used, add the powder gradually to the Honey, and beat them until thoroughly incorporated." *Lond.*

"Take of Black Pepper, Liquorice Root in powder, each, *a pound;* Fennel *three pounds;* Honey, White Sugar, each, *two pounds.* Triturate the solids together into a very fine powder; add the Honey; and beat the whole into a uniform mass." *Ed.*

"Take of Black Pepper, in fine powder, Liquorice Root, in powder, each, *half an ounce* [avoirdupois]; Refined Sugar *one ounce* [avoird.]; Oil of Fennel *half a fluidrachm;* Clarified Honey *two ounces* [avoird.]. Rub the dry substances together into a very fine powder, then add the Honey and Oil, and beat them into a uniform mass." *Dub.*

This preparation was intended as a substitute for *Ward's paste*, which acquired some reputation in Great Britain as a remedy in piles and ulcers of the rectum. To do good, it must be continued, according to Mr. Brodie, for two, three, or four months. The dose is from one to two drachms repeated two or three times a day. Its stimulating properties render it inapplicable to cases attended with much inflammation. W.

CONFECTIO ROSÆ. *U. S., Lond., Dub.* Conserva Rosæ. *Ed.* *Confection of Roses. Conserve of Roses.*

"Take of Red Roses, in powder, *four ounces;* Sugar [refined], in powder, *thirty ounces;* Clarified Honey *six ounces;* Rose Water *eight fluidounces.* Rub the Roses with the Rose Water heated to 150°; then gradually add the Sugar and Honey, and beat the whole together until thoroughly mixed." *U. S.*

"Take of fresh Red Roses *a pound;* Sugar [refined] *three pounds.* Beat the Roses in a marble mortar; then add the Sugar, and beat again until they are incorporated." *Lond.*

The *Edinburgh College* directs the petals to be beaten into a pulp with the gradual addition of twice their weight of white sugar. The *Dublin College*, using the avoirdupois weights, macerates *an ounce* of the dried roses in *two fluidounces* of rose water for two hours, adds gradually *eight ounces* of refined sugar, and beats them into a uniform mass; or, it prepares the confection in the same manner as the London College, using three parts of petals to eight of sugar.

In the London process, the unblown petals only are used, and these should be deprived of their claws; in other words, the rose buds should be cut off a short distance above their base, and the lower portion rejected. In the last two editions of the U. S. Pharmacopœia, dried roses have been substituted for the fresh, as the latter are not brought to our market. The process is very similar to that of the French Codex. We have been informed, however, that much of the confection of roses made in Philadelphia is prepared from the fresh petals of the hundred-leaved rose and others, by beating them into a pulp with sugar as in the London process. An excuse for this deviation from the officinal formula is, that the confection thus made has greater adhesiveness than the officinal, and is therefore better fitted for the formation of pills.

This confection is slightly astringent, but is almost exclusively used as a vehicle of other medicines, or to impart consistence to the pilular mass. The Edinburgh College employs it in most of its officinal pills.

Off. Prep. Pilulæ Hydrargyri. W.

CONFECTIO ROSÆ CANINÆ. *Lond.* Conserva Rosæ Fructûs. *Ed.* *Confection of Dog Rose.*

"Take of Dog Rose, enucleated, *a pound;* Sugar [refined], in powder, *twenty ounces.* Rub the Rose with the Sugar gradually added, until they are incorporated." *Lond.*

"Take any convenient quantity of hips, carefully deprived of their carpels, beat them to a fine pulp, adding gradually thrice their weight of white Sugar." *Ed.*

This preparation is acidulous and refrigerant, and is used in Europe for forming more active medicines into pills and electuaries. W.

CONFECTIO RUTÆ. *Lond.* *Confection of Rue.*

"Take of Rue, recently powdered, Caraway, Laurel [fruit], each, *an ounce and*

a half; Prepared Sagapenum *half an ounce;* Black Pepper *two drachms;* Honey [clarified] *sixteen ounces.* Rub the dry ingredients together to a very fine powder; then, the Sagapenum having been liquefied over a slow fire with the Water and Honey, gradually add the powder, and mix all together." *Lond.*

The confection of rue is antispasmodic, and in Great Britain is employed in the form of enema in hysterical complaints and flatulent colic; but in this country it is not used. From a scruple to a drachm may be administered, diffused in half a pint of warm mucilaginous fluid. W.

CONFECTIO SCAMMONII. *Lond., Dub. Confection of Scammony.*

"Take of Scammony *an ounce and a half;* Cloves, bruised, Ginger, in powder, each, *six drachms;* Oil of Caraway *half a fluidrachm;* Syrup of Roses *a sufficient quantity.* Rub the dry ingredients into a very fine powder, and keep them in a closed vessel; then, when the Confection is to be used, pour in the Syrup, and again rub them; finally, add the Oil of Caraway, and mix them all." *Lond.*

The *Dublin College,* employing avoirdupois weights, beats *three ounces* of powdered scammony, and *an ounce and a half* of finely powdered ginger, with *three fluidounces* of simple syrup and *an ounce and a half* of clarified honey; then adds *half a fluidrachm,* each, of oil of cloves and oil of caraway, and mixes all together.

This confection is actively cathartic in the dose of half a drachm or a drachm; but is very little used. The proportion of scammony in the London preparation is uncertain, from the indefinite quantity of syrup employed. W.

CONFECTIO SENNÆ. *U. S., Lond., Dub.* ELECTUARIUM SENNÆ. *Ed. Confection of Senna. Lenitive Electuary.*

"Take of Senna *eight ounces;* Coriander [seed] *four ounces;* Liquorice Root, bruised, *three ounces;* Figs *a pound;* Pulp of Prunes, Pulp of Tamarinds, Pulp of Purging Cassia, each, *half a pound;* Sugar [refined] *two pounds and a half;* Water *four pints.* Rub the Senna and Coriander together, and separate ten ounces of the powder with a sieve. Boil the residue with the Liquorice Root and Figs, in the Water, to one-half; then press out the liquor and strain. Evaporate the strained liquor, by means of a water-bath, to a pint and a half; then add the Sugar and form a syrup. Lastly, rub the Pulps with the syrup gradually added, and, having thrown in the sifted powder, beat all together until thoroughly mixed." *U. S.*

The *London* process corresponds with the above. The *Edinburgh College* directs *a pound* of the pulp of prunes, and omits the pulps of tamarinds and cassia fistula; but otherwise proceeds in the same manner. The *Dublin College,* using avoirdupois weights, takes of finely powdered senna *two ounces,* finely powdered coriander *an ounce,* oil of caraway *half a fluidrachm,* pulp of prunes *five ounces,* pulp of tamarinds *two ounces,* brown sugar *eight ounces,* and water *two fluidounces;* dissolves the sugar in the water, and beats the pulps to a uniform consistence; then, having stirred in the powders and oil, mixes all well together, and heats the mass thoroughly in a water-bath for ten minutes.

The confection of senna, when properly made, is an elegant preparation. Directions may be found under *Pulpæ* for preparing the several pulps referred to in the U. S. formula; but the apothecary will find it most convenient to prepare them in connexion with this process; and, by following the directions here given, he will approximate very closely to the result aimed at in the officinal directions. Take *sixteen ounces* of cassia fistula, *ten ounces* of tamarinds, and *seven ounces* of prunes; bruise and slice them; digest with sufficient boiling water thoroughly to soften the pulps; remove as far as convenient the fragments of the cassia pods, and the seeds and fibres of the prunes and tamarinds; and

then separate the pulp by rubbing through a hair sieve. The crude substances will, in the quantities mentioned, each yield on the average half a pound of pulp. It is common to omit the cassia pulp in the preparation of the confection, as the pods are not always to be found in the market. But as this is next to senna the most active ingredient, the omission is to be regretted; and there is no doubt that a steady demand for the fruit would be met by an abundant supply from the West Indies.

This is one of our best and most pleasant laxatives, being admirably adapted to cases of habitual costiveness, especially in pregnant women and persons affected with piles. It is also very useful in the constipation which is apt to attend convalescence from fevers and other acute diseases. The mean dose is two drachms, to be taken at bedtime. W.

CONFECTIO SULPHURIS. *Dub. Confection of Sulphur.*

"Take of Sublimed Sulphur *two ounces;* Bitartrate of Potassa *one ounce;* Clarified Honey, by weight, *one ounce;* Syrup of Ginger, Syrup of Saffron, of each, *half a fluidounce.* Triturate all the ingredients in a mortar, until they are intimately mixed." *Dub.* The weights here employed are avoirdupois.

This is merely a mode of administering the two laxatives sulphur and bitartrate of potassa; and the relative proportion of the latter is so small that it can have little effect. The dose may be from two drachms to half an ounce or more. W.

CONFECTIO TEREBINTHINÆ. *Dub. Confection of Turpentine.*

"Take of Oil of Turpentine *one fluidounce;* Liquorice Root, in powder, *one ounce;* Clarified Honey, by weight, *two ounces.* Rub the Oil of Turpentine with the Liquorice Powder, then add the Honey, and beat them all together into a uniform consistence." *Dub.* The weights employed are avoirdupois.

Confections might be multiplied indefinitely upon the principle which appears to have been adopted here, that, namely, of giving a convenient formula for the administration of medicines. The effects of this confection are those only of the oil of turpentine. The dose may be from a scruple to a drachm. W.

CUPRUM.

Preparations of Copper.

CUPRI SUBACETAS PRÆPARATUM. *Dub. Prepared Subacetate of Copper.*

"Take of Subacetate of Copper *a convenient quantity.* Reduce it to powder by careful trituration in a porcelain mortar, and separate the finer parts for use by means of a sieve." *Dub.*

By the process of the former Dublin Pharmacopœia, in which levigation and elutriation were employed, a chemical change was effected, which was not originally contemplated, the object being merely to reduce verdigris to the state of very fine powder. This object is accomplished by the present process. The preparation is used only as an escharotic and stimulant application to unhealthy ulcers and obstinate cutaneous eruptions.

Off. Prep. Unguentum Cupri Subacetatis. W.

CUPRUM AMMONIATUM. *U. S., Ed.* CUPRI AMMONIO-SULPHAS. *Lond., Dub. Ammoniated Copper.*

"Take of Sulphate of Copper *half an ounce;* Carbonate of Ammonia *six drachms.* Rub them together in a glass mortar till the effervescence ceases; then wrap the Ammoniated Copper in bibulous paper, and dry it with a gentle heat. Let it be kept in a well-stopped glass bottle." *U. S.*

The processes of the British Colleges are essentially the same as the above, the ingredients, proportions, and general mode of operating being identical. The *London College* orders that the salt be dried in the air, and omits the direction as to the mode of keeping it; the *Edinburgh* directs that the product should be first dried in folds of blotting paper, and afterwards by exposure for a short time to the air; and the *Dublin* orders the ingredients to be triturated in a porcelain mortar, and the drying to be effected in bibulous paper on a porous brick.

When the two salts above mentioned are rubbed together, a reaction takes place between them attended with the extrication of the water of crystallization of the sulphate of copper, which renders the mass moist, and with the simultaneous escape of carbonic acid gas from the carbonate (sesquicarbonate) of ammonia, which occasions an effervescence. The colour is at the same time altered, passing from the light blue of the powdered sulphate of copper to a beautiful deep azure. The nature of the chemical changes which take place is not precisely known. One of the views which have been taken is, that the blue vitriol parts with a portion of its acid to the ammonia of the carbonate, thus forming a subsulphate of copper and sulphate of ammonia, which are either mixed together, or chemically united in the form of a double salt, the sulphate of copper and ammonia. According to Phillips, the sulphuric acid of the sulphate of copper unites with the ammonia of a portion of the sesquicarbonate of ammonia; while the carbonic acid of the decomposed sesquicarbonate partly escapes, and partly combines with the oxide of copper; so that the resulting preparation consists of sulphate of ammonia, carbonate of copper, and undecomposed sesquicarbonate of ammonia. It is highly probable that Cuprum Ammoniatum, independently of the excess of sesquicarbonate of ammonia which it may contain, is identical with the crystallized salt obtained by dropping a solution of pure ammonia into a solution of sulphate of copper till the subsalt first thrown down is dissolved, then concentrating, and precipitating by alcohol. Now, from the analysis of this salt by Berzelius, it appears to contain one equivalent of sulphuric acid, one of oxide of copper, two of ammonia, and one of water, which may be supposed to be combined in the form of a double salt—the *cupro-sulphate of ammonia*—consisting of one equiv. of sulphate of ammonia, one of cuprate of ammonia, in which the oxide of copper acts the part of an acid, and one of water of crystallization ($NH_3,SO_3+NH_3,CuO+HO$). But as half an ounce of sulphate of copper would require for such a result somewhat less than the same weight of sesquicarbonate of ammonia, there must be a considerable excess of the latter salt, unless dissipated in the drying process. In the uncertainty which exists as to the precise nature of the preparation, the name of *ammoniated copper* appears to be as appropriate for a pharmaceutical title as any that could be adopted.

This salt has a beautiful deep azure-blue colour, a strong ammoniacal odour, and a styptic, metallic taste. It is soluble in water, and the solution has an alkaline reaction on vegetable colours; but, unless there be excess of sesquicarbonate of ammonia, the solution deposits subsulphate of copper if much diluted. When exposed to the air it parts with ammonia, and is said to be ultimately converted into sulphate of ammonia and carbonate of copper. This change is apt to occur to a greater or less extent while it is drying. It should not, therefore, be prepared in large quantities at a time, and should be kept in well-closed bottles. By heat, the whole of it is dissipated, except the oxide of copper. Arsenious acid precipitates a green arsenite of copper from its solution. Potassa, soda, lime-water, and the acids are incompatible with it.

Medical Properties and Uses. Ammoniated copper is tonic, and is thought to exercise an influence over the nervous system which renders it antispasmodic. It has been much employed in epilepsy, in which it was recommended by Cullen.

There is good reason to believe that it has occasionally effected cures; but like all other remedies in that complaint it very frequently fails. It has also been used in chorea, hysteria, and worms; and by Swediaur as an injection in gonorrhœa and leucorrhœa. In over-doses it produces vomiting, and the poisonous effects which result from the other preparations of copper. (See *Cuprum.*) It is said, however, to be less apt to excite nausea. The dose is a quarter or half a grain, repeated twice a day, and gradually increased to four or five grains. It may be given in pill or solution. The medicine should not be very long continued without interruption; according to Cullen, not longer than a month.

Off. Prep. Cupri Ammoniati Solutio; Pilulæ Cupri Ammoniati. W.

CUPRI AMMONIATI SOLUTIO. *Ed.* Liquor Cupri Ammonio-sulphatis. *Lond.* *Solution of Ammoniated Copper.*

"Take of Ammonio-sulphate of Copper *a drachm;* Distilled Water *a pint* [Imperial measure]. Dissolve and filter." *Lond.*

The *Edinburgh* formula is the same as the *London.*

By the quantity of water employed in these processes, the ammoniated copper, unless it contain an excess of carbonate of ammonia, which it probably does when recently prepared, is said by Mr. Phillips to be decomposed, with a precipitation of one-half of the oxide of copper. According to the same author, a smaller portion of water dissolves it perfectly.

This solution is sometimes employed as a stimulant to foul and indolent ulcers, and, diluted with water, as an application to the cornea when affected with specks or opacity; but it is probably in no respect superior for these purposes to a solution of sulphate of copper, and scarcely deserves a place among the officinal preparations. W.

CUPRI SULPHAS. *Lond.* *Sulphate of Copper.*

"Take of Commercial Sulphate of Copper *four pounds;* Boiling Distilled Water *four pints* [Imperial measure]. Pour the Water upon the Sulphate, and apply heat, occasionally stirring until it is dissolved. Filter the solution while hot, and set it aside that crystals may form. Evaporate the decanted liquor, that it may again crystallize. Dry all the crystals." *Lond.*

This is merely a method of purifying commercial sulphate of copper. For the properties and uses of the purified salt the reader is referred to *Cupri Sulphas* in the first part of this work. The London College gives as tests of its purity, that it is [wholly] soluble in water, and that whatever ammonia throws down from the solution is redissolved by the ammonia in excess.

Off. Prep. Cupri Ammonio-sulphas. W.

DECOCTA.

Decoctions.

Decoctions are solutions of vegetable principles, obtained by boiling the substances containing these principles in water. Vegetables generally yield their soluble ingredients more readily and in larger proportion to water maintained at the point of ebullition, than to the same liquid at a lower temperature. Hence decoction is occasionally preferred to infusion as a mode of extracting the virtues of plants, when the call for the remedy is urgent, and the greatest possible activity in the preparation is desirable. The process should be conducted in a covered vessel, so as to confine the vapour over the surface of the liquid, and thus prevent the access of atmospheric air, which sometimes exerts an injurious agency upon the active principle. The boiling, moreover, should not, as a general rule, be long continued; as the ingredients of the vegetable are apt to react

on each other, and thus lose, to a greater or less extent, their original character. The substance submitted to decoction should if dry be either powdered or well bruised, if fresh should be sliced, so that it may present an extensive surface to the action of the solvent; and previous maceration for some time in water is occasionally useful by overcoming the cohesion of the vegetable fibre. Should the physician in his prescription not happen to direct this preliminary comminution, the apothecary should nevertheless not omit it.

All vegetable substances are not proper objects for decoction. In many the active principle is volatile at a boiling heat, in others it undergoes some change unfavourable to its activity, and in a third set is associated with inefficient or nauseous principles, which, though insoluble or but slightly soluble in cool water, are abundantly extracted by that liquid at the boiling temperature, and thus encumber, if they do not positively injure the preparation. In all these instances, infusion is preferable to decoction. Besides, by the latter process, more matter is often dissolved than the water can retain, so that upon cooling a precipitation takes place, and the liquid is rendered turbid. When the active principle is thus dissolved in excess, the decoction should always be strained while hot; so that the matter which separates on cooling, may be mixed again with the fluid by agitation at the time of administering the remedy.

In compound decoctions, the ingredients may be advantageously added at different periods of the process, according to the length of boiling requisite for extracting their virtues; and, should any one of them owe its activity to a volatile principle, the proper plan is, at the close of the process, to pour upon it the boiling decoction, and allow the liquor to cool in a covered vessel.

As a general rule, glass or earthenware vessels should be preferred; as those made of metal are sometimes corroded by the ingredients of the decoction, which thus becomes contaminated. Vessels of clean cast-iron or common tin, or of block tin, are preferable to those of copper, brass, or zinc; but iron pots should not be used when astringent vegetables are concerned.

Decoctions, from the mutual reaction of their constituents, as well as from the influence of the air, are apt to spoil in a short time. Hence they should be prepared only when wanted for use, and should not be kept, in warm weather, for a longer period than forty-eight hours. W.

DECOCTUM ALOES COMPOSITUM. *Lond.*, *Dub.* DECOCTUM ALOES. *Ed.* *Compound Decoction of Aloes.*

"Take of Extract of Liquorice *seven drachms;* Carbonate of Potassa *a drachm;* Extract of Aloes, Myrrh, in powder, Saffron, each, *a drachm and a half;* Distilled Water *a pint and a half* [Imperial measure]; Compound Tincture of Cardamom *seven fluidounces.* Boil the Liquorice, Carbonate, Aloes, Myrrh, and Saffron with the Water to a pint [Imp. meas.], and strain; then add the Tincture." *Lond.*

"Take of Socotrine or Hepatic Aloes, Powder of Myrrh, and Saffron, each, *one drachm;* Extract of Liquorice *half an ounce;* Carbonate of Potash *two scruples;* Compound Tincture of Cardamom *four fluidounces;* Water *sixteen fluidounces.* Mix the Aloes, Myrrh, Saffron, Liquorice, and Carbonate of Potash with the Water; boil down to *twelve* [*fluid*]*ounces;* filter, and add the Compound Tincture of Cardamom." *Ed.*

"Take of Hepatic Aloes, in powder, *a drachm and a half;* Myrrh, in powder, Saffron, chopped fine, of each, *one drachm;* Pure Carbonate of Potash *two scruples;* Extract of Liquorice *half an ounce;* Water *fourteen* [*fluid*]*ounces;* Compound Tincture of Cardamom *as much as is sufficient.* Rub the Aloes, Myrrh, and Carbonate of Potash together, then add the Saffron and Extract of Liquorice, and boil for ten minutes in a covered vessel; cool, strain through flannel, and add

of Compound Tincture of Cardamom as much as will make *sixteen fluidounces.*" *Dub.* The weights employed in this process are avoirdupois.

There is no essential difference between these processes.

The aloes, myrrh, and carbonate of potassa should be rubbed together before the addition of the other ingredients. The effect of the alkaline carbonate is, by combining with the resin of the myrrh, and the insoluble portion (apotheme of *Berzelius*) of the aloes, to render them more soluble in water; while the liquorice assists in the suspension of the portion not actually dissolved. The tincture of cardamom is useful not only by its cordial property, but also by preventing spontaneous decomposition.

Long boiling impairs the purgative property of aloes; and the same effect is thought to be produced, to a certain extent, by the alkalies, which certainly qualify its operation, and render it less apt to irritate the rectum. This decoction, therefore, is milder as a cathartic than aloes itself, and not so liable to produce or aggravate hemorrhoidal disease. At the same time it is more tonic and cordial from the presence of the myrrh, saffron, and cardamom, and derives antacid properties from the carbonate of potassa. It is given as a gentle cathartic, tonic, and emmenagogue; and is especially useful in dyspepsia, habitual constipation, and those complicated cases in which suppressed or retained menstruation is connected with enfeebled digestion and a languid state of bowels. The dose is from half a fluidounce to two fluidounces. The decoction should not be combined in prescription with acids, acidulous salts, or other saline bodies which are incompatible with the alkaline carbonate. W.

DECOCTUM CETRARIÆ. *U. S.*, *Lond.* Decoctum Lichenis Islandici. *Dub.* *Decoction of Iceland Moss.*

"Take of Iceland Moss *half an ounce;* Water *a pint and a half.* Boil down to a pint, and strain with compression." *U. S.*

The *London College* orders *five drachms* of the moss with *a pint and a half* of water to be boiled to a pint and strained; but, as the Imperial measure is used in the process, the proportion is in fact equivalent to about half an ounce to the apothecaries' pint. The *Dublin College* orders *an ounce* (avoirdupois) of the moss to be washed in cold water to purify it, then to be boiled for ten minutes in *a pint and a half* of water (Imp. meas.), and strained while hot.

As the bitter principle is dissolved along with the starch of the moss, this decoction unites an unpleasant flavour to its demulcent properties; but the plan which has been proposed of first extracting the bitterness by maceration in water, or a very weak solution of an alkaline carbonate, and afterwards preparing the decoction, is inadmissible; as the peculiar virtues which distinguish the medicine from the ordinary demulcents are thus entirely lost. (See *Cetraria.*) A pint of the decoction may be taken in divided doses during the twenty-four hours. W.

DECOCTUM CHIMAPHILÆ. *U. S.*, *Lond.* Decoctum Pyrolæ. *Dub.* *Decoction of Pipsissewa.* *Decoction of Winter Green.*

"Take of Pipsissewa, bruised, *an ounce;* Water *a pint and a half.* Boil down to a pint and strain." *U. S.*

"Take of Pipsissewa *an ounce*; Distilled Water *a pint and a half* [Imperial measure]. Boil to a pint, and strain." *Lond.*

"Take of Leaves of Winter-green, dried, *half an ounce* [avoirdupois]; Water *half a pint* [Imp. meas.]. Boil for ten minutes, in a covered vessel, and strain. The product should measure about *eight* [*fluid*]*ounces.*" *Dub.*

The medical properties and uses of pipsissewa have been detailed under the head of Chimaphila. One pint of the decoction may be given in the course of twenty-four hours. W.

DECOCTUM CINCHONÆ FLAVÆ. *U. S.* DECOCTUM CINCHONÆ. *Lond., Ed. Decoction of Yellow Bark.*

"Take of Yellow Bark, bruised, *an ounce;* Water *a pint.* Boil for ten minutes in a covered vessel, and strain the liquor while hot." *U. S.*

The *London College* boils *ten drachms* of yellow bark, bruised, with *a pint* [Imperial measure] of distilled water, for a quarter of an hour, in a covered vessel, and strains while hot. The *Edinburgh College* boils an ounce of the yellow bark, bruised, with *twenty-four fluidounces* of water, for ten minutes, allows the decoction to cool, then filters it, and evaporates to *sixteen fluidounces.*

DECOCTUM CINCHONÆ PALLIDÆ. *Lond.* DECOCTUM CINCHONÆ. *Ed., Dub. Decoction of Pale Bark.*

The *London* and *Edinburgh Colleges* prepare this in the same manner as the *Decoction of Yellow Bark.* The *Dublin College* takes *half an ounce* (avoirdupois) of pale bark, in coarse powder, and *half a pint* (Imp. meas.) of water, boils for ten minutes in a covered vessel, and strains while hot.

DECOCTUM CINCHONÆ RUBRÆ. *U. S., Lond.* DECOCTUM CINCHONÆ. *Ed. Decoction of Red Bark.*

The *U. S., London,* and *Edinburgh* Pharmacopœias direct this to be prepared in the same manner as the Decoction of Yellow Bark.

The virtues of Peruvian bark, though extracted more rapidly by decoction than by infusion, are materially impaired by long boiling, in consequence of the changes effected in its constituents, either by their mutual reaction, or by the agency of atmospheric oxygen, or by both causes united. To prevent this result, the process is directed to be performed in a covered vessel, and to be continued only ten minutes. But even with these precautions, a considerable precipitate takes place in the decoction upon cooling, which is thus rendered turbid. According to Pelletier, besides the kinates of cinchonia and quinia, the water dissolves gum, starch, yellow colouring matter, kinate of lime, tannin, and a portion of cinchonic red, with a minute quantity of fatty matter. But the tannin and starch, at the boiling temperature, unite to form a compound insoluble in cold water; and, when the decoction is allowed to cool, this compound is precipitated, together with a portion of the cinchonic red and fatty matter, which carry with them also a considerable quantity of the alkaline principle of the bark. (*Journ. de Pharm.*, vii. 119.) Hence the decoction is ordered to be strained while hot, so that the portion of active matter precipitated may be mingled by agitation with the liquor, and not be lost. Pelletier recommends that a larger proportion of water, sufficient to retain the alkali in solution, be employed, that the decoction be filtered when cold, and then sufficiently concentrated by evaporation. This plan has been adopted by the Edinburgh College, but is unnecessarily tedious. A better mode is to add to the liquid some acid which may form with the quinia and cinchonia compounds more soluble than the native salts. Lemon juice has been long employed as a useful addition to the decoction of cinchona, and we can now understand the manner in which it acts.* Sulphuric acid in excess answers the same purpose. By acidulating the pint of water employed in preparing the decoction with a fluidrachm of the aromatic or diluted sulphuric acid, we shall probably enable the menstruum to extract all the virtues of the bark. The propriety of such an addition is confirmed by the experiments of *MM. Henry, Jun.*, and *Plisson*, who have ascertained that portions of the alkalies exist in the bark connected with the colouring matter in the form of insoluble compounds, and that it is impossible, therefore, completely to exhaust the bark by water alone. There may, however, be some diversity of action in the different salts of quinia and cinchonia; and the native kinates may, under certain circumstances, be most efficient.

Numerous substances produce precipitates with this decoction; but comparatively few affect its activity as a medicine. (See *Infusum Cinchonæ.*) Tannic acid and the substances containing it should be excluded from the decoction; as it forms salts with the alkaline principles of the bark, which are either insoluble or but slightly soluble in water. The alkalies, alkaline earths, and salifiable bases generally should also be excluded; because, uniting with the kinic acid, they precipitate the quinia and cinchonia.

The dose of the decoction is two fluidounces, to be repeated more or less frequently according to circumstances. Two drachms of orange peel, added to the decoction while still boiling hot, improve its flavour, and render it more acceptable to the stomach. W.

DECOCTUM CORNÛS FLORIDÆ. *U. S. Decoction of Dogwood.*

"Take of Dogwood [bark], bruised, *an ounce;* Water *a pint.* Boil for ten minutes in a covered vessel, and strain the liquor while hot." *U. S.*

This decoction has been proposed as a substitute for that of Peruvian bark; but, though possessed of analogous properties, it is much inferior in efficacy, and is not likely to be extensively employed so long as the Peruvian tonic is attainable. The dose is two fluidounces. W.

DECOCTUM CYDONII. *Lond. Decoction of Quince Seed.*

"Take of Quince [seeds] *two drachms;* Distilled Water *a pint* [Imperial measure]. Boil over a slow fire for ten minutes; then strain." *Lond.*

This decoction is viscid, nearly colourless, insipid, and inodorous; and consists chiefly of the mucilaginous principle of the quince seeds dissolved in water. For an account of the properties and uses of this mucilage see *Cydonia.* It is only employed externally. As it speedily undergoes decomposition, it should be used immediately after being prepared. W.

DECOCTUM DULCAMARÆ. *U. S., Lond., Ed., Dub. Decoction of Bittersweet.*

"Take of Bittersweet, bruised, *an ounce;* Water *a pint and a half.* Boil down to a pint, and strain." *U. S.*

The processes of the *London* and *Edinburgh Colleges* correspond with the above. The *Dublin College* boils *half an ounce* (avoirdupois) of the bittersweet with *half a pint* (Imperial measure) of water, for ten minutes, in a covered vessel, and strains.

The slender twigs of the bittersweet are the part employed. Their properties and uses have been already detailed under the head of *Dulcamara.* The dose of the decoction is from one to two fluidounces three or four times a day, or more frequently. W.

DECOCTUM GALLÆ. *Lond. Decoction of Galls.*

"Take of Galls, bruised, *two ounces and a half;* Distilled Water *two pints* [Imperial measure]. Boil to a pint, and strain." *Lond.*

For the properties of this decoction and its uses, see *Galla* in the first part of this work. The dose internally would be from half a fluidounce to a fluidounce; but it is better adapted for external or local use. W.

DECOCTUM GRANATI. *Lond. Decoction of Pomegranate.*

"Take of Pomegranate [rind] *two ounces;* Distilled Water *a pint and a half* [Imperial measure]. Boil down to a pint, and strain." *Lond.*

The dose of this decoction is a fluidounce. For its uses see *Granatum.*

DECOCTUM GRANATI RADICIS. *Lond. Decoction of Pomegranate Root.*

"Take of Pomegranate Root, sliced, *two ounces;* Distilled Water *two pints* [Imperial measure]. Boil to a pint and strain." *Lond.*

For the uses and dose of this decoction, see *Granati Radicis Cortex.*

DECOCTUM GUAIACI. *Ed.* *Decoction of Guaiacum Wood.*

"Take of Guaiac turnings *three ounces;* Raisins *two ounces;* Sassafras [root] rasped, and Liquorice Root bruised, each, *one ounce;* Water *eight pints* [Imperial measure]. Boil the Guaiac and Raisins gently with the Water down to five pints, adding the Liquorice and Sassafras towards the end. Strain the decoction." *Ed.*

This is the old *decoction of the woods.* Notwithstanding its former reputation, it is little more than a demulcent drink; for water is capable of dissolving but a minute proportion of the active matter of guaiacum wood, and one ounce of sassafras root can impart no appreciable activity to five pints of menstruum. It was thought useful in chronic rheumatism and cutaneous affections, and as an adjuvant to a mercurial course in syphilis, or an alterative course of antimonials. As the patient was directed to be kept warm during its use, it no doubt acted favourably in some instances as a mere diluent, by promoting perspiration. From one to two pints may be taken in the course of the day, in doses of about four fluidounces. W.

DECOCTUM HÆMATOXYLI. *U. S., Lond., Ed., Dub.* *Decoction of Logwood.*

"Take of Logwood, rasped, *an ounce;* Water *two pints.* Boil down to a pint, and strain." *U. S.*

The *London College* takes *ten drachms* to *a pint and a half* [Imperial measure], boils to a pint, and strains.

"Take of Logwood, in chips, *one ounce;* Water *a pint* [Imperial measure]; Cinnamon, *one drachm,* in powder. Boil the Logwood in the Water down to ten fluidounces, adding the Cinnamon towards the end; and then strain." *Ed.*

The *Dublin College* boils *an ounce* (avoirdupois) of logwood with *half a pint* (Imp. meas.) of water for ten minutes, in a covered vessel, and strains.

This is an excellent astringent in diarrhœa; particularly in that form of it which succeeds the cholera infantum of this climate, or occurs as an original complaint in children during summer. The dose for an adult is two fluidounces, for a child about two years old, two or three fluidrachms, repeated several times a day. A little bruised cinnamon may often be added with advantage at the end of the boiling, as directed by the Edinburgh College. W.

DECOCTUM HORDEI. *U. S., Lond., Dub.* *Decoction of Barley.*

"Take of [Pearl] Barley *two ounces;* Water *four pints and a half.* First wash away, with cold water, the extraneous matters which adhere to the Barley; then pour upon it half a pint of the Water, and boil for a short time. Having thrown away this water, pour the remainder boiling hot upon the Barley; then boil down to two pints, and strain." *U. S.*

The process of the *London* College does not essentially differ from the above. The *Dublin College* washes *an ounce and a half* (avoirdupois) of barley in cold water, rejects the washings, and then boils for twenty minutes with a *pint and a half* (Imperial measure) of water, in a covered vessel, and strains.

Barley water, as this decoction is usually called, is much employed as a nutritive drink in febrile and inflammatory complaints, and, from the total absence of irritating properties, is peculiarly adapted to cases in which the gastric or intestinal mucous membrane is inflamed. As the stomach of those for whom it is directed is often exceedingly delicate, and apt to revolt against anything having the slightest unpleasantness of flavour, it is important that the decoction should be properly made; and, though the office of preparing it generally falls to nurses, yet the introduction of the process into the Pharmacopœia is not without advantage, as a formula is thus ever before the physician, by which he may give his directions, with the certainty, if obeyed, of having a good prepa-

ration. The use of the washing with cold water, and of the first short boiling, is completely to remove any mustiness, or other disagreeable flavour, which the barley may have acquired from exposure.

Off. Prep. Decoctum Hordei Compositum; Enema Aloës; Enema Assafœtidæ; Enema Terebinthinæ. W.

DECOCTUM HORDEI COMPOSITUM. *Lond.* MISTURA HORDEI. *Ed.* *Compound Decoction of Barley.*

"Take of Decoction of Barley *two pints* [Imperial measure]; Figs, sliced, *two ounces and a half;* fresh Liquorice Root, bruised, *five drachms;* Raisins, stoned, *two ounces and a half;* Distilled Water *a pint* [Imperial measure]. Boil down to two pints [Imp. meas.], and strain." *Lond.*

"Take of Pearl-Barley, Figs, sliced, Raisins freed of the seeds, of each, *two ounces and a half;* Liquorice Root, sliced and bruised, *five drachms;* Water *five pints and a half* [Imperial measure]. Clean the Barley, if necessary, by washing it with cold water; boil it with four pints and a half of the Water down to two pints; add the Figs, Raisins, and Liquorice Root, with the remaining pint of Water; and again boil down to two pints; then strain." *Ed.*

The compound decoction of barley, in addition to the demulcent and nutritive properties of the simple, is somewhat laxative, and may be preferably employed where there is a tendency to constipation. But it is so often necessary to vary the nature of the sapid ingredients to suit the taste of the patient, that it would be better to leave the preparation entirely to extemporaneous prescription. W.

DECOCTUM LINI COMPOSITUM. *Dub.* *Compound Decoction of Flaxseed.*

"Take of Linseed *one ounce;* Liquorice Root, bruised, *half an ounce;* Water *one pint and a half* [Imperial measure]. Boil for ten minutes in a covered vessel, and strain while hot." *Dub.* The weights employed are the avoirdupois.

Flaxseed is, we think, a better subject for infusion than decoction, by which the oil is partially evolved, and the preparation rendered unpleasant. W.

DECOCTUM MEZEREI. *Ed.* *Decoction of Mezereon.*

"Take of Mezereon, in chips, *two drachms;* Liquorice Root, bruised, *half an ounce;* Water *two pints* [Imperial measure]. Mix them and boil down with a gentle heat to a pint and a half, and then strain." *Ed.*

This preparation affords a convenient mode of exhibiting mezereon, the acrimony of which is qualified by the demulcent principles of the liquorice root. For an account of its medical applications, see *Mezereum.* The dose is from four to eight fluidounces four times a day. W.

DECOCTUM MYRRHÆ. *Dub.* *Decoction of Myrrh.*

"Take of Myrrh *two drachms* [Dub. weight]; Water *eight* [*fluid*]*ounces and a half.* Triturate the Myrrh with the Water gradually added; then boil for ten minutes, in a covered vessel, and strain. The product should measure about eight [fluid]ounces." *Dub.*

It does not appear to us that myrrh is a suitable substance for decoction. Its active principles are but very sparingly imparted to water. W.

DECOCTUM PAPAVERIS. *Lond., Ed., Dub.* *Decoction of Poppy.*

"Take of Poppy [Capsules], sliced, *four ounces;* Distilled Water *four pints* [Imperial measure]. Boil for a quarter of an hour, and strain." *Lond.*

The *Edinburgh* process differs from the above only in the proportion of water, employing *three pints* (Imp. meas.). The *Dublin College* boils *four ounces*

(avoirdupois) with *three pints* (Imp. meas.) of water, for ten minutes, in a covered vessel, and strains.

This decoction is used as an anodyne fomentation in painful tumours, and superficial cutaneous inflammation or excoriation. It is recommended not to reject the seeds; as their oil, suspended in the water by the mucilage of the capsules, adds to the emollient virtues of the preparation. W.

DECOCTUM PAREIRÆ. *Lond.* *Decoction of Pareira Brava.*

"Take of Pareira Brava, sliced, *ten drachms;* Distilled Water *a pint and a half* [Imperial measure]. Boil down to a pint, and strain." *Lond.*

The dose of this preparation is from one to two fluidounces three or four times a day. W.

DECOCTUM QUERCÛS ALBÆ. *U. S.* *Decoction of White Oak Bark.* DECOCTUM QUERCÛS. *Lond, Ed., Dub.* *Decoction of Oak Bark.*

"Take of White Oak Bark, bruised, *an ounce;* Water *a pint and a half.* Boil down to a pint, and strain." *U. S.*

The *London* and *Edinburgh Colleges* take *ten drachms* of oak bark and *two pints* (Imperial measure) of distilled water, and boil to a pint; the *Dublin College* takes *an ounce and a half* (avoirdupois) of the bark; and *a pint and a half* (Imp. meas.) of water, and boils for ten minutes.

This decoction contains the tannin, bitter principle, and gallic acid of oak bark. It affords precipitates with the decoction of Peruvian bark and other substances containing vegetable alkalies, with solution of gelatin, and with most metallic salts, particularly those of iron. Alkaline solutions diminish or destroy its astringency. Its uses have been already detailed. The dose is a wineglassful, frequently repeated. W.

DECOCTUM SARSAPARILLÆ. *Dub.* DECOCTUM SARSÆ. *Lond.* DECOCTUM SARZÆ. *Ed.* *Decoction of Sarsaparilla.*

"Take of Sarsaparilla, *five ounces;* Distilled Water *four pints* [Imperial measure]. Boil down to two pints, and strain." *Lond.*

"Take of Sarza, in chips, *five ounces;* boiling Water *four pints* [Imperial measure]. Digest the root in the Water for two hours at a temperature somewhat below ebullition, take out the root, bruise it, replace it, boil down to two pints [Imp. meas.], and then squeeze out the decoction and strain it." *Ed.*

The *Dublin College* digests *two ounces* (avoirdupois) of the sliced root with *a pint and a half* (Imp. meas.) of water for an hour, then boils for ten minutes, in a covered vessel, cools, and strains.

There can be no occasion for the digestion directed by the Edinburgh College, as, if the root is sliced and well bruised, all its ingredients that are soluble in water may be extracted by a length of boiling sufficient to reduce the liquor to one-half. An idea was formerly entertained that the virtues of sarsaparilla resided in its fecula, the extraction of which was, therefore, the main object of the decoction. Hence the long boiling ordered by the London and Edinburgh Colleges. But this opinion is now admitted to be erroneous. The activity of the root is believed to depend upon one or more acrid principles, soluble to a certain extent in water cold or hot, and either volatilized, or rendered inert by chemical change, at the temperature of 212°. This fact appears to be demonstrated by the experiments of Pope,* Hancock,† Soubeiran,‡ Beral, and others.

* Trans. of the Medico-Chirurg. Society of London, vol. xii. p. 344.

† Trans. of the Medico-Botan. Society of London. See also Journ. of the Phil. Col. of Pharm., vol. i. p. 295. The observations of Dr. Hancock are entitled to much credit, as he practised long in South America, in the neighbourhood of the best sarsaparilla regions.

‡ Journ. de Pharmacie, tom. xvi. p. 38.

Hancock makes the following observations. "After long boiling, the peculiar odour which rises abundantly on the coction of good *sarsa* is almost extinguished. From the sarsa prepared in this way, I found no sensible results upon any patient, nor were its peculiar nauseating, drowsy, and racking effects produced by a large quantity, although the decoction of six or eight ounces was tried at a dose. These experiments having been carried to a sufficient length, most of the same patients recovered under the use of the sarsa, taken from the same parcels as before, but now prepared by simple maceration in hot water, *i. e.*, affused in a boiling state, and kept near the boiling state for some hours. In all cases the sarsa was directed to be well bruised in large mortars, and in the mean time all other remedies were abstained from, which might, in any way, affect the result." Soubeiran macerated one portion of bruised sarsaparilla in cold water for twenty-four hours; infused another portion in boiling water, and digested with a moderate heat for two hours; boiled a third portion bruised, and a fourth unbruised, in water for two hours; and in each instance used the same relative quantities. Testing these various preparations by the taste, he found the cold and hot infusions scarcely different in this respect; and both possessed of a stronger odour and more acrid taste than the decoctions, of which that prepared with the bruised root was the strongest. Beral has proved that *sarsaparillin*, which is believed to be the active principle of the drug, is volatile. From all these facts the inference is obvious, that the best method of imparting the virtues of sarsaparilla to water is either by cold or hot infusion. Digestion for some hours in water maintained at a temperature of 180° or somewhat less, in a covered vessel, has strong testimony in its favour. Percolation in a displacement apparatus, if properly conducted, is a convenient, and no doubt efficient mode of exhausting the root, so far as water will effect that object. Decoction is the worst method; and the longer it is continued, the weaker will be the preparation. Accordingly, in the last edition of the U. S. Pharmacopœia, an infusion of sarsaparilla has been substituted for the simple decoction. It is probable that, as in the case of the Peruvian bark, a boiling of ten or fifteen minutes might be advantageously resorted to, when circumstances require the preparation to be made in less time than is requisite for infusion. In every instance the root should be thoroughly bruised, or reduced to a coarse powder, thus obviating the necessity for a long maceration, merely to overcome the cohesion of its fibres.

Precipitates are produced by various substances with the decoction of sarsaparilla; but it has not been ascertained how far such substances interfere with its activity. Those which merely throw down the fecula do not injure the preparation.

The simple decoction of sarsaparilla is chiefly used in the preparation of the compound decoction. If given alone, it may be administered in the dose of four or six fluidounces four times a day.

Off. Prep. Decoctum Sarsæ Compositum. W.

DECOCTUM SARSAPARILLÆ COMPOSITUM. *U. S.*, *Dub.* Decoctum Sarsæ Compositum. *Lond.* Decoctum Sarzæ Compositum. *Ed.* *Compound Decoction of Sarsaparilla.*

Take of Sarsaparilla, sliced and bruised, *six ounces;* Bark of Sassafras Root, sliced, Guaiacum Wood, rasped, Liquorice Root, bruised, each, *an ounce;* Mezereon, sliced, *three drachms;* Water *four pints.* Macerate for twelve hours; then boil for a quarter of an hour, and strain." *U. S.*

"Take of Decoction of Sarsaparilla, boiling hot, *four pints* [Imp. meas.]; Sassafras [root], sliced, Guaiacum Wood, rasped, fresh Liquorice Root, bruised, each, *ten drachms;* Mezereon *three drachms.* Boil for a quarter of an hour, and strain." *Lond.*

The *Edinburgh* process differs from the London only in the quantity of mezereon, which in the former is *half an ounce.* The *Dublin College* takes *two ounces* (avoirdupois) of the sarsaparilla, *two drachms* (Dub. weight), each, of the sassafras, guaiacum wood, and liquorice root, *a drachm* (Dub. weight) of the mezereon root-bark, and *a pint and a half* (Imp. meas.) of boiling water; digests all together, in a close vessel, for an hour, then boils for ten minutes, cools, and strains.

The process of the U. S. Pharmacopœia differs essentially from those of the London and Edinburgh Colleges in this respect, that, instead of taking the simple decoction of sarsaparilla prepared by long boiling, it mixes the bruised root immediately with the other ingredients, and boils the whole together for a few minutes. Thus, the sarsaparilla does not undergo a longer boiling than the other substances; and the preparation is brought more nearly into accordance with the present state of knowledge in relation to this valuable drug. (See *Decoctum Sarsaparillæ.*) The direction in the edition of the U. S. Pharmacopœia for 1850, to macerate for twelve hours, is an improvement. The Dublin process is preferable to those of the other British Colleges.

This decoction is an imitation of the celebrated *Lisbon diet drink.* The sarsaparilla and mezereon are the active ingredients; the guaiacum wood imparting scarcely any of its virtues, and the sassafras and liquorice serving little other purpose than to communicate a pleasant flavour.

If prepared with good sarsaparilla, and with a due regard to the practical rules which may now be considered as established, the decoction may be used with great advantage as a gentle diaphoretic and alterative in secondary syphilis, either alone, or as an adjuvant to a mercurial course; also in certain scrofulous and other depraved conditions of the system, in chronic rheumatism, and in various obstinate cutaneous affections. The dose is from four to six fluidounces three or four times a day. The patient during its use should wear flannel next the skin, and avoid unnecessary exposure to changes of temperature.* W.

DECOCTUM SCOPARII. *Dub.* *Decoction of Broom.*

"Take of Broom-tops, dried, *half an ounce* [avoirdupois]; Water *half a pint* [Imperial measure]. Boil for ten minutes in a covered vessel, and strain. The product should measure about eight [fluid]ounces." *Dub.*

DECOCTUM SCOPARII COMPOSITUM. *Lond.* DECOCTUM SCOPARII. *Ed.* *Compound Decoction of Broom.*

"Take of Broom, Juniper, bruised, Dandelion, bruised, each, *half an ounce;* Distilled Water *a pint and a half* [Imperial measure]. Boil down to a pint [Imp. meas.], and strain." *Lond.*

"Take of Broom-tops, and Juniper-tops, of each, *half an ounce;* Bitartrate

* The *Decoction of Zittmann* (Decoctum Zitmanni) is a preparation of sarsaparilla much used in Germany, for similar purposes with our compound decoction of sarsaparilla; and, as it has attracted some attention in this country as a remedy in obstinate ulcerative affections, we give the formula of the Prussian Pharmacopœia, which is generally followed in its preparation: "Take of sarsaparilla *twelve ounces;* spring water *ninety pounds.* Digest for twenty-four hours; then introduce, enclosed in a small bag, *an ounce and a half* of saccharine alum (a paste formed of alum ℥vi, white lead ℥vi, sulphate of zinc ℥iij, white sugar ℥iss, white of egg and distilled vinegar, each *q. s.*), *half an ounce* of calomel, and *a drachm* of cinnabar. Boil to thirty pounds, and near the end of the boiling add of aniseed, fennel-seed, each, *half an ounce*, senna *three ounces*, liquorice root *an ounce and a half.* Put aside the liquor under the name of THE STRONG DECOCTION. To the residue add *six ounces* of sarsaparilla and *ninety pounds* of water. Boil to thirty pounds, and near the end add lemon-peel, cinnamon, cardamom, liquorice, of each, *three drachms.* Strain, and set aside the liquor under the name of THE WEAK DECOCTION." Mercury was detected by Wiggers in this decoction in very small proportion. It should not be prepared in metallic vessels, lest the mercurial in solution should be decomposed. The decoction may be drunk freely.

of Potassa *two drachms and a half;* Water *a pint and a half* [Imp. meas.]. Boil them together down to a pint [Imp. meas.], and then strain." *Ed.*

This decoction may be used as an adjuvant to more powerful diuretics in dropsy. From half a pint to a pint may be taken during the day. The simple decoction of the Dublin College is twice as strong with broom as the compound decoction. W.

DECOCTUM SENEGÆ. *U. S., Lond. Decoction of Seneka.*

"Take of Seneka, bruised, *an ounce;* Water *a pint and a half.* Boil down to a pint, and strain." *U. S.*

The *London College* boils *ten drachms* of the root with *two pints* of distilled water to a pint; but the relation of the Imperial measure used by this College to the common wine measure is such, that the proportions in the decoction are essentially the same as those of the U. S. Pharmacopœia.

It is customary to add to the seneka an equal weight of liquorice root, which serves to cover its taste, and in some measure to obtund its acrimony. The virtues and practical application of seneka have been already treated of. (See *Senega.*) The dose of the decoction is about *two fluidounces* three or four times a day, or a tablespoonful every two or three hours. W.

DECOCTUM TARAXACI. *Lond., Ed. Decoction of Dandelion.*

"Take of Dandelion, bruised, *four ounces;* Distilled Water *a pint and a half* [Imperial measure]. Boil to a pint, and strain." *Lond.*

The *Edinburgh College* takes *seven ounces* of the fresh herb and root, and *two pints* [Imperial measure] of water, boils to one pint [Imperial measure], and strains.

This decoction is most efficient when prepared from the root alone. The dose is a wineglassful two or three times a day. (See *Taraxacum.*) W.

DECOCTUM TORMENTILLÆ. *Lond. Decoction of Tormentil.*

"Take of Tormentil, bruised, *two ounces;* Distilled Water *a pint and a half* [Imperial measure]. Boil down to a pint, and strain." *Lond.*

This decoction is astringent, and may be given in the dose of one or two fluidounces, three or four times a day. W.

DECOCTUM ULMI. *Lond. Decoction of Elm Bark.*

"Take of Elm [bark], bruised, *two ounces and a half;* Distilled Water *two pints* [Imperial measure]. Boil down to a pint, and strain." *Lond.*

This decoction, being prepared from the bark of the European elm, is not used in this country. It has had some repute in England as a remedy for certain cutaneous disorders. From four to six fluidounces are given two or three times a day. W.

DECOCTUM UVÆ URSI. *U.S., Lond., Dub. Decoction of Uva Ursi.*

"Take of Uva Ursi *an ounce;* Water *twenty fluidounces.* Boil down to a pint, and strain." *U. S.*

"Take of Uva Ursi, bruised, *an ounce;* Distilled Water *a pint and a half* [Imperial measure]. Boil down to a pint, and strain." *Lond.*

"Take of Uva Ursi, bruised, *half an ounce* [avoirdupois]; Water *half a pint* [Imp. meas.]. Boil for ten minutes in a covered vessel, and strain. The product should measure about eight [fluid]ounces." *Dub.*

This decoction contains the tannin, extractive, and gallic acid of the leaves. For an account of its uses see *Uva Ursi.* The dose is from one to two fluidounces three or four times a day. W.

EMPLASTRA.

Plasters.

Plasters are solid compounds intended for external application, adhesive at the temperature of the human body, and of such a consistence as to render the aid of heat necessary in spreading them. Most of them have as their basis a compound of olive oil and litharge, constituting the Emplastrum Plumbi of the United States Pharmacopœia. Those plasters which contain none of the compound of oil and litharge, owe their consistence and adhesiveness to resinous substances, or to a mixture of these with wax and oleaginous matter.

In the preparation of the plasters, care is requisite that the heat employed be not sufficiently elevated to produce decomposition, nor so long continued as to drive off any volatile ingredient upon which the virtues of the preparation may in any degree depend. After having been prepared, they are usually shaped into cylindrical rolls, and wrapped in paper to exclude the air. Plasters should be firm at ordinary temperatures, should spread easily when heated, and, after being spread, should remain soft, pliable, and adhesive, without melting at the heat of the human body. When long kept, they are apt to change colour and to become hard and brittle; and as this alteration is most observable upon their surface, it must depend chiefly upon the action of the air, which should therefore be as much as possible excluded. The defect may usually be remedied by melting the plaster with a moderate heat, and adding a sufficient quantity of oil to give it the due consistence.

Plasters are prepared for use by spreading them upon leather, linen, or muslin, according to the particular purposes they are intended to answer. Leather is most convenient when the application is made to the sound skin, linen or muslin when the plaster is used as a dressing to ulcerated or abraded surfaces, or with the view of bringing and retaining together the sides of wounds. The leather usually preferred is white sheep skin. A margin about a quarter or half an inch broad should usually be left uncovered, in order to facilitate the removal of the plaster, and to prevent the clothing in contact with its edges from being soiled. An accurate outline may be obtained by pasting upon the leather a piece of paper, so cut as to leave in the centre a vacant space of the required dimensions, and removing the paper when no longer required. The same object may sometimes be accomplished by employing two narrow rulers of sheet tin, graduated in inches, and so shaped that each of them may form two sides of a rectangle. (See the figure p. 785.) These may be applied in such a manner as to enclose within them any given rectangular space, and may be fixed by weights upon the leather while the plaster is spread. For any other shape, as in the instance of plasters for the breast, pieces of tin may be employed having a vacuity within, corresponding to the required outline. The spreading of the plaster is most conveniently accomplished by means of a peculiar iron instrument employed for the purpose; though a common spatula will answer. This may be heated by means of a spirit lamp. Care must be taken that the instrument be not so hot as to discolour or decompose the plaster, and special care is requisite in the case of those plasters which contain a volatile ingredient. A sufficient portion of the plaster should first be melted by the heated instrument, and, having been received on a piece of coarse stiff paper, or in a shallow tin tray open on one side, should, when nearly cool, be transferred to the leather, and applied quickly and evenly over its extended surface. By this plan the melted plaster is prevented from penetrating the leather, as it is apt to do when applied too hot. Before removing the paper from the edge of the plaster, if it has become so hard as to crack, the iron

should be drawn over the line of junction.* When linen or muslin is used, and the dimensions of the portion to be spread are large, as is often the case with adhesive plaster, the best plan is to pass the cloth "on which the plaster has been laid, through a machine formed of a spatula, fixed by screws at a proper distance from a plate of polished steel." A machine for spreading plasters is described by M. Hérent in the *Journ. de Pharm. et de Chim.* (3e *sér.*, ii. 403).† W.

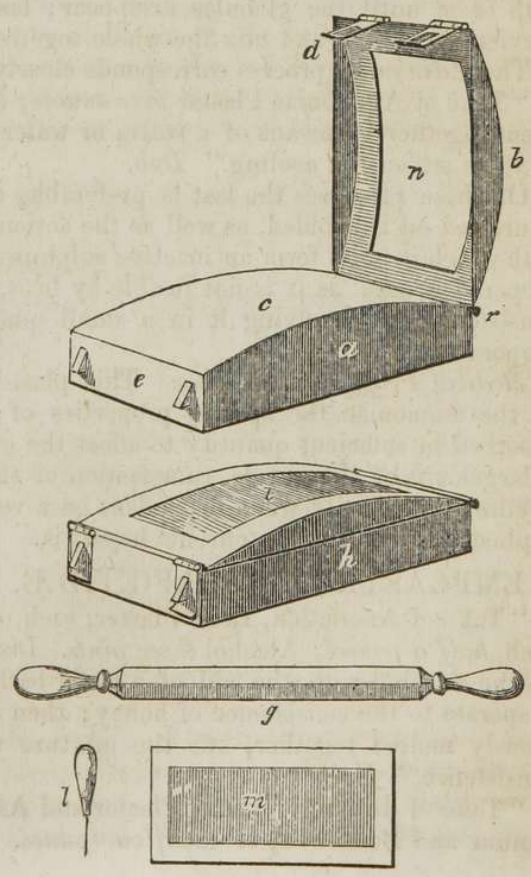
EMPLASTRUM AMMONIACI. *U. S., Lond., Ed., Dub. Ammoniac Plaster.*

"Take of Ammoniac *five ounces;* Diluted Acetic Acid *half a pint.* Dissolve the Ammoniac in the Diluted Acetic Acid, and strain; then evaporate the solution by means of a water-bath, stirring constantly until it acquires a proper consistence." *U. S.*

The *London College* takes *five ounces* of prepared ammoniac, and *eight fluidounces* of diluted acetic acid; dissolves the ammoniac in the acid; and evaporates the solution by a slow fire, stirring constantly, to the proper consistence. The *Edinburgh College* takes *five ounces* of ammoniac and *nine fluidounces* of distilled vinegar; dissolves the ammoniac in the vinegar, and evaporates over the vapour-bath, frequently stirring. The *Dublin College* dissolves *four ounces* (avoirdupois) of ammoniac, coarsely powdered, in *four fluidounces* of proof spirit, and then evaporates, by means of a steam or water-bath, stirring constantly until it acquires a proper consistence.

* The reader is referred to the *Am. Journ. of Pharm.* (xxv. 29, and xxvi. 15), for descriptions of plaster spatulas, with contrivances for heating them, which he may sometimes find convenient.

† Within a few years it has been customary with apothecaries to employ an apparatus, such as that here figured, for preparing quantities of plasters. An oblong rectangular block of hard wood (*a e*) has its upper surface (*c*) gently convex. To this is attached by a movable joint (at *r*) a sheet iron frame (*b*), with an opening (*n*) of the dimensions of the plaster to be spread, and clasps (*d*) at the other end, by which this may be fixed to the block. Another portion of the apparatus is a wooden measure (*m*), by which the leather is cut out, and the margin marked. The leather thus prepared is laid on the convex surface of the block (*c*); the sheet iron frame is brought down on it evenly (as at *h i*); the plaster, previously melted, is poured on the leather in the centre, and, by means of an iron instrument (*g*), previously heated by a spirit lamp, is spread uniformly over the surface, the thickness being regulated by the frame against which the iron is pressed. Any excess of plaster is thus pressed over upon the frame. The point of a sharp instrument (*l*) is then drawn along the interior edge of the frame so as to separate the plaster from it, after which the clasps are unfastened and the plaster removed.



As ammoniac is not usually kept purified in our shops, the straining of the solution in the diluted acid is directed as the most convenient method of separating impurities. Dr. Duncan remarked that the plaster, prepared in iron vessels, "acquires an unpleasant dark colour, from being impregnated with iron; whereas, when prepared in a glass or earthenware vessel, it has a yellowish-white colour, and more pleasant appearance."

Medical Properties. The ammoniac plaster is stimulant, and is applied over scrofulous tumours and chronic swellings of the joints, to promote their resolution. It often produces a papular eruption, and sometimes occasions considerable inflammation of the skin. Dr. Duncan has described a fatal case of diffuse inflammation following its use in an instance of diseased knee-joint.

Off. Prep. Emplastrum Ammoniaci cum Hydrargyro. W.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. *U. S., Lond., Dub.* EMPLASTRUM AMMONIACI ET HYDRARGYRI. *Ed. Plaster of Ammoniac with Mercury.*

"Take of Ammoniac *a pound;* Mercury *three ounces;* Olive Oil *a fluidrachm;* Sulphur *eight grains.* Heat the Oil, and gradually add the Sulphur, constantly stirring, until they unite; then add the Mercury, and triturate until globules no longer appear. Boil the Ammoniac with sufficient water to cover it until they are mixed; then strain through a hair sieve, and evaporate, by means of a water-bath, until a small portion taken from the vessel hardens on cooling. Lastly, add the Ammoniac, while yet hot, gradually to the mixture of Oil, Sulphur, and Mercury, and thoroughly incorporate all the ingredients." *U. S.*

"Take of Prepared Ammoniac *a pound;* Mercury *three ounces;* Olive Oil *a fluidrachm;* Sulphur *eight grains.* Add the Sulphur gradually to the heated Oil, constantly stirring with a spatula, until they unite; then rub the Mercury with them until the globules disappear; lastly, gradually add the Ammoniac, previously melted, and mix the whole together." *Lond.*

The *Edinburgh* process corresponds closely with the above.

"Take of Ammoniac Plaster *four ounces;* Mercurial Plaster *eight ounces.* Mix them together by means of a steam or water-bath, and stir constantly until the mixture stiffens on cooling." *Dub.*

Of these processes the last is preferable, as the unpleasant odour of the sulphuretted oil is avoided, as well as the action of the sulphur upon the mercury, with which it must form an inactive sulphuret. When ammoniac not previously prepared is used, as it is not fusible by heat, it must be brought to the proper consistence by dissolving it in a small quantity of hot water, straining, and evaporating.

Medical Properties and Uses. This plaster unites with the stimulant power of the ammoniac the specific properties of the mercury, which is sometimes absorbed in sufficient quantity to affect the gums. It is used as a discutient in enlargement of the glands, tumefaction of the joints, nodes, and other indolent swellings, especially when dependent on a venereal taint. It is also sometimes applied over the liver in chronic hepatitis. W.

EMPLASTRUM ASSAFŒTIDÆ. *U. S., Ed. Assafetida Plaster.*

"Take of Assafetida, Lead Plaster, each, *a pound;* Galbanum, Yellow Wax, each, *half a pound;* Alcohol *three pints.* Dissolve the Assafetida and Galbanum in the Alcohol with the aid of a water-bath, strain the liquor while hot, and evaporate to the consistence of honey; then add the Lead Plaster and Wax previously melted together, stir the mixture well, and evaporate to the proper consistence." *U. S.*

"Take of Litharge [Lead] Plaster and Assafetida, of each, *two ounces;* Galbanum and Bees'-wax, of each, *one ounce.* Liquefy the gum-resins together,

and strain them, then add the plaster and wax also in the fluid state, and mix them all thoroughly." *Ed.*

The directions of the U. S. Pharmacopœia indicate the mode in which the gum-resins may be brought to the liquid state before being incorporated with the other ingredients. Galbanum melts sufficiently by the aid of heat to admit of being strained; but this is not the case with assafetida, which must be prepared by dissolving it in a small quantity of hot water or alcohol, straining, and evaporating to the consistence of honey; and even galbanum may be most conveniently treated in the same way. Formerly these gum-resins were ordered merely to be melted and strained, and such is at present the direction of the Edinburgh Pharmacopœia, unless the term "liquefy" be considered as leaving to the operator the choice of the mode in which they should be brought into the liquid state.

This plaster may be advantageously applied over the stomach or abdomen, in cases of hysteria attended with flatulence, and to the chest or between the shoulders in hooping-cough. W.

EMPLASTRUM BELLADONNÆ. *U. S., Lond., Ed., Dub. Plaster of Belladonna.*

"Take of Resin Plaster *three ounces;* Extract of Belladonna *an ounce and a half.* Add the Extract to the Plaster, previously melted by the heat of a water-bath, and mix." *U. S.*

The *Edinburgh* and *Dublin* processes are the same as the above. The *London* differs in taking *three ounces*, each, of the extract and of soap plaster.

The most convenient method of forming this plaster is to rub the ingredients together in an earthenware mortar, placed in hot water, and then, having removed the mortar from the water-bath, to continue the trituration till the mixture cools. It should be prepared with the extract made according to the directions of the U. S. Pharmacopœia, which is deprived of the albumen and insoluble matter; as otherwise it is apt to be wanting in the due adhesiveness. The preparation is a useful anodyne application in neuralgic and rheumatic pains, and in dysmenorrhœa. We have seen the constitutional effects of belladonna result from its external use. W.

EMPLASTRUM CANTHARIDIS. *Lond., Ed., Dub. Plaster of Spanish Flies.*

See CERATUM CANTHARIDIS. *U. S.*

EMPLASTRUM CANTHARIDIS COMPOSITUM. *Ed. Compound Plaster of Spanish Flies.*

"Take of Venice Turpentine *four ounces and a half;* Burgundy Pitch and Cantharides, of each, *three ounces;* Bees'-wax *one ounce;* Verdigris *half an ounce;* White Mustard Seed and Black Pepper, of each, *two drachms.* Liquefy the Wax and Burgundy Pitch, add the Turpentine, and while the mixture is hot sprinkle into it the remaining articles, previously in fine powder, and mixed together. Stir the whole briskly as it concretes on cooling." *Ed.*

This is intended to be a powerful and speedy blistering plaster, and may probably prove beneficial in very urgent cases attended with much torpor of the skin; but great care should be observed not to allow it to remain on too long, as unpleasant and tedious ulceration, if not gangrene, might result. To the cases of children it is wholly inapplicable. W.

EMPLASTRUM CUMINI. *Lond. Cumin Plaster.*

"Take of Cumin, Caraway, Laurel [fruit], each, *three ounces;* Prepared Burgundy Pitch *three pounds;* Wax *three ounces;* Olive Oil, Water, each *a fluidounce and a half.* To the Pitch and Wax melted together add the dry

ingredients powdered, the Oil, and the Water; then evaporate to the proper consistence." *Lond.*

This is a gently stimulant plaster of an agreeable odour, and may be used when a very moderate rubefacient impression is indicated. The London College has inadvertently employed the name *Cyminum* in the Materia Medica list, and *Cuminum* here. W.

EMPLASTRUM FERRI. *U.S.*, *Lond.*, *Ed.*, *Dub.* EMPLASTRUM ROBORANS. *Iron Plaster. Strengthening Plaster.*

"Take of Subcarbonate of Iron *three ounces;* Lead Plaster *two pounds;* Burgundy Pitch *half a pound.* Add the Subcarbonate of Iron to the Lead Plaster and Burgundy Pitch, previously melted together, and stir them constantly until they thicken upon cooling." *U. S.*

The *London* and *Dublin* preparations are the same as the above, except that prepared *Thus* or frankincense is used in the former instead of Burgundy pitch, and peroxide of iron in the latter, instead of the subcarbonate.

"Take of Litharge Plaster *three ounces;* Resin *six drachms;* Olive Oil *three fluidrachms and a half;* Bees'-wax *three drachms;* Red Oxide of Iron [Subcarbonate of Iron, U. S] *one ounce.* Triturate the Oxide of Iron with the Oil, and add the mixture to the other articles previously liquefied by gentle heat. Mix the whole thoroughly." *Ed.*

This preparation has enjoyed some popular celebrity, under the impression that it strengthens the parts to which it is applied; whence it has derived the name of strengthening plaster. It is used in those conditions of the loins, larger muscles, and joints, which, though usually ascribed to debility, are in fact most frequently dependent on rheumatic or other chronic inflammatory affections, and, if relieved by the plaster, are so in consequence of the gentle excitation which it produces in the vessels of the skin. It may also, in some instances, give relief by affording mechanical support; but neither in this, nor in any other respect, can it be deemed very efficient. W.

EMPLASTRUM GALBANI COMPOSITUM. *U.S.* EMPLASTRUM GALBANI. *Lond. Compound Galbanum Plaster.*

"Take of Galbanum *eight ounces;* Turpentine *ten drachms;* Burgundy Pitch *three ounces;* Lead Plaster *three pounds.* To the Galbanum and Turpentine, previously melted together and strained, add first the Burgundy Pitch, and afterwards the Lead Plaster melted over a gentle fire, and mix the whole together." *U. S.*

The *London* process differs only in directing *an ounce* of turpentine instead of *ten drachms*, prepared galbanum instead of the crude, and prepared *Thus* or frankincense, instead of Burgundy pitch.

Before being employed in this process, the galbanum should be purified, as it often contains foreign matters which must injure the plaster. It may be freed from these by melting it with a little water or diluted alcohol, straining, and evaporating to the due consistence.

This plaster is an excellent local stimulant in chronic scrofulous enlargements of the glands and joints. We have employed it in some obstinate cases of this kind, which, after having resisted general and local depletion, blistering and other measures, have yielded under its use. As a discutient it is also employed in the induration which sometimes remains after the discharge of abscesses. It is said to have been useful in rickets when applied over the whole lumbar region, and has been recommended in chronic gouty or rheumatic articular affections. It should not be used in the discussion of tumours in which any considerable inflammation exists. W.

EMPLASTRUM GUMMOSUM. *Ed.* *Gum Plaster.*

"Take of Litharge Plaster [Emplastrum Plumbi] *four ounces;* Ammoniac, Galbanum, and Bees'-wax, of each, *half an ounce.* Melt the Gum-resins together and strain them; melt also together the Plaster and Wax; add the former to the latter mixture, and mix the whole thoroughly." *Ed.*

The addition of ammoniac adds little to the virtues of this plaster, which closely resembles the compound galbanum plaster in its effects. The galbanum and ammoniac are best prepared by dissolving them in a small quantity of hot water or diluted alcohol, straining the solution, and evaporating it to the proper consistence for mixing with the other ingredients.

Off. Prep. Emplastrum Saponis. W.

EMPLASTRUM HYDRARGYRI. *U.S., Lond., Ed., Dub.* *Mercurial Plaster.*

"Take of Mercury *six ounces;* Olive Oil, Resin, each, *two ounces;* Lead Plaster *a pound.* Melt the Oil and Resin together, and when they have become cool, rub the Mercury with them till the globules disappear; then gradually add the Lead Plaster, previously melted, and mix the whole together." *U. S.*

The *London College* takes *three ounces* of mercury, *a pound* of lead plaster, *a fluidrachm* of olive oil, and *eight grains* of sulphur; gradually adds the sulphur to the heated oil, constantly stirring with a spatula until they unite; then rubs the mercury with them until the globules disappear; and finally adds by degrees the lead plaster previously melted with a slow fire, and mixes the whole together. The *Edinburgh* process corresponds with that of the United States Pharmacopœia, except that only one-half of the quantity of materials is employed, and *nine fluidrachms* of olive oil are directed instead of an ounce.

The *Dublin College* substitutes a *fluidounce* of oil of turpentine for the two ounces of olive oil; but in other respects its process corresponds with that of the U. S. Pharmacopœia.

The sulphuretted oil employed by the London College is intended to facilitate the extinguishment of the mercury; but, as it operates by the union of the sulphur with the metal forming an inefficient sulphuret, it impairs the virtues of the plaster at least as much as it assists in its preparation. The melted resin and oil of the United States and Edinburgh processes are decidedly preferable.

This plaster is employed to produce the local effects of mercury upon venereal buboes, nodes, and other chronic tumefactions of the bones or soft parts, dependent on a syphilitic taint. In these cases it sometimes acts as a powerful discutient. It is frequently also applied to the side in chronic hepatitis or splenitis. In habits peculiarly susceptible to the mercurial influence, it occasionally affects the gums.

From observations made in France by Messrs. Serres, Gariel, Briquet, and others (*Archives Générales*, viii. 468, and 3*e sér.*, vi. 24), it appears that the mercurial plaster of the French Codex (*Emplastrum de Vigo cum Mercurio*) has the power, when applied over the eruption of small-pox, before the end of the third day from its first appearance, to check the progress of the eruption, and prevent suppuration and pitting. This operation of the plaster, so far from being attended with an increase of the general symptoms, seems to relieve them in proportion to the diminution of the local affection. It is also thought that the course of the disease is favourably modified when the mercurial impression is produced upon the system. That the local effect is not ascribable to the mere exclusion of air is proved by the fact, that the use of lead plaster was not followed by the same results. It is probable that other mercurial preparations would answer the same purpose; and the common mercurial ointment has, in our own hands, proved effectual in rendering the eruption upon the face to a consider-

able extent abortive, in one bad case of small-pox. But as the most successful results were obtained with the plaster above mentioned, we give the formula of the French Codex for its preparation. The weights mentioned are those of the French metrical pound. (See *table in the Appendix.*)

Emplastrum de Vigo cum Mercurio. "Take of simple plaster [lead plaster] *two pounds eight ounces;* yellow wax *two ounces;* resin *two ounces;* ammoniac, bdellium, olibanum, and myrrh, each, *five drachms;* saffron *three drachms;* mercury *twelve ounces;* turpentine [common European] *two ounces;* liquid storax *six ounces;* oil of lavender *two drachms.* Powder the gum-resins and saffron, and rub the mercury with the storax and turpentine in an iron mortar until completely extinguished. Melt the plaster with the wax and resin, and add to the mixture the powders and volatile oil. When the plaster shall have been cooled, but while it is yet liquid, add the mercurial mixture, and incorporate the whole thoroughly." This should be spread upon leather or linen cloth, and applied so as effectually to cover the face, or whatever other part it is desired to protect.

Off. Prep. Emplastrum Ammoniaci cum Hydrargyro. W.

EMPLASTRUM OPII. *U. S., Lond., Ed., Dub. Opium Plaster.*

"Take of Opium, in powder, *two ounces;* Burgundy Pitch *three ounces;* Lead Plaster *a pound;* Boiling Water *four fluidounces.* Melt together the Lead Plaster and Burgundy Pitch; then add the Opium previously mixed with the Water, and boil them over a gentle fire to the proper consistence." *U. S.*

"Take of Extract of Opium *an ounce;* Lead Plaster *eight ounces;* Prepared Thus [frankincense] *two ounces;* boiling Water *a fluidounce.* To the melted Thus add the Plaster melted with a slow fire, and the Extract previously mixed with the Water, and evaporate, with a slow fire, constantly stirring, until the proper consistence is obtained." *Lond.*

"Take of Powder of Opium *half an ounce;* Burgundy Pitch *three ounces;* Litharge Plaster [Lead Plaster] *twelve ounces.* Liquefy the Plaster and Pitch, add the Opium by degrees, and mix them thoroughly." *Ed.*

"Take of Opium, in very fine powder, *one ounce;* Resin Plaster *nine ounces.* Melt the Plaster by means of a steam or water bath, then add the Opium by degrees, and mix thoroughly." *Dub.*

The use of the water in the U. S. and London processes is to enable the opium to be more thoroughly incorporated with the other ingredients; but care should be taken that the moisture be well evaporated.

The opium plaster is thought to relieve rheumatic and other pains in the parts to which it is applied. W.

EMPLASTRUM PICIS. *Lond., Ed. Pitch Plaster.*

"Take of Prepared Burgundy Pitch *two pounds;* Prepared Thus [frankincense] *a pound;* Resin, Wax, each, *four ounces;* Expressed Oil of Nutmegs *an ounce;* Olive Oil, Water, each, *two fluidounces.* To the Thus, Pitch, Resin, and Wax, melted together, add the Oils and the Water. Then evaporate all, continually stirring, to the proper consistence." *Lond.*

"Take of Burgundy Pitch *one pound and a half;* Resin and Bees'-wax, of each, *two ounces;* Oil of Mace *half an ounce;* Olive Oil *one fluidounce;* Water *one fluidounce.* Liquefy the Pitch, Resin, and Wax with a gentle heat; add the other articles; mix them well together; and boil till the mixture acquires the proper consistence." *Ed.*

The simple "*Myristicæ Oleum*" of the London Materia Medica list, has become "*Myristicæ Oleum Expressum*" here. We presume that the Edinburgh *oil of mace*, in the above formula, though the term is not defined in the Pharmacopœia, has reference to the substance denominated, in the Edinburgh Materia Medica catalogue, *Myristicæ Adeps* or *concrete oil of nutmeg.* (See *Myristicæ Adeps*, page 487.)

This is a rubefacient plaster, applicable to catarrhal and other pectoral affections, chronic inflammation of the liver, and rheumatic pains in the joints and muscles. It often keeps up a serous discharge, which requires that it should be frequently renewed. The irritation which it sometimes excites is so great as to render its removal necessary. W.

EMPLASTRUM PICIS BURGUNDICÆ. *U.S.* *Burgundy Pitch Plaster.*

"Take of Burgundy Pitch *six pounds;* Yellow Wax *half a pound.* Melt them together, and stir them constantly till they thicken on cooling." *U. S.*

In this formula, the object of the wax is simply to give a proper consistence to the Burgundy pitch, and to prevent it from breaking in cold weather. W.

EMPLASTRUM PICIS CUM CANTHARIDE. *U.S.* EMPLASTRUM CALEFACIENS. *Dub.* *Plaster of Pitch with Spanish Flies. Warming Plaster.*

"Take of Burgundy Pitch *three pounds and a half;* Cerate of Spanish Flies *half a pound.* Melt them together by means of a water-bath, and stir them constantly till they thicken upon cooling." *U.S.*

The *Dublin College* employs the same ingredients, but has increased the proportion of Burgundy pitch to *five pounds and a half.*

This plaster is an excellent rubefacient, more active than Burgundy pitch, yet in general not sufficiently so to produce vesication. Still, however, in consequence of peculiar susceptibility of the skin in some individuals, it occasionally blisters; and it has been recommended to lessen the proportion of the flies. But, while such a reduction would render the plaster insufficiently active in most cases, it would not entirely obviate the objection; as the smallest proportion of flies would vesicate in certain persons, and even the Burgundy pitch alone sometimes produces the same effect. In whatever mode, therefore, this plaster may be prepared, it cannot always answer the expectations which may be entertained; and the only plan, when the skin of any individual has been found to be very susceptible, is to accommodate the proportions to the particular circumstances of the case. Much, however, may be accomplished by care in the preparation of the plaster, towards obviating its tendency to blister. If the flies of the *Ceratum Cantharidis* have been coarsely pulverized, the larger particles coming in contact with the skin, will exert upon the particular part to which they may be applied their full vesicatory effect, while, if reduced to a very fine powder, they would be more thoroughly enveloped in the other ingredients, and thus have their strength much diluted. Hence the cerate, when used as an ingredient of the warming plaster, should contain the cantharides as minutely divided as possible, and, if that usually kept is not in the proper state, a portion should be prepared for this particular purpose. A good plan, we presume, would be to keep the cerate used in this preparation, for a considerable time, at the temperature of 212°, and then strain it so as to separate the flies. (See *Ceratum Cantharidis.*) The mode frequently pursued of preparing the warming plaster by simply sprinkling a very small proportion of powdered flies upon the surface of Burgundy pitch is altogether objectionable. The U. S. process is that of the old Dublin Pharmacopœia. In the edition of the Dub. Pharmacopœia of 1850, the proportion of the Burgundy pitch has been increased so as considerably to diminish the strength of the preparation.

The warming plaster is employed in chronic rheumatism, and various chronic internal diseases attended with inflammation or an inflammatory tendency; such as catarrh, asthma, pertussis, phthisis, hepatitis, and the sequelæ of pleurisy and pneumonia. W.

EMPLASTRUM PLUMBI. *U. S., Lond.* EMPLASTRUM LITHARGYRI. *Ed., Dub. Lead Plaster. Litharge Plaster.*

"Take of Semivitrified Oxide of Lead, in very fine powder, *five pounds;* Olive Oil *a gallon;* Water *two pints.* Boil them together over a gentle fire, stirring constantly, until the Oil and Oxide of Lead unite into a plaster. It will be proper to add a little boiling water, if that employed at the commencement be nearly all consumed before the end of the process." *U. S.*

The above process is precisely that of the *London Pharmacopœia* of 1824. In the editions of that work for 1836 and 1851, the quantities directed are *six pounds* of the oxide of lead, *a gallon* of olive oil, and *two pints* of water; but, as the Imperial measure is employed, the proportions are in fact nearly the same as before.

The *Edinburgh College* orders *five ounces* of litharge, *twelve fluidounces* of olive oil, and *three fluidounces* of water. The *Dublin* process does not differ materially from that of the London and U. S. Pharmacopœias.

The importance of this plaster, as the basis of most of the others, requires a somewhat detailed account of the principles and manner of its preparation.

It was formerly thought that the oil and oxide of lead entered into direct union, and that the presence of water was necessary only to regulate the temperature, and prevent the materials from being decomposed by heat. The discovery, however, was afterwards made, that this liquid was essential to the process; and that the oil and oxide alone, though maintained at a temperature of 220°, would not combine; while the addition of water, under these circumstances, would produce their immediate union. It was now supposed that the oil was capable of combining only with the hydrated oxide of lead, and that the use of the water was to bring the oxide into that state; and, in support of this opinion, the fact was advanced that the hydrated oxide of lead and oil would form a plaster, when heated together without any free water. But, since the general reception of Chevreul's views in relation to oils and their combinations with alkalies and other metallic oxides, the former opinions have been abandoned; and it is now admitted that the preparation of the lead plaster affords a genuine example of saponification, as explained by that chemist. A reaction takes place between the oil and water, resulting in the development of a sweetish substance called *glycerin*, and of two acid bodies, the *oleic* and *margaric acids*, to which, when animal fat is employed instead of olive oil, a third is added, namely, the *stearic*. The plaster is formed by a union of these acids with the oxide, and, prepared according to the directions of the Pharmacopœias, is in fact an oleo-margarate of lead. The glycerin remains dissolved in the water, or mechanically mixed with the plaster. That such is the correct view of the nature of this compound is evinced by the fact, that, if the oxide of lead be separated from the plaster by digestion at a moderate heat in very dilute nitric acid, the fatty matter which remains will unite with litharge with the greatest facility, without the intervention of water. According to a more recent chemical view, the fixed oils are compounds of the oily acids mentioned and *oxide of glyceryle*. When boiled with the oxide of lead and water, the oily acids combine with the metallic oxide to form the plaster, and the oxide of glyceryle takes an equivalent of water and becomes glycerin. *Glyceryle* is a hypothetical compound of carbon and hydrogen (C_6H_7), which unites with five equivalents of oxygen to form oxide of glyceryle ($C_6H_7O_5$), also a hypothetical substance, and additionally with an equivalent of water to form glycerin ($C_6H_7O_5+HO$).

Other oleaginous substances and other metallic oxides are susceptible of the same combination, and some of them form compounds having the consistence of a plaster; but according to *M. Henry*, of Paris, no oily matter except animal fat can properly be substituted for olive oil, and no metallic oxide, not even one

of the other oxides of lead, for litharge. He ascertained, moreover, that the English litharge is preferable for the formation of lead plaster to the German. From more recent experiments of Soubeiran, it appears that massicot or even minium may be substituted for litharge, and a plaster of good consistence be obtained; but that a much longer time is required for completing the process than when the officinal formula is followed. When minium is used, the necessity for its partial deoxidation renders a longer continuance of the process necessary than with massicot. According to M. Davallon, Professor in the School of Medicine and Pharmacy at Lyons, it is important that the olive oil employed should be pure; for when adulterated, as it frequently is in commerce, it yields an imperfect product. Mr. N. S. Thomas prepared a good plaster by substituting lard for olive oil, in the proportion of eight pounds of lard to five of litharge. (*Am. Journ. of Pharm.*, xix. 175.)

Lead plaster has also been prepared by double decomposition between soap and acetate or subacetate of lead; but the results have not been so advantageous as to lead to the general adoption of this process. For particular information on the subject the reader is referred to the *American Journal of Pharmacy* (ix. 127), and to the *Journal de Pharmacie* (xxiii. 163 and 322).

Preparation. The vessel in which the lead plaster is prepared, should be of such a size that the materials will not occupy more than two-thirds of its capacity. The oil should be first introduced, and the litharge then sprinkled in by means of a sieve, the mixture being constantly stirred with a spatula. The particles of the oxide are thus prevented from coalescing in small masses, which the oil would not easily penetrate, and which would therefore delay the process. While the water exerts an important chemical agency in the changes which occur, it is also useful by preventing too high a temperature, which would decompose the oil and cause the reduction of the metal. The waste must, therefore, be supplied by fresh additions as directed in the process; and the water added for this purpose should be previously heated, as otherwise it would not only delay the operation, but by producing explosion might endanger the operator. During the continuance of the boiling, the materials should be constantly stirred, and the spatula should be repeatedly passed along the bottom of the vessel, from side to side, so as to prevent any of the oxide, which is disposed by its greater density to sink to the bottom, from remaining in that situation. The materials swell up considerably in consequence partly of the vaporization of the water, partly of the escape of carbonic acid gas, which is liberated by the oily acids from some carbonate of lead usually contained in the litharge. The process should not be continued longer than is sufficient to produce complete union of the ingredients, and this may be known by the colour and consistence of the mass. The colour of the litharge gradually becomes paler, and at length almost white when the plaster is fully formed. The consistence increases with the progress of the boiling, and is sufficiently thick, when a portion of the plaster, taken out and allowed to cool upon the end of a spatula, or thrown into cold water, becomes solid, without adhering in this state to the fingers. The portion thus solidified should not present, when broken, any red points, which would indicate the presence of a portion of uncombined litharge. When the plaster is formed, it should be removed from the fire, and after a short time cold water should be poured upon it. Portions should then be detached from the mass, and, having been well kneaded under water, in order to separate the viscid solution of glycerin contained in the interior, should be formed into cylindrical rolls, and wrapped in paper. Such at least has been the course of proceeding usually recommended. But M. Davallon maintains that the presence of glycerin in the plaster is useful by keeping it in a plastic state, and that washing and kneading are injurious, the former by removing the glycerin, the latter by introducing

particles of air and moisture into the mass, which is thus rendered more disposed to rancidity. (*Am. Journ. of Pharm.*, xv. 274, from *Journ. de Chim. Méd.*) By employing steam heat in the preparation of this plaster the risk of burning it is avoided. For a good arrangement for this purpose see *Mohr and Redwood's Pharmacy*, edited by Prof. Procter, p. 420.

Medical Properties and Uses. This plaster, which has long been known under the name of *diachylon*, is used as an application to excoriated surfaces, and to slight wounds, which it serves to protect from the action of the air. It may also be beneficial by the sedative influence of the lead which enters into its composition. A case is on record in which lead colic resulted from its long-continued application to a large ulcer of the leg. (*Am. Journ. of Med. Sci.*, xxiii. 246.) Its chief use is in the preparation of other plasters.* While in its yet incomplete state, it is used in the preparation of glycerin. (See *Glycerina.*)

Off. Prep. Emplastrum Assafœtidæ; Emp. Ferri; Emp. Galbani Compositum; Emp. Gummosum; Emp. Hydrargyri; Emp. Opii; Emp. Resinæ; Emp. Saponis; Unguentum Plumbi Compositum. W.

EMPLASTRUM POTASSII IODIDI. *Lond. Plaster of Iodide of Potassium.*

"Take of Iodide of Potassium *an ounce;* prepared Thus [frankincense] *six ounces;* Wax *six drachms;* Olive Oil *two fluidrachms.* To the Thus and Wax melted together add the Iodide previously rubbed with the Oil, and stir constantly till they cool. This plaster is to be spread rather on linen than leather." *Lond.*

This plaster may be employed for the resolution of indolent tumours, and for the other purposes for which the preparations of iodine are used externally. (See *Potassii Iodidum.*) W.

EMPLASTRUM RESINÆ. *U.S., Lond., Dub.* EMPLASTRUM RESINOSUM. *Ed.* EMPLASTRUM ADHÆSIVUM. *Resin Plaster. Adhesive Plaster.*

"Take of Resin, in powder, *half a pound;* Lead Plaster *three pounds.* To the Lead Plaster melted over a gentle fire add the Resin, and mix them." *U. S.*

The *London* process differs only in melting the resin before adding it. The *Edinburgh College* orders *five ounces* of the lead plaster, and *one* of resin. The *Dublin* melts *two pounds* of litharge plaster over a gentle fire, then adds *four ounces* of powdered resin, and *two ounces* of powdered castile soap, and mixes them intimately, employing the avoirdupois weights in the process.

This preparation differs from the lead plaster in being more adhesive and somewhat more stimulating. It is the common adhesive plaster of the shops, and is much employed for retaining the sides of wounds in contact, and for dressing ulcers according to the method of Baynton, by which the edges are drawn towards each other, and a firm support is given to the granulations. As prepared by the Dublin College it contains soap, which gives it greater pliability, and renders it less liable to crack in cold weather, without impairing its adhe-

* *A plaster of carbonate of lead* was originally introduced into our Pharmacopœia as a substitute for *Mahy's plaster*, so much employed in some parts of the United States; but was omitted in the edition of 1840. It is a good application to surfaces inflamed or excoriated by friction; and may be resorted to with advantage in those troublesome cases of cutaneous irritation, and even ulceration, occurring upon the back and hips during long-continued confinement to one position. We give the process as contained in the Pharmacopœia of 1830. "Take of Carbonate of Lead *a pound;* Olive Oil *two pints;* Yellow Wax *four ounces;* Lead Plaster *a pound and a half;* Florentine Orris, in powder, *nine ounces.* Boil together the Oil and Carbonate of Lead, adding a little water, and constantly stirring, till they are thoroughly incorporated; then add the Wax and Plaster, and, when these are melted, sprinkle in the Orris, and mix the whole together." By this process, a good plaster may be prepared, rather too soft, perhaps, at first, but soon acquiring the proper consistence.

siveness. As thus prepared, it is equivalent to the *Emplastrum Saponis Compositum vel adhærens* of the old Dublin Pharmacopœia. It is usually spread upon muslin; and the spreading is best accomplished, on a large scale, by means of a machine, as described in the general observations upon plasters. It is kept in the shops ready spread; but, as the plaster becomes less adhesive by long exposure to the air, the supply should be frequently renewed. When the skin is very delicate, it occasionally excites some irritation, and under these circumstances a plaster may be substituted, containing a smaller proportion of resin. That originally employed by Baynton contained only six drachms of resin to the pound of lead plaster.

In order to render the plaster more adhesive, and less brittle in cold weather, it is customary with many apothecaries to employ a considerable proportion of Burgundy pitch or turpentine in its preparation; but these additions are objectionable, as they greatly increase the liability of the plaster to irritate the skin, and thus materially interfere with the purposes for which the preparation was chiefly intended.*

Off. Prep. Emplastrum Belladonnæ; Emplastrum Opii. W.

EMPLASTRUM SAPONIS. *U. S., Lond., Ed., Dub. Soap Plaster.*

"Take of Soap, sliced, *four ounces;* Lead Plaster *three pounds.* Rub the Soap with sufficient water to bring it to a semi-fluid state; then mix it with the Plaster previously melted, and boil to the proper consistence." *U. S.*

"Take of Soap, sliced, *half a pound;* Lead Plaster *three pounds;* Resin *an ounce.* To the Plaster melted by a slow fire add the Soap and Resin previously liquefied; then evaporate the whole, constantly stirring, to the proper consistence." *Lond.*

"Take of Litharge Plaster [Lead Plaster] *four ounces;* Gum Plaster *two ounces;* Castile Soap, in shavings, *one ounce.* Melt the Plasters together with a moderate heat, add the Soap, and boil for a little." *Ed.*

"Take of Castile Soap, in powder, *four ounces;* Litharge Plaster [Lead Plaster] *two pounds and a half.* To the Plaster previously melted over a gentle fire, add the Soap, and heat them together until they are thoroughly incorporated." *Dub.* The avoirdupois weights are used in this process.

The present U. S. process is an improvement upon that of the former edition of the Pharmacopœia. The proportion of soap in the old process was so large as to render the plaster friable. It has been diminished from six to four ounces. Besides, by the present mode of proceeding, it is more thoroughly incorporated with the plaster. The same end of greater plasticity is accomplished, in some degree, in the London process by the resin, and in the Edinburgh by the gum plaster.

Soap plaster is considered discutient, and is sometimes used as an application to tumours.

Off. Prep. Emplastrum Belladonnæ. W.

EMPLASTRUM SIMPLEX. *Ed. Simple Plaster.*

"Take of Bees'-wax *three ounces;* Suet and Resin, of each, *two ounces.* Melt them together with a moderate heat, and stir the mixture briskly till it concretes on cooling." *Ed.*

* An adhesive plaster, exempt from oxide of lead, is prepared by Pettenkofer. It consists of calcareous soap incorporated with turpentine and suet, and may be prepared in the following manner. A solution of soap is decomposed by a solution of chloride of calcium. The precipitate, having been expressed and dried, is powdered with half its weight of turpentine dried by heat; and the mixture is melted along with an eighth part of suet, in boiling water. The mixture is boiled until the mass melts into a homogeneous fluid, when it is worked by the hand, in the ordinary manner, in cold water. Should portions of the calcareous soap not melt, they should be separated by straining through flannel. (*Journ. de Pharm.*, 3e *sér.*, x. 358, from *Repertorium für die Pharm.*, xlii. 40.)

This plaster was originally intended for dressing blistered surfaces, in order to maintain a moderate discharge, to which purpose it is adapted by the stimulant property of the resin. But its stiffness and adhesiveness render it unpleasant and of difficult management; and it has been entirely superseded by the resin cerate. It is equivalent to the old *Emplastrum Ceræ* of the London College.

W.

ENEMATA.

Clysters.

These can scarcely be considered proper objects for officinal direction; but, having been introduced into the British Pharmacopœias, the plan of this work requires that they should be noticed. They are substances in the liquid form, intended to be thrown up the rectum, with the view either of evacuating the bowels, of producing the peculiar impression of a remedy upon the lower portion of the alimentary canal and neighbouring organs, or of acting on the system generally through the medium of the surface to which they are applied. They are usually employed to assist the action of remedies taken by the mouth, or to supply their place when the stomach rejects them, or is insensible to their impression. Sometimes they are preferably used when the seat of the disorder is in the rectum or its vicinity. As a general rule, three times as much of any remedy is required to produce a given impression by enema, as when taken into the stomach; but this rule should be acted on with caution, as the relative susceptibilities of the stomach and rectum are not the same in all individuals; and, with regard to all very active remedies, the best plan is to administer less than the stated proportion. Attention should also be paid to the fact, that, by the frequent use of a medicine, the susceptibility of the stomach may be in some measure exhausted, without a proportionate diminution of that of the rectum.

When the object is to evacuate the bowels, the quantity of liquid administered should be considerable. For an adult from ten fluidounces to a pint; for a child of eight or ten years, half that quantity; for an infant within the year, from one to three fluidounces, are about the proper proportions. Much larger quantities of mild liquids may sometimes be given with safety and advantage; as the bowels will occasionally feel the stimulus of distension, when insensible to irritating impressions.

When the design is to produce the peculiar impression of the remedy upon the neighbouring parts, or on the system, it is usually desirable that the enema should be retained; and the vehicle should therefore be bland, and as small in quantity as is compatible with convenient administration. A solution of starch, flaxseed tea, or other mucilaginous fluid should be selected, and the quantity should seldom exceed two or three fluidounces.

In every case, the patient should be instructed to resist any immediate disposition to discharge the injected fluid; and his efforts to retain it should be assisted, if necessary, by pressure with a warm folded towel upon the fundament. The best instrument for administering enemata is an accurate metallic syringe.

W.

ENEMA ALOËS. *Lond.* *Clyster of Aloes.*

"Take of Aloes *two scruples;* Carbonate of Potassa *fifteen grains;* Decoction of Barley *half a pint* [Imperial measure]. Mix, and rub them together." *Lond.*

This is intended as a formula for the use of aloes in cases of ascarides in the rectum, and of amenorrhœa attended with constipation. W.

ENEMA ASSAFŒTIDÆ. *Lond.* ENEMA FŒTIDUM. *Ed., Dub.* *Clyster of Assafetida.*

"Take of Prepared Assafetida *a drachm;* Decoction of Barley *half a pint*

[Imperial measure]. Rub the Assafetida with the Decoction gradually added, till they are thoroughly mixed." *Lond.*

The *Edinburgh College* prepares this by adding *two drachms* of tincture of assafetida to the cathartic clyster; the *Dublin*, by mixing *two fluidrachms* of the tincture with *twelve fluidounces* of warm water.

This is carminative and antispasmodic as well as laxative. The preparation of the London Pharmacopœia is, we think, the best. The whole quantity directed may be administered at once. W.

ENEMA CATHARTICUM. *Ed., Dub. Cathartic Clyster.*

"Take of Olive Oil *one ounce;* Sulphate of Magnesia *half an ounce;* Sugar *one ounce;* Senna *half an ounce;* Boiling Water *sixteen fluidounces.* Infuse the Senna for an hour in the Water; then dissolve the Salt and Sugar; add the Oil, and mix them by agitation." *Ed.*

"Take of Sulphate of Magnesia *one ounce* [avoirdupois]; Olive Oil *one fluidounce;* Mucilage of Barley *sixteen fluidounces.* Dissolve the Sulphate of Magnesia in the Mucilage, add the Oil, and mix." *Dub.*

The laxative enema most commonly employed in this country, consists of a tablespoonful of common salt, two tablespoonfuls of lard or olive oil, the same quantity of molasses, and a pint of warm water. It has the advantage of consisting of materials which are always at hand in families, is in all respects equal to the Dublin preparation, and, though less active than the Edinburgh, is preferable to it on ordinary occasions.

Off. Prep. Enema Fœtidum. W.

ENEMA COLOCYNTHIDIS. *Lond. Clyster of Colocynth.*

"Take of Extract of Colocynth *half a drachm;* Soft Soap *an ounce;* Water *a pint* [Imperial measure]. Mix, and rub them together." *Lond.*

This may be employed whenever a very powerful purgative impression is required upon the lower bowels, as in obstinate colic and constipation. W.

ENEMA OPII. *Lond.* ENEMA OPII vel ANODYNUM. *Ed. Clyster of Opium.*

"Take of Decoction of Starch *four fluidounces;* Tincture of Opium *thirty minims.* Mix them." *Lond.*

The *Edinburgh College* boils *half a drachm* of starch in *two fluidounces* of water, and, when it is cool enough for use, adds from *thirty minims* to *a fluidrachm* of tincture of opium.

Of these processes that of the London College is preferable, although the quantity of decoction of starch is unnecessarily large. The Edinburgh process is objectionable from its indefiniteness. It must have happened to every one in the habit of prescribing opium in this way, to have seen a much greater effect produced by a certain amount of laudanum injected into the rectum than by one-third of the quantity swallowed. The fluidrachm contains at least one hundred drops of laudanum of the ordinary size, and not less than one hundred and twenty as they are often formed. From twenty to twenty-five drops are usually considered as a medium dose by the mouth; so that sixty drops, equivalent to about thirty minims, are abundantly sufficient by enema. The quantity, therefore, ordered by the London College, and the smallest quantity by the Edinburgh, is the full dose. As the object is that the enema should remain in the rectum, the smaller the quantity of the vehicle the better; and a mucilaginous fluid is preferable to water, as it involves the tincture, and prevents the irritation of the alcohol before the opium begins to take effect. The ordinary anodyne enema, employed in this country, consists of about sixty drops of laudanum and one or two fluidounces of flaxseed tea or solution of starch.

This is an admirable remedy in obstinate vomiting, strangury from blisters, painful affections of the kidneys, bladder, and uterus, and in the tenesmus of dysentery. It may also frequently be employed to produce the effects of opium upon the system, when circumstances prevent the administration of that medicine by the mouth. W.

ENEMA TEREBINTHINÆ. *Lond., Ed., Dub. Clyster of Turpentine.*

"Take of Oil of Turpentine *a fluidounce;* the Yolk of *one* Egg; Decoction of Barley *nineteen fluidounces.* Rub the Oil with the Yolk, and mix the Decoction with them." *Lond.*

The *Edinburgh College* employs the same proportions, but substitutes water for decoction of barley. The *Dublin College* mixes *a fluidounce* of the oil with *sixteen fluidounces* of mucilage of barley. (See *Oleum Terebinthinæ.*) W.

EXTRACTA.

Extracts.

Extracts, as the term is employed in the Pharmacopœias, are solid substances, resulting from the evaporation of the solutions of vegetable principles, obtained either by exposing the vegetable to the action of a solvent, or by expressing its juice in the recent state. The Dublin College formerly made a distinction between those prepared from the infusions, decoctions, or tinctures, and those from the expressed juices of plants, calling the former *Extracta*, the latter *Succi Spissati;* but abandoned it in the last edition of its Pharmacopœia. There is no such essential difference between these two sets of preparations, as to require that they should be separately classed; and something is gained in the simplicity of nomenclature, as well as of arrangement, which results from their union. We shall consider them under the same head, taking care, however, to detail distinctly whatever is peculiar in the mode of preparing each.

The composition of extracts varies with the nature of the vegetable, the character of the solvent, and the mode of preparation. The object is generally to obtain as much of the active principles of the plant, with as little of the inert matter as possible; though sometimes it may be desirable to separate the active ingredients from each other, when their effects upon the system are materially different; and this may be accomplished by employing a menstruum which, while it dissolves one, leaves the other untouched. The proximate principles most commonly present in extracts are gum, sugar, starch, tannin, extractive, colouring matter, salts, and the peculiar principles of plants; to which, when a spirituous solvent is employed, may usually be added resinous substances, fatty matter, and frequently more or less essential oil; gum and starch being excluded when the menstruum is pure alcohol. Of these substances, as well as of others which, being soluble, are sometimes necessarily present in extracts, we have taken occasion to treat under various heads in the Materia Medica. There is one, however, which, from its supposed almost uniform presence in this class of preparations, and from the influence it is thought to exert upon their character, deserves particular consideration in this place. We allude to *extractive*, or, as it is sometimes called, *extractive matter.*

It has long been observed that in most vegetables there is a substance, soluble both in water and alcohol, which, in the preparation of extracts, undergoes chemical change during the process of evaporation, imparting to the liquid, even if originally limpid, first a greenish, then a yellowish-brown, and ultimately a deep-brown colour, and becoming itself insoluble. This substance, originally called *saponaceous matter* by Scheele, afterwards received the more expressive

name of *extractive*, derived from its frequent presence in extracts. Its existence as a distinct principle is denied, or at least doubted by some chemists, who consider the phenomena supposed to result from its presence, as depending upon the mutual reaction of other principles; and, in relation to Peruvian bark, it appears to have been proved that the insoluble matter which forms during its decoction in water is a compound of starch and tannin. A similar compound must also be formed in other cases when these two principles co-exist; but they are not always present in the same vegetable, nor can all the changes which have been attributed to extractive be accounted for by their union, even when they are present; so that, till further light is shed on the subject, it is best to admit the existence of a distinct substance, which, though not the same in all plants, possesses sufficient identity of character to be entitled, like sugar, resin, &c., to a distinctive name. The most interesting property of extractive is its disposition to pass, by the influence of atmospheric air at a high temperature, into an insoluble substance. If a vegetable infusion or decoction be evaporated in the open air to the consistence of an extract, then diluted, filtered, and again evaporated, and the process repeated so long as any insoluble matter is formed, the whole of the extractive will be separated from the liquid, while the other ingredients may remain. If chlorine be passed through an infusion or decoction, a similar precipitate is formed with much greater rapidity. The change is usually ascribed to the absorption of oxygen by the extractive, which has, therefore, been called, in its altered condition, oxidized extractive; but De Saussure ascertained that, though oxygen is absorbed during the process, an equal measure of carbonic acid gas is given out, and the oxygen and hydrogen of the extractive unite to form water in such a manner as to leave the principle richer in carbon than it was originally. The name of oxidized extractive is, therefore, obviously incorrect; and Berzelius proposes to substitute for it that of *apotheme*, synonymous with deposit. According to Berzelius, apotheme is not completely insoluble in water, but imparts a slight colour to that liquid when cold, and is rather more soluble in boiling water, which becomes turbid upon cooling. It is still more soluble in alcohol, and is freely dissolved by solutions of the alkalies and alkaline carbonates, from which it is precipitated by acids. It has a great tendency, when precipitated from solutions, to unite with other principles, and to carry them along with it; thus acquiring properties somewhat different, according to the source from which it is obtained. In this way, also, even when the extractive of a plant is itself medicinally inert, its conversion into apotheme may be injurious by causing a precipitation of a portion of the active principle; and, in practical pharmaceutic operations, this change should always, if possible, be avoided. With these preliminary views, we shall proceed to the consideration of the practical rules necessary to be observed in the preparation of extracts. We shall treat of the subject under the several heads of, 1. the extraction of the soluble principles from the plant; 2. the method of conducting the evaporation; 3. the proper condition of extracts, the changes they are liable to undergo, and the best method of preserving them; and 4. the general directions of the several Pharmacopœias in relation to them.

1. *Extraction of the Soluble Principles.*

There are two distinct modes of obtaining, in a liquid state, the principles which we wish to extract; 1. by expression alone; 2. by the agency of a solvent, with or without expression.

1. *By Expression.* This method is applicable to recent vegetables. All plants cannot be advantageously treated in this way, as many have too little juice to afford an appreciable quantity upon pressure, and of the succulent a considerable

portion do not yield all their active principles with their juice. Succulent fruits, and various acrid and narcotic plants, are proper subjects of this treatment. The plants should be operated upon, if possible, immediately after collection. Mr. Battley, of London, recommends that, if not entirely fresh, they should be revived by the immersion of the stalks in water for twelve or eighteen hours, and those only used which recover their freshness by this management. They should then be cut into pieces, and bruised in a stone mortar till brought to a pulpy consistence. When the plant is not very succulent, it is necessary to add a little water during this part of the process, in order to dilute the juice. After sufficient contusion, the pulp is introduced into a linen or canvas bag, and the liquid parts expressed. Mr. Brande states that light pressure only should be employed; as the extract is thus procured greener, of a less glutinous or viscid consistence, and, in his opinion, more active than when considerable force is used in the expression. (*Manual of Pharmacy.*) The juice thus obtained is opaque and usually green, in consequence of the presence of green wax or chlorophylle, and of a portion of the undissolved vegetable fibre in minute division. By heating the juice to about 160°, the albumen contained in it coagulates, and, involving the chlorophylle and vegetable fibre, forms a greenish precipitate. If the liquid be now filtered, it becomes limpid and nearly colourless, and is prepared for evaporation. The clarification, however, is not absolutely necessary, and is generally neglected. Sometimes the precipitate carries with it a considerable portion of the active principle; in which case it should be subsequently incorporated with the juice, when reduced by evaporation to the consistence of a syrup.

2. *By Solution.* The active principles of dried vegetables can be extracted only by means of a liquid solvent. The menstruum usually employed is either water or alcohol, or a mixture of the two. Water, on account of its cheapness, is always preferred, when circumstances do not strongly call for the use of alcohol. It has the advantage, moreover, that it may be assisted in its action, if necessary, by a higher degree of heat than the latter. Pump water is often unfit for the purpose, in consequence of the quantity of its saline matter, which, in some instances, may exert an unfavourable influence on the active principle, and must always be left in the extract. Rain, river, or distilled water should be preferred. Alcohol is employed when the principles to be extracted are insoluble, or but slightly soluble in water, as in the case of the resins; when it is desirable to avoid in the extract inert substances, such as gum and starch, which are dissolved by water and not by alcohol; when the heat required to evaporate the aqueous solution would dissipate or decompose the active ingredients of the plant, as the volatile oils and the active principle of sarsaparilla; when the reaction of the water itself upon the vegetable principles is injurious; and, finally, when the nature of the substance to be exhausted requires so long a maceration in water as to endanger spontaneous decomposition. The watery solution requires to be soon evaporated, as this fluid rather promotes than counteracts chemical changes; while an alcoholic tincture may be preserved unaltered for an indefinite period. An addition of alcohol to water is sufficient to answer some of the purposes for which the former is preferable; and the employment of both fluids is essential, when the virtues of the plant reside in two or more principles, all of which are not soluble in either of these menstrua. In this case it is usually better to submit the vegetable to the action of the two fluids successively, than to both united. Extracts obtained by the agency of water, are called *watery* or *aqueous extracts*, those by means of alcohol, undiluted or diluted, *alcoholic* or *spirituous extracts*.

The method of preparing the solution is not a matter of indifference. The vegetable should be thoroughly bruised, or reduced to a coarse powder, so as to allow the access of the solvent to all its parts, and yet not so finely pulverized as to prevent a ready precipitation of the undissolved and inactive portion.

When water is employed, it has been customary to boil the medicine for a considerable time, and, if the first portion of liquid does not completely exhaust it, to repeat the operation with successive portions, till the whole of the active matter is extracted. This may be known by the sensible properties of the liquid, and by its influence upon reagents. But the boiling temperature produces the decomposition of many vegetable principles, or at least so modifies them as to render them inert; and the extracts prepared by decoction are usually less efficient than those prepared with a less degree of heat. From numerous experiments upon extracts, Orfila concluded that their virtues were less in proportion to the heat employed. It has, therefore, been recommended to substitute for decoction the process of maceration, digestion, or hot infusion; in the first of which the liquid acts without heat, in the second is assisted by a moderately increased temperature sustained for a considerable time, and in the third is poured boiling hot upon the vegetable matter, and allowed to stand for a short period in a covered vessel. When the active principles are readily soluble in cold water, *maceration* is often preferable to the other modes, as starch, which is inert, is thus left behind; but in many instances the preparation would spoil before the extraction would be completed. By *digestion*, though the solvent power of water is moderately increased, the advantage is often more than counterbalanced by the increased disposition to spontaneous decomposition. *Hot infusion*, therefore, is to be preferred where the vegetable does not readily yield its virtues to cold water. It has the advantage, moreover, in the case of albuminous substances, that the albumen is coagulated, and thus prevented from increasing the bulk of the extract, without any addition to its virtues. A convenient mode of performing this process, is to introduce the solid material into a vessel with an opening near the bottom temporarily closed, or into a funnel with its mouth loosely stopped, then to pour on the boiling water, and, having allowed it to remain a sufficient length of time, to draw it off through the opening. This operation may be repeated till the water comes away without any obvious impregnation. It is always desirable to obtain the solution in the first place as concentrated as possible, so as to prevent the necessity of long continued evaporation, which injures the extract. It is better, therefore, to incur the risk, both where decoction and infusion are employed, of leaving a portion of the active matter behind, than to obtain a very weak solution. When successive portions of water are employed, those which are least impregnated should be brought by evaporation to the strength of that first obtained before being mixed with it, as the latter thus escapes exposure to unnecessary heat.

When alcohol is employed as a menstruum, the vegetable should be macerated in it for one or two weeks, and care should be taken that the tincture be as nearly saturated as possible. The extraction may be hastened by substituting digestion for maceration; as the moderate heat employed, while it facilitates the action of the alcohol, has in this case no effect in promoting decomposition, and the influence of the atmospheric air may be excluded by performing the process in close vessels. When alcohol and water are both used, it is best, as a general rule, to exhaust the vegetable with each separately, as the two menstrua require different modes of treatment. In whichever of these modes the extraction is effected, it requires the assistance of occasional agitation; and, when the vegetable matter is very porous, and absorbs large quantities of the solvent, expression must be resorted to.

Acetic acid has been introduced into use as a menstruum in the preparation of extracts. It is supposed to be a better solvent of the active principles of certain substances than either water or alcohol alone. According to Girolamo Ferrari, the acrid narcotics, such as aconite, hemlock, hyoscyamus, and stramonium, yield much stronger extracts with distilled vinegar than with water, and

still stronger to alcohol to which strong acetic acid has been added. (*Journ. de Pharm. 3e sér.*, i. 239.) This acid is used in the preparation of the acetic extract of colchicum.

Ether is now also used to a considerable extent in the preparation of certain extracts. Having the property of dissolving volatile oil and resin, and of evaporating at a temperature insufficient to volatilize the oil, it is admirably adapted for the preparation of extracts from those substances the virtues of which reside in the two principles referred to. An ethereal tincture is first prepared by the process of percolation or displacement, and the ether is then either allowed to escape by spontaneous evaporation, or is distilled off at a very moderate heat. The oleo-resinous extracts thus obtained are usually of a thick fluid or semi-fluid consistence. For more precise information as to the mode of preparing them, the reader is referred to a paper by Prof. Procter, in the *Amer. Journ. of Pharm.* (xxi. 114). Several of them are now ranked among the officinal preparations, in the U. S. Pharmacopœia, under the title of *Fluid Extracts.*

The process of percolation or displacement has within a few years been very advantageously applied to the preparation of extracts, both with water and spirituous menstrua. It has the following great advantages; 1. that it enables the soluble principles to be sufficiently extracted by cold water, thereby avoiding the injury resulting from heat in decoction and hot infusion; 2. that it effects the extraction much more quickly than can be done by maceration, thereby not only saving time, but also obviating the risk of spontaneous decomposition; and 3. that it affords the opportunity of obtaining highly concentrated solutions, thus diminishing all the injurious effects of the subsequent evaporation. While thus advantageous, it is less liable in this particular case than in others to the objection of yielding imperfect results if not well performed; for, though an inexpert or careless operator may incur loss by an incomplete exhaustion of the substance acted on, and the extract may be deficient in quantity, it may still be of the intended strength and quality, which is not the case with infusions or tinctures unskilfully prepared upon this plan. For an account of the mode of operating in the process of displacement, and of the instruments used, the reader is referred to pages 782 and 789.

Some prefer the mode of expression to that of displacement. This also is applicable both to watery and alcoholic menstrua. The substance to be acted upon is mixed with the menstruum, cold or hot according to circumstances; and the mixture is allowed to stand from twelve to twenty-four hours. The liquid part is then filtered off, and the remainder submitted to strong pressure, in a linen bag, by means of a common screw press, or other convenient instrument. Another portion of the menstruum may then be added, and pressure again applied; and, if the substance is not sufficiently exhausted, the same operation may be performed a third time. Frequently only a single expression is required, and very seldom a third. The quantity of menstruum added must vary with the solubility of the principles to be extracted. According to Mohr, the method of expression has the advantages over that of displacement, that it yields solutions of more uniform concentration, that it does not require the material to be so carefully powdered, or otherwise so skilfully managed in order to insure favourable results, and finally that it occupies less time.

2. *Mode of conducting the Evaporation.*

In evaporating the solutions obtained in the modes above described, attention should always be paid to the fact, that the extractive matter is constantly becoming insoluble at high temperatures with the access of air, and that other chemical changes are going on, sometimes not less injurious than this, while the volatile principles are expelled with the vapour. The operator should,

therefore, observe two rules; 1. to conduct the evaporation at as low a temperature as is consistent with other objects; 2. to exclude atmospheric air as much as possible, and, when this cannot be accomplished, to expose the liquid the shortest possible time to its action. According to Berzelius, the injurious influence of atmospheric air is much greater at the boiling point of water than at a less heat, even allowing for the longer exposure in the latter case; and, therefore, a slow evaporation at a moderate heat is preferable to the more rapid effects of ebullition. Bearing these principles in mind, we shall proceed to examine the different modes in practice. First, however, it is proper to observe that decoctions generally let fall upon cooling a portion of insoluble matter; and it is a question whether this should be rejected, or retained so as to form a part of the extract. Though it is undoubtedly in many instances inert, as in that of the insoluble tannate of starch formed during the decoction of certain vegetable substances, yet, as it frequently also contains a portion of the active principle which a boiling saturated solution necessarily deposits on cooling, and, as it is difficult to decide with certainty when it is active and when otherwise, the safest plan, as a general rule, is to allow it to remain.

The method of evaporation usually resorted to in the case of the aqueous solutions is rapid boiling over a fire. The more quickly the process is conducted the better, provided the liquid is to be brought to the boiling point; for the temperature cannot exceed this, and the length of exposure is diminished. But, even where this method is employed, it should not be continued till the completion of the evaporation; for, when most of the water has escaped, the temperature can no longer be kept down to the boiling point, and the extract is burnt. The caution, therefore, should always be observed of removing the preparation from the fire, before it has attained the consistence of thick syrup, and completing the evaporation either by means of a water-bath, or in shallow vessels at a moderate heat. When large quantities of liquid are to be evaporated, it is best to divide them into portions, and evaporate each separately; for, as each portion requires less time for evaporation than the whole, it will thus be a shorter time exposed to heat. (*Mohr.*) But the mode of evaporation by boiling is always more or less objectionable, and should be employed only in cases where the principles of the plant are so fixed and unchangeable as to authorize their extraction by decoction.

Evaporation by means of the water-bath, from the commencement of the process, is safer than the plan just mentioned, as it obviates all danger of burning the extract; but, as the heat is not supplied directly from the fire, the volatilization of the water cannot go on so rapidly, and the temperature being the same, or very nearly so, when the water-bath is kept boiling, there is greater risk of injurious action from the air. The liquid should be stirred during the process. The use of the vapour-bath, as suggested by M. Henry, is perhaps preferable; as it requires a smaller consumption of fuel, and the heat imparted to the liquid, while sufficient to evaporate it, is less than 212°. We take the following description of the apparatus employed at the Central Pharmacy of Paris, from M. Chevallier's highly useful Manual. It consists of a covered boiler, containing water, the vapour of which is conducted through a pipe into evaporating vessels, communicating with each other by means of metallic tubes. These vessels have the form of an ordinary copper basin, over the top of which is soldered a shallow tin capsule, intended to contain the liquor to be evaporated. The vapour from the boiler circulates through these vessels, and the water into which it condenses is allowed to escape through a stop-cock attached to the bottom of each vessel. From the last one of the series a tube passes into a vessel of water, so as to afford a slight pressure against the escape of any excess of vapour. The liquid to be evaporated is first distributed in two or three capsules, but when con-

siderably concentrated is transferred to a single one, where it is stirred towards the close of the process to hasten the evaporation. The heat applied to the liquid, if there are four vessels, is in that nearest the boiler about 198° F., in the fourth or most remote, about 135°. An incidental advantage of this apparatus is, that it affords a large supply of distilled water.

A good plan of evaporation, though slow, is to place the liquid in a broad shallow vessel, exposed in a stove or drying room to a temperature of about 100°, or a little higher, taking care that the air have free access in order to facilitate the evaporation. This mode is particularly applicable to those cases in which maceration or infusion is preferred to decoction for extracting the active principles. Berzelius says that we may thus usually obtain the extract in the form of a yellowish transparent mass, while those prepared in the ordinary way are almost black, and are opaque even in very thin layers. Even when the liquid is boiled at first, the process may often be advantageously completed in this manner. It has been proposed to effect the evaporation at the common temperature, by directing a strong current of air, by means of a pair of smith's bellows, over the surface of the liquid; and in reference to substances which are injured by heat and not by atmospheric air, the plan will be found useful.

Plans have been proposed and carried into execution for performing evaporation without the admission of atmospheric air. The apparatus for evaporation in vacuo invented by Mr. Barry, and described in the *Lond. Journ. of Science and Arts* (vol. viii. p. 360), is well calculated to meet this object, at the same time that, by removing the atmospheric pressure, it enables the water to rise in vapour more rapidly, and at a comparatively low temperature. The method of Barry consists in distilling the liquid into a large receiver from which the air has been expelled by steam, and in which the vapour is condensed by cold water applied to the surface of the receiver, so as to maintain a partial vacuum. Mr. Redwood has modified this process by keeping an air-pump in action during the evaporation, thus removing not only the air, but the vapour as fast as it forms, and maintaining a more complete vacuum than can be done by the condensation of the vapour alone. (*Journ. de Pharm.*, 3*e sér.*, i. 231.) Another method is to place the liquid under an exhausted receiver, together with some concentrated sulphuric acid, or chloride of calcium, which, by its affinity for water, assists the evaporation of the liquid. But, from the expense and trouble of these modes of evaporation, they are not calculated for general use. Dr. Christison recommends as probably the most perfect and convenient method, especially with watery infusions and decoctions, to evaporate the fluid in a vacuum to the consistence of syrup, and then to complete the process in shallow vessels, exposed to a current of air without heat.*

A convenient plan of excluding the air, though it does not at the same time meet the object of reducing the requisite degree of heat, is to distil off the water

* Mr. Grandval has described an apparatus, for evaporation in vacuo for the preparation of extracts, in the *Journ. de Pharm. et de Chim.*, xv. 82. Messrs. Tilden & Co., of New York, have recently employed a vacuum apparatus analogous to that used in refining sugar. The vacuum is obtained and continued by the constant action of a powerful steam driven pump. Their apparatus includes two evaporating pans; one large, having a capacity of several hundred gallons, used to concentrate the solutions for extracts to a syrupy consistence; the other, holding about fifty gallons, in which the evaporation is finished. The latter is furnished with an opening of such size as to permit the operator to remove the residual extract. The temperature during the evaporation is from 120° to 140° F., and is derived from steam pipes, placed within the boiler in the large evaporating pan, and a steam jacket beneath the smaller one. Very fine extracts are prepared in this way. In the *Journ. de Pharm.* (3*e sér.*, xxiii. 1), MM. Soubeiran and Gobley have particularly described and figured an apparatus, founded upon that of M. Grandval, but modified so as to be adapted to operations on a small scale, and to be within the reach of apothecaries who may desire to prepare their own extracts.—*Note to the ninth and tenth editions.*

in close vessels. Berzelius says that this is the best mode of concentration next to that *in vacuo*. Care, however, must be taken that the fire be not too long applied, lest the extract should be burnt. The process should, therefore, be completed by means of the water-bath.

In the concentration of alcoholic solutions, distillation should always be performed; as not only is the atmospheric air thus excluded, but the alcohol is recovered, if not absolutely pure, certainly fit for the purpose to which it was originally applied. Here also the water-bath should be employed, to obviate any possible risk of injury from the fire. When the decoction or infusion, and tincture of the same vegetable have been made separately, they should be separately evaporated to the consistence of syrup, and then mixed together, while they are of such a consistence as to incorporate without difficulty. The object of this separate evaporation is, that the spirituous extract may not be exposed to the degree of heat, or lengthened action of the air, which is necessary in the ordinary mode of concentrating the infusion or decoction.

In every instance, care should be taken to prevent any portion of the extract from becoming dry and hard on the sides of the evaporating vessel, as in this state it will not readily incorporate with the remaining mass. The heat, therefore, should be applied to the bottom, and not to the sides of the vessel.

3. *Condition and Preservation of Extracts.*

Extracts are prepared of two different degrees of consistence; soft so that they may be readily made into pills, and hard that they may be pulverized. In astringent extracts, the evaporation should be carried to dryness. Those obtained from the expressed juices of plants are apt to attract moisture from the air, in consequence of the deliquescent nature of the salts existing in the juice. They are thus rendered softer, and more liable to become mouldy upon the surface. Others, especially such as contain much chlorophylle, harden by time, in consequence of the escape of their moisture; and it not unfrequently happens that small crystals of saline matter are formed in their substance. Most extracts, especially those containing azotized principles, are capable, when left to themselves, of producing nitrates. The air, moreover, exercises an unfavourable chemical influence over the softer extracts, which are enfeebled, and ultimately become nearly inert, by the same changes which they undergo more rapidly in the liquid state at an elevated temperature. If an extract be dissolved in water, and the liquid be saturated with common salt, or any other very soluble salt of difficult decomposition, the greater part of it is precipitated, in consequence of the insolubility of this class of substances in saline solutions. The precipitate may be again dissolved in pure water.

Extracts, in order that they may keep well, should be placed in glazed earthenware, glass, or porcelain jars, and completely protected from the access of the air. This may be effected by covering their surface with a layer of melted wax, or with a piece of paper moistened with strong spirit, then closing the mouth of the vessel with a cork, spreading wax or rosin over this, and covering the whole with leather, or a piece of bladder. (*Duncan.*) The dry extracts, being less liable to be affected by atmospheric oxygen, do not require so much care. The application of alcohol to the surface has a tendency to prevent mouldiness. A method of protecting extracts from the action of the air frequently resorted to, is to cover them closely with oiled bladder; but this, though better than to leave them uncovered, is not entirely effectual. Should the extract become too moist, it may be dried by means of a water-bath; should it, on the contrary, be too dry, the proper consistence may be restored by softening it in the same manner, and incorporating with it a little distilled water. (*Chevallier.*)

Some extracts when powdered have a tendency to cohere again. According to Geiseler, this may be obviated by the addition of sugar of milk or powdered liquorice-root; two or three parts of the former, and one part of the latter to one of the extract being sufficient for the purpose. (*Pharm. Cent. Blatt*, A. D. 1850, p. 238.) Mohr recommends the following plan of drying and preserving extracts. Take equal parts of powdered liquorice-root and of the extract, rub them well together in a mortar, put the resulting paste into an earthen vessel with a flat bottom, place this in another of iron, a little deeper, containing chloride of calcium thoroughly dried by a heat insufficient to melt it; then enclose the whole with a cover fitted to the iron vessel, and allow them to stand for a day or more. When the extract is quite dry, powder it, and mix it with an equal weight of powdered liquorice-root. (*Ibid.* p. 719.)

Extracts from recent plants should be prepared at the season when the plant is medicinally most active; and a good rule is to prepare them once a year.

4. *General Officinal Directions.*

"In the preparation of the Extracts, evaporate, unless otherwise directed, as quickly as possible, in a broad, shallow dish, by means of a water-bath, until they have acquired the consistence proper for forming pills; and towards the end of the process, stir them constantly with a spatula. Sprinkle upon the softer Extracts a small quantity of Alcohol." *U. S.*

The directions of the *London College* are the same as the above, the sprinkling being omitted.

"Extracts are usually prepared by evaporating the expressed juices of plants, or their infusions and decoctions in water, proof spirit, or rectified spirit, at a temperature not exceeding 212° F., by means of a vapour-bath. Most of them, however, may be obtained of greatly superior quality by the process of evaporation in vacuo. And the extracts of expressed juices cannot, perhaps, be better prepared than by spontaneous evaporation in shallow vessels, exposed to a current of air. Extracts should be evaporated to such a consistence as to form a pill-mass when cold." *Ed.* W.

EXTRACTUM ACONITI. *U. S., Lond., Ed. Extract of Aconite.*

This is prepared, according to the U. S. Pharmacopœia, from fresh Aconite Leaves in the manner directed for extract of stramonium leaves. (See *Extractum Stramonii Foliorum.*)

"Take of fresh Aconite Leaves *a pound*. Bruise them in a stone mortar; then express the juice, and evaporate it, without straining, to the proper consistence." *Lond.*

"Take of the Leaves of Monkshood, fresh, *any convenient quantity*. Beat them into a pulp; express the juice; subject the residuum to percolation with Rectified Spirit, so long as the Spirit passes materially coloured; unite the expressed juice and the spirituous infusion; filter; distil off the spirit; and evaporate the residuum in the vapour-bath, taking care to remove the vessel from the heat so soon as the due degree of consistence shall be attained." *Ed.*

The U. S. and London processes for this extract are the same; consisting in the evaporation of the expressed juice of the leaves. The reader will find the general officinal directions at the close of our introductory observations in relation to extracts. Among these observations, he will also find rules which may be of practical use in regulating the various steps of the process under consideration.

In relation to the preparation of this extract, as well as of all others derived from the expressed juices of narcotic plants, the following summary of the plan pursued by Mr. Battley, an experienced apothecary of London, may be of service. Having passed the expressed juice through a fine hair sieve, he places it

immediately upon the fire. Before it boils, a quantity of green matter rises to the surface, which in some plants is very abundant. This is removed by a perforated tin dish, and preserved. It ceases to appear soon after the liquid begins to boil. The boiling is continued till rather more than half the fluid has been evaporated, when the decoction is poured into a conical pan and allowed to cool. An abundant dark-green precipitate forms, from which the supernatant liquid is poured off; and this, having been reduced one-half by a second boiling, is again allowed to stand. The precipitate which now falls is less green than the first. The remaining fluid is once more placed over the fire, and allowed to boil till it assumes the consistence of syrup, when it is removed. The matter at first collected by skimming, together with that precipitated, is now incorporated with it, and the whole placed in a metallic pan, and by means of a water-bath evaporated to the consistence of an extract. In the latter part of the process, care is necessary to prevent the extract from hardening on the sides of the vessel, as it thus loses its fine green colour, and becomes proportionably feeble.

The superiority of this plan over a continuous boiling is, that the portions of active matter which are deposited at different stages of the process, are subjected for a shorter time to heat than if allowed to remain in the liquor, and are consequently less deteriorated. The matter which coagulates before the fluid boils is chiefly albumen, embracing portions of chlorophylle and of the undissolved vegetable fibre. It might probably be thrown away without diminishing the virtues of the extract; but as chlorophylle, though itself inactive, has often associated with it a portion of the active principle, it is the most economical plan to incorporate it with the other matters. Mr. Brande states that one cwt. of fresh aconite yields about five pounds of extract. According to Geiger, one pound yields an ounce and a half.

The Edinburgh process, which was adopted from the Prussian Pharmacopœia, first expresses the leaves, then digests the residue in alcohol, and evaporates the two liquids together. This is an improvement on the other process; as the residue of the leaves after the expression of the juice is still very acrid. But the evaporation of the expressed juice and that of the tincture should be carried on separately to the consistence of a syrup; since, by the present plan, the active matter of both liquids is exposed to heat during the time necessary for the evaporation of the whole.

When properly prepared by means of a water-bath, according to the U. S. and London process, which is that of Störck, this extract has a yellowish-brown colour, with a disagreeable narcotic odour, and the acrid taste of the plant. Prepared according to the Edinburgh process, it is said to be more acrid and more active as a medicine. The extract of aconite may be given in the dose of one or two grains, night and morning, to be gradually increased till the system is affected. Twenty grains or more have been given in the course of a day. Dr. Turnbull states that he has tried several extracts of aconite made by evaporating the expressed juice, and found them almost inert. W.

EXTRACTUM ACONITI ALCOHOLICUM. *U. S. Alcoholic Extract of Aconite.*

"Take of Aconite Leaves, in coarse powder, *a pound;* Diluted Alcohol *four pints.* Moisten the powder with half a pint of the Diluted Alcohol, and, having allowed the mixture to stand for twenty-four hours, transfer it to a percolator, and add gradually the remainder of the Diluted Alcohol. When the last portion of this has penetrated the powder, pour in sufficient water from time to time to keep the mass covered. Cease to filter when the liquid which passes begins to produce a precipitate, as it falls, in that which has already passed. Distil off the Alcohol from the filtered liquor, and evaporate the residue to the proper consistence." *U. S.*

This is essentially the process of the French Codex. The water added is merely intended to expel that portion of the spirituous solution remaining in the aconite; and the filtration is directed to cease when a precipitate begins to appear, because this is an indication that the water is passing. It is important that the heat employed in the evaporation should not be greater than that produced by a vapour-bath, as otherwise decomposition will be apt to ensue. If made from recently dried leaves, which have not yet been impaired by time, this is a good preparation of aconite, and is believed to be more powerful, and to keep better, than the inspissated juice. The dose is half a grain or a grain, to be gradually increased if necessary.

An alcoholic extract prepared from the root is stronger, and may be given in the dose of one-sixth or one-quarter of a grain three times a day, to be gradually increased until its effects are experienced.* W.

EXTRACTUM ALOËS. *Lond.* EXTRACTUM ALOËS AQUOSUM. *Dub. Extract of Aloes.*

"Take of Socotrine Aloes *fifteen ounces;* Boiling Distilled Water *a gallon* [Imperial measure]. Macerate for three days with a gentle heat; then strain the liquor, and set it by that the dregs may subside. Pour off the clear liquor, and evaporate it to a proper consistence." *Lond.*

"Take of Hepatic Aloes, in coarse powder, *four ounces* [avoirdupois]; Water *two pints* [Imp. meas.]. Boil the Aloes until it is dissolved; when the solution is cold and the dregs have subsided, pour off the clear liquid, and evaporate it to a proper consistence." *Dub.*

Off. Prep. Decoctum Aloës Compositum; Pilula Colocynthidis Composita.

EXTRACTUM ALOËS BARBADENSIS. *Lond. Extract of Barbadoes Aloes.*

"Prepare this in the manner directed for Extract of Aloes." *Lond.*

The object of these processes is to separate from aloes the resinoid matter, the *apotheme* of Berzelius, which is supposed to irritate the bowels, without possessing purgative properties; but the truth appears to be, that, when deprived of a small proportion of adhering extractive, this matter is quite inert. It cannot, therefore, injuriously affect the virtues of the medicine; and, as it exists in comparatively small proportion, and during the process a part of the extractive becomes insoluble, the preparation may be considered as at best unnecessary. The dose of the purified aloes is from five to fifteen grains.

Off. Prep. Pilula Aloës cum Sapone. W.

EXTRACTUM ANTHEMIDIS. *Ed. Extract of Chamomile.*

"Take of Chamomile [dried flowers] *a pound.* Boil it with *a gallon* [Imperial measure] of Water down to four pints; filter the liquor hot; evaporate in the vapour-bath to the proper consistence." *Ed.*

According to Mr. Brande, one cwt. of dried chamomile flowers affords upon an average 48 pounds of extract.

This extract has a deep-brown colour, and the bitter taste of chamomile, but

* *Plaster of Aconite.*—It is often desirable to employ aconite externally in the form of a plaster, and for this purpose the alcoholic extract of the root may be advantageously resorted to. Professor Procter prepares such a plaster by the following process. Mix four ounces of the coarsely powdered root with six fluidounces of alcohol (sp. gr. 0·835), macerate for 24 hours, then submit the mixture to percolation with alcohol, so as to obtain a pint of tincture. From this distil off three-fourths of the alcohol, and evaporate the residue by a water-bath to a syrupy consistence. While it is still hot, add three ounces and a half of adhesive plaster, previously melted, and stir the mixture constantly till it cools. About four ounces of plaster are thus obtained. (*Am. Journ. of Pharm.* xxv. 202.) —*Note to the tenth edition.*

is wholly destitute of aroma; the volatile oil having been entirely driven off during the process. It does not, therefore, possess the peculiar virtues of the flowers; but is simply a mild bitter, which may sometimes be advantageously combined with laxatives and mineral tonics in debilitated states of the digestive organs. All the effects of the flowers may be obtained from it by adding a little of the oil of chamomile. It is most used, however, as a vehicle for other tonics in the pilular form. The dose is from ten to twenty grains. An extract may be prepared, having the peculiar flavour as well as bitterness of chamomile, by macerating the flowers in water, and evaporating the infusion in vacuo. W.

EXTRACTUM BELLADONNÆ. *U. S., Lond., Ed., Dub. Extract of Belladonna.*

This is prepared from fresh Belladonna (leaves) in the manner directed by the *U. S. Pharmacopœia* for extract of stramonium leaves (see *Extractum Stramonii Foliorum*); and by the *London* for extract of aconite (see *Extractum Aconiti*).

"Take of Belladonna, fresh, *any convenient quantity*. Bruise it in a marble mortar into a uniform pulp; express the juice; moisten the residuum with water, and express again. Unite the expressed fluids, filter them, and evaporate the filtered liquid in the vapour-bath to the consistence of firm extract, stirring constantly towards the close." *Ed.*

"Take of fresh Belladonna Leaves, collected when the plant begins to flower, *any convenient quantity*. Crush them in a mortar, express the juice, and allow it to stand for twenty-four hours. Pour off the clear liquor, and set it aside for subsequent use; and having placed the sediment on a calico filter, wash it with an equal bulk of distilled water, and mix the washings with the decanted liquors. When, by the application of a water heat, coagulation has occurred, skim off the coagulated matter, filter the hot liquid through flannel, mix in now the washed sediment, and evaporate to the consistence of a firm extract, by a steam or water bath, constantly stirring, particularly towards the close of the evaporation." *Dub.*

From the experiments of MM. Solon and Soubeiran, it appears that, in relation to this extract, the insoluble matter separated from the expressed juice by filtering, and that coagulated by heat, are nearly if not quite inert; so that advantage results from clarifying the juice by these means before evaporating it. Mr. Brande states that one cwt. of fresh belladonna yields from 4 to 6 pounds of extract. According to M. Recluz, nearly ten parts may be obtained from one hundred. The extract employed in this country is brought chiefly from England; but Mr. Alfred Jones has found that it may be prepared of equally good quality from the plant grown in the United States. (*Am. Journ. of Pharm.*, xxiv. 108.) It has usually a dark-brown colour, a slightly narcotic not unpleasant odour, a bitterish taste, and a soft consistence which it long retains. Asparagin has been found in this extract. (*Journ. de Pharm.*, xxi. 178.)

Its medical properties and uses have been detailed under the head of Belladonna. A few words in relation to its mode of application may be proper here. For the dilatation of the pupil, it is either mixed with water to the consistence of cream and rubbed on the brow and eyelids, or dissolved in water and dropped into the eye. In rigidity of the os uteri, it is applied at intervals to the neck of the uterus, mixed with simple ointment in the proportion of two drachms to an ounce; but care must be taken not too powerfully to affect the system; and the preparation, therefore, should be used in a small quantity at first. In irritability of the bladder, chordee, spasm of the urethra, and painful constriction of the rectum, it may either be rubbed in the form of ointment upon the perineum, along the urethra, &c., or may be used in the form of enema; but care is requisite not to introduce it too freely into the bowel. It is sometimes smeared upon the

bougie, mixed with oil, in the treatment of stricture of the urethra. In the form of ointment it has been beneficially employed in phymosis and paraphymosis, and in that of plaster or ointment, in local pains of a neuralgic or rheumatic character. (See *Emplastrum Belladonnæ.*) The dose of the extract is uncertain on account of its variable strength. The best plan is to begin with one-quarter or one-half of a grain, repeated two or three times a day, and gradually to increase the dose till the effects of the medicine are experienced. To a child two years old not more than one-twelfth of a grain should be administered at first.

Off. Prep. Emplastrum Belladonnæ; Unguentum Belladonnæ. W.

EXTRACTUM BELLADONNÆ ALCOHOLICUM. *U. S. Alcoholic Extract of Belladonna.*

This is directed by the U. S. Pharmacopœia to be prepared from Belladonna, in coarse powder, in the same manner as the alcoholic extract of aconite. (See *Extractum Aconiti Alcoholicum.*) It is a good preparation, though less necessary than some other spirituous extracts of the narcotic plants; as the inspissated juice, or common extract of belladonna, can generally be procured of good quality. It is one of the officinals of the French Codex. The dose to begin with is half a grain. W.

EXTRACTUM CINCHONÆ FLAVÆ. *U. S.* EXTRACTUM CINCHONÆ. *Lond., Ed. Extract of Yellow Bark.*

"Take of Yellow Bark, in coarse powder, *a pound;* Alcohol *four pints;* Water *a sufficient quantity.* Macerate the Yellow Bark with the Alcohol for four days; then filter by means of a percolator, and, when the liquid ceases to pass, pour gradually upon the Bark sufficient Water to keep its surface covered. When the filtered tincture measures four pints, set it aside, and proceed with the filtration until six pints of infusion are obtained. Distil off the alcohol from the tincture, and evaporate the infusion, till the liquids respectively are brought to the consistence of thin honey; then mix them, and evaporate so as to form an extract." *U. S.*

"Take of Yellow Bark, coarsely powdered, *three pounds;* Distilled Water *six pints* [Imperial measure]. Add four pints of the Water to the Bark, and stir constantly with a spatula until it is thoroughly moistened; macerate for twenty-four hours, and strain through linen. Macerate what remains in the rest of the water for twenty-four hours, and strain. Then mix the liquors, and evaporate to the proper consistence." *Lond.*

"Take of any of the varieties of Cinchona, but especially the Yellow or Red Cinchona, in fine powder, *four ounces;* Proof Spirit *twenty-four fluidounces.* Percolate the Cinchona with the Spirit; distil off the greater part of the spirit; and evaporate what remains in an open vessel over the vapour-bath to a due consistence." *Ed.*

EXTRACTUM CINCHONÆ PALLIDÆ. *Lond.* EXTRACTUM CINCHONÆ. *Ed. Extract of Pale Bark.*

The *London* and *Edinburgh Colleges* prepare this from Pale Bark in the same manner as extract of yellow bark. (See *Extractum Cinchonæ Flavæ.*)

EXTRACTUM CINCHONÆ RUBRÆ. *U. S., Lond.* EXTRACTUM CINCHONÆ. *Ed. Extract of Red Bark.*

This is directed, in the Pharmacopœias recognising it, to be prepared from Red Bark in the same manner as extract of yellow bark. (See *Extractum Cinchonæ Flavæ.*)

Either of the above processes will afford an efficient extract; and they are all much preferable to the old methods, in which the virtues of the bark were extracted by boiling. The U. S. or Edinburgh process is preferable to that of the

London Pharmacopœia, as water does not thoroughly exhaust the bark, and the method of percolation is more efficient than maceration simply. It is very desirable that the evaporation, in the preparation of this extract, should be effected at a low temperature.

A very good extract of bark was formerly prepared, in the shops of Philadelphia, by macerating cinchona for a considerable length of time in a large proportion of water, and slowly evaporating the infusion, by a very moderate heat, in large shallow dishes placed upon the top of a stove. Before the use of the sulphate of quinia had superseded that of most other preparations of bark, we employed this extract with success in the treatment of intermittents, and found ten grains of it equivalent to nearly a drachm of the powdered cinchona.

According to Mr. Brande, one cwt. of fine crown bark (best pale bark) yields on an average 28 pounds of watery extract, and 25 pounds of alcoholic extract. It is best that the bark should be only coarsely powdered when submitted to decoction or maceration; as in this state it is sufficiently penetrable by the solvent, and more readily separated after being exhausted. The extract should always be brought to the hard dry state in which it may be pulverized; as it is thus less apt to be injured by exposure, and in the state of powder may be more uniformly incorporated with other substances. It is best prepared from the yellow (*Calisaya*) or the red bark.

Medical Uses. The extract of Peruvian bark is at present much less employed than before the discovery of quinia. It is still, however, occasionally prescribed as a tonic in combination with other medicines; and as it possesses, when properly prepared with a spirituous menstruum, almost all the active principles as they exist in the bark itself, it may be used in preference to the sulphate of quinia, whenever it is supposed that the latter is incapable of exerting all the curative influence of cinchona. We are told, however, that on account of the high price of Calisaya bark, much of the extract as at present in the shops is prepared from inferior varieties. The dose is from ten to thirty grains, equivalent to about a drachm of the powdered bark. W.

EXTRACTUM COLCHICI. *Lond.* *Extract of Colchicum.*

This is prepared in the manner directed for extract of aconite; the cormus being first deprived of its coating. (See *Extractum Aconiti.*)

There scarcely seems to be occasion for both this and the following extract of meadow-saffron bulb. The dose is one or two grains.

In Great Britain a preparation called *preserved juice of colchicum* is given in the dose of five minims or more. It is prepared by expressing the fresh bulb, allowing it to stand for forty-eight hours, so that the feculent matter may be deposited, then adding one-quarter of its bulk of alcohol, allowing it again to stand for a short period, and ultimately filtering. W.

EXTRACTUM COLCHICI ACETICUM. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Acetic Extract of Colchicum.*

"Take of Colchicum Root, in coarse powder, *a pound;* Acetic Acid *four fluid-ounces;* Water *a sufficient quantity.* To the Acetic Acid add a pint of Water, and mix the resulting liquid with the Colchicum Root. Transfer the mixture to a percolator, and pour Water gradually upon it until the liquid passes with little or no taste. Lastly, evaporate the liquid, in a porcelain vessel, to the proper consistence." *U. S.*

"Take of fresh Colchicum Cormus [bulb] *a pound;* Acetic Acid *three fluid-ounces.* Bruise the Cormus previously deprived of its coating, gradually sprinkling in the Acetic Acid; then express the juice, and evaporate it, without straining, to the proper consistence." *Lond.*

"Take of Bulb of Colchicum *a pound;* Pyroligneous Acid [acetic acid, sp. gr.

1·034] *three fluidounces.* Beat the Colchicum to a pulp, gradually adding the Acid; express the liquor, and evaporate it in a porcelain vessel (not glazed with lead) over the vapour-bath to the due consistence." *Ed.*

"Take of Colchicum Root, dried, *four ounces* [avoirdupois]; Dilute Acetic Acid *eight fluidounces.* Digest the Root in the Acid for fourteen days, then filter, and evaporate by means of a water-bath, to the consistence of a soft extract." *Dub.*

As the fresh colchicum bulb is rarely to be had in this country, the U. S. Pharmacopœia employs the dried bulb; and its process, if properly conducted, will afford a very efficient extract. Some inconveniences are experienced in preparing the extract, according to the London process, from the recent bulb by expression, which would seem to render the U. S. process under all circumstances preferable. (*Pharm. Journ. and Trans.*, xiii. 62.)

The use of the acetic acid, in this preparation, is to render more soluble the alkaline principle upon which the virtues of meadow-saffron are thought to depend. The acetic extract of colchicum is highly commended by Sir C. Scudamore, who, however, prefers it made by evaporating to the consistence of honey, a saturated acetic infusion of the dried bulb. (*Lond. Med. Gazette*, Dec. 10, 1841.) The dose of the extract is one or two grains, to be repeated two or three times a day, and increased if necessary. W.

EXTRACTUM COLOCYNTHIDIS. *Lond., Ed. Extract of Colocynth.*

"Take of Colocynth, sliced and deprived of its seeds, *three pounds;* Distilled Water *half a gallon* [Imperial measure]. Macerate the Colocynth for thirty-six hours, occasionally pressing it with the hand. Express the liquor strongly and strain. Finally evaporate to the proper consistence." *Lond.*

"Take of Colocynth *a pound;* Water *two gallons.* Boil gently for six hours, replacing the evaporated water occasionally. Strain the liquor while hot; and evaporate it in the vapour-bath to the due consistence." *Ed.*

Colocynth should be deprived of its seeds, as directed by the London College, before being submitted to the action of the menstruum. Dr. Duncan found half a pound of colocynth to contain 2770 grains of seeds, which, boiled by themselves, yielded almost nothing to water. Boiling water extracts so much pectic acid and mucilage from colocynth, that the decoction or hot infusion gelatinizes on cooling. Hence the Edinburgh College directs that the decoction should be strained while hot. But the extract made in this way is loaded with inert matter, and, besides, is apt to be mouldy or so tough and hard as to resist trituration and formation into pills. Hence the London College, following in this respect the French Codex, directs in the last edition of its Pharmacopœia, maceration with cold water; but there is reason to believe that the very large proportion of colocynth ordered is a mistake; *three pounds* having probably been inadvertently substituted for *three ounces.* In the former London process, in which boiling was directed, the proportion was *a pound* of colocynth to *two gallons* of water, which is the same as *three ounces* to *half a gallon;* and it is probable that the only difference intended was the use of cold instead of boiling water. Besides, it is admitted that the *compound pill of colocynth* of the present London Pharmacopœia was designed as a substitute for the old *compound extract*, to be given in the same dose; but, if made with the present simple extract, it has been found to be much more powerful than the old preparation, so that it cannot with propriety be given in the same quantity; while, if made with simple extract prepared from three ounces of the pulp to half a gallon of water, it has precisely the same strength. (See *Pharm. Journ. and Trans.*, xii. 271, 376, and 495.) Upon the whole it will be safest to adopt the three ounces in making this preparation; in which case it may be used, as formerly recommended, in the dose of

from five grains to half a drachm; whereas if it be made in precise compliance with the formula, the dose has not been well ascertained, but would certainly be much less. This extract is little used in the United States.

Off. Prep. Enema Colocynthidis; Pilula Colocynthidis Composita. W.

EXTRACTUM COLOCYNTHIDIS COMPOSITUM. *U. S. Compound Extract of Colocynth.*

"Take of Colocynth, deprived of the seeds and sliced, *six ounces;* Aloes, in powder, *twelve ounces;* Scammony, in powder, *four ounces;* Cardamom, in powder, *an ounce;* Soap [Castile] *three ounces;* Diluted Alcohol *a gallon.* Macerate the Colocynth in the Diluted Alcohol, with a gentle heat, for four days. Express and filter the liquor, and add to it the Aloes, Scammony, and Soap; then evaporate to the proper consistence, and near the end of the process, mix the Cardamom with the other ingredients." *U. S.*

The object of the soap in this formula is to improve the consistence of the mass, which, when hardened by time, it renders more soluble in the liquors of the stomach. It may possibly also serve the purpose of qualifying the action of the aloes. Diluted alcohol is a much better solvent of the active principle of colocynth than water. The proper consistence, alluded to in this process, is that which is adapted to the formation of pills; but as it is very convenient to have it in the state of powder for admixture with other substances, a portion of the extract should be evaporated to dryness, by exposing it in thin layers to dry air for a few days.

This extract is an energetic and safe cathartic, possessing the activity of its three purgative ingredients, with comparatively little of the drastic character of the colocynth and scammony. It may be still further and advantageously modified by combination with rhubarb, jalap, calomel, &c., with one or more of which it is very often united in prescription. In such combination it is much employed wherever an active cathartic is desirable, particularly in the commencement of fevers and febrile complaints, in congestion of the liver or portal system, and in obstinate constipation. In small doses it is an excellent laxative in that state of habitual costiveness, depending on a want of the due irritability of the bowels, which often occurs in old people. The dose is from five to thirty grains, according to the effect to be produced, and the susceptibility of the bowels. A very eligible combination is the compound cathartic pill of the U. S. Pharmacopœia. We are informed that much of the extract sold in this country is made with inferior scammony and aloes, and an insufficient proportion of colocynth, so that it is comparatively inert. Cheap compound extract of colocynth should be looked on with suspicion, and the apothecary should prepare it for himself.

Off. Prep. Pilulæ Catharticæ Compositæ. *U. S.* W.

EXTRACTUM CONII. *U. S., Lond., Ed., Dub. Extract of Hemlock.*

"Take of fresh Hemlock Leaves *a pound.* Bruise them in a stone mortar, sprinkling on them a little water; then express the juice, and, having heated it to the boiling point, filter it, and evaporate to the proper consistence, either in a vacuum with the aid of heat, or in shallow vessels, at ordinary temperatures, by means of a current of air directed over the surface of the liquid." *U. S.*

The *London College* directs this extract to be made in the same manner as extract of aconite (see *Extractum Aconiti*), and the *Dublin*, as extract of belladonna (see *Extractum Belladonnæ*).

"Take of Conium *any convenient quantity.* Beat it into a uniform pulp in a marble mortar, express the juice, and filter it. Let this juice be evaporated to the consistence of a very firm extract, either in a vacuum with the aid of heat, or spontaneously in shallow vessels exposed to a strong current of air freed of

dust by gauze-screens. This extract is of good quality only when a very strong odour of conia is disengaged by degrees on its being carefully triturated with Aqua Potassæ." *Ed.*

The most important point in the preparation of this extract is to evaporate the juice without an undue degree of heat. At a temperature of 212° or upwards, its active principle undergoes rapid decomposition, being converted into resinous matter and ammonia. This is detected by the operator by the ammoniacal odour mixed with that which is peculiar to the plant. The juice always to a certain extent undergoes this decomposition when evaporated over a fire, and is not exempt from it even when the heat is regulated by a water-bath. Hence the propriety of the directions in the U. S. and Edinburgh Pharmacopœias. An excellent plan in the evaporation is to conduct it first in a vacuum, and afterwards in shallow vessels with a current of air at common temperatures. By the present U. S. process, which is an improvement upon that of the former edition of the Pharmacopœia, the extract is procured in a more concentrated state by heating the juice to the boiling point and then filtering, whereby the inert albumen is coagulated, and, along with the equally inert chlorophylle and vegetable fibre, is separated from the liquid before evaporation. Long-continued exposure to the air is productive of the same result as too much heat, so that old extracts are frequently destitute of activity. (*Journ. de Pharm.*, xxii. 416.) No one of the extracts is more variable in its qualities than this. The season at which the herb is collected, the place and circumstances of its growth, the method of preparing the extract, are all points of importance, and are all too frequently neglected. (See *Conii Folia.*) In this country the process is often very carelessly conducted; and large quantities of an extract, prepared by boiling the plant in water and evaporating the decoction, have been sold as the genuine drug. The apothecary should always prepare the extract himself, or procure it from persons in whom he can have entire confidence. That imported from London has usually been considered the best; but we have seen and tried the extract prepared by the Messrs. Tilden and Co., of New York, by evaporation in vacuo at a low heat, and have found it superior to any that we had previously employed. It is not improbable that, as suggested to us by Professor Procter, the addition of a portion of acetic acid to the juice before evaporation, might tend to fix the conia, and enable it better to resist the influence of heat than in its native combination. The activity of any specimen of the extract may be in some measure judged of by rubbing it with potassa, which, disengaging the *conia* and rendering it volatile, gives rise to the peculiar mouse-like odour of that principle. If no odour be evolved under these circumstances, the extract may be deemed inert.

The extract of hemlock prepared without separating the chlorophylle has a fresh olive or green colour; but made according to the U. S. process is brownish. It should have a strong narcotic somewhat fetid odour, and a bitterish saline taste. According to Brande, from three to five pounds are obtained from one cwt. of the leaves. M. Recluz got rather more than an ounce from sixteen ounces. Of the medical properties and application of this extract, we have spoken under the head of Conii Folia. The dose is two grains two, three, or four times a day, to be gradually increased till evidences of its action upon the system are afforded. It may be administered in pill or solution.

Off. Prep. Cataplasma Conii; Pilula Conii Composita. W.

EXTRACTUM CONII ALCOHOLICUM. *U. S. Alcoholic Extract of Hemlock.*

This is prepared, according to the U. S. Pharmacopœia, from Hemlock Leaves, in coarse powder, in the manner directed for alcoholic extract of aconite. (See *Extractum Aconiti Alcoholicum.*)

This is one of the French officinal extracts, and, when well made from recently and carefully dried leaves, is a good preparation. The same caution is requisite in evaporating in this case as in that of the inspissated juice or common extract. The dose, to begin with, is two or three grains. W.

EXTRACTUM DIGITALIS. *Ed.* *Extract of Foxglove.*

This is prepared from the fresh leaves, in the manner directed by the *Edinburgh College* for extract of hemlock. (See *Extractum Conii.*)

This preparation appears to us, considering the activity of the leaves themselves, and the at least equal uncertainty of the extract, to be quite superfluous. The dose is from half a grain to two grains. W.

EXTRACTUM DULCAMARÆ. *U. S.* *Extract of Bittersweet.*

This is prepared, according to the U. S. Pharmacopœia, from Bittersweet, in coarse powder, in the manner directed for extract of gentian. (See *Extractum Gentianæ.*)

The preparation is well known on the continent of Europe, but little used in this country or Great Britain. The dose is from five to ten grains; but much more may be given with impunity. W.

EXTRACTUM GENTIANÆ. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Extract of Gentian.*

"Take of Gentian, in coarse powder, *a pound;* Water *a sufficient quantity.* Mix the Gentian with a pint of Water, and, after allowing the mixture to stand for twenty-four hours, transfer it to a percolator, and pour Water upon it gradually until the liquid passes but slightly impregnated with the properties of the Gentian. Heat the filtered liquor to the boiling point, strain, and evaporate to the proper consistence." *U. S.*

"Take of Gentian, sliced, *three pounds;* Distilled Water *six pints* [Imperial measure]. Macerate for twelve hours in four pints of the Water; pour off the liquor and strain. To the residue add two pints of the Water, macerate for six hours, and lightly express the liquor and strain. Lastly, having mixed the liquors, evaporate to the proper consistence." *Lond.*

The *Dublin* process does not differ essentially from that of the London College.

"Take of Gentian *any convenient quantity.* Bruise it to a moderately fine powder, mix it thoroughly with half its weight of Distilled Water; in twelve hours put it into a proper percolator, and exhaust it by percolation with temperate Distilled Water; concentrate the liquid, filter it before it becomes too thick, and evaporate in the vapour-bath to the due consistence." *Ed.*

The London and Dublin Colleges have very properly abandoned decoction in preparing this extract, but have not adopted percolation as employed in the U. S. and Edinburgh processes, which is a great improvement over the plan of maceration. The extract, however, may be advantageously made by macerating the root in two parts of water for thirty-six hours, then expressing in a powerful press, again macerating with additional water and in like manner expressing, and evaporating the united expressed liquors. MM. Guibourt and Cadet de Vaux obtained by maceration in cold water an extract not only greater in amount, but more transparent, more bitter, and possessing more of the colour and smell of the root than that prepared by decoction. Guibourt attributes this result to the circumstance that, as gentian contains little if any starch, it yields nothing to boiling which it will not also yield to cold water; while decoction favours the combination of a portion of the colouring matter with the lignin. But this opinion requires modification, now that it is understood that gentian contains pectic acid, which water will extract when boiling hot, but not when cold. For observations in relation to the best modes of evaporation in the

formation of extracts, the reader is referred to page 964. Gentian, according to Brande, yields half its weight of extract by decoction.

As ordinarily procured, the extract of gentian is nearly inodorous, very bitter, of a dark-brown colour approaching to black, shining, and tenacious. It is frequently used as a tonic in the form of pill, either alone or in connexion with metallic preparations. The dose is from ten to thirty grains.

Off. Prep. Pilulæ Aloës Compositæ. W.

EXTRACTUM HÆMATOXYLI. *U. S., Lond., Ed. Extract of Logwood.*

"Take of Logwood, rasped, *a pound;* Water *a gallon.* Boil down to four pints, and strain the liquor while hot; then evaporate to the proper consistence." *U. S.*

"Take of Logwood, in fine chips, *a pound;* boiling Water *a gallon* [Imperial measure]. Macerate for twenty-four hours, then boil down to four pints, strain, and concentrate in the vapour-bath to the due consistence." *Ed.*

The *London College* takes *two pounds and a half* of sliced logwood and *two gallons* [Imperial measure] of boiling distilled water; macerates for twenty-four hours, then boils down to a gallon, and strains the liquor while hot; and lastly evaporates to the proper consistence.

The evaporation should be carried so far that the extract may be dry and brittle when cold. About twenty pounds of it are obtained from one cwt. of logwood. (*Brande.*) It is of a deep ruby colour, and an astringent sweetish taste; and possesses all the medical virtues of the wood. If given in pills, these should be recently made, as, when long kept, they are said to become so hard as sometimes to pass unchanged through the bowels. The extract, however, is best administered in solution. The dose is from ten to thirty grains. This extract is said to be prepared largely in Yucatan and other parts of Mexico. W.

EXTRACTUM HELLEBORI. *U. S. Extract of Black Hellebore.*

This is prepared, according to the U. S. Pharmacopœia, from Black Hellebore, in coarse powder, in the manner directed for alcoholic extract of aconite. (See *Extractum Aconiti Alcoholicum.*)

In consequence, probably, of the injurious influence of heat upon black hellebore, the watery extract prepared by decoction is little if at all stronger than the root. The process of percolation with cold spirit, has, therefore, been adopted in the last edition of the U. S. Pharmacopœia; and, if proper attention be paid to conduct the evaporation at as low a temperature, and with as little exposure to the air as possible, an efficient extract will probably be obtained. Care should be taken to separate from the sides of the vessel any of the resin deposited during the evaporation, and mix it with the rest. The extract operates as a drastic purge in the dose of twelve or fifteen grains, but is seldom employed.

The former French Codex contained a process for preparing the extract of hellebore, according to the method of Bacher. Two pounds of the root and half a pound of carbonate of potassa are digested, with a moderate heat, for twelve hours, in eight pounds of alcohol of 22° B.; the tincture is strained with expression; the residuum is again digested with eight pounds of white wine for twenty-four hours; the wine is expressed, and having stood four hours to settle is decanted; the liquors are then mixed, and with a gentle heat evaporated to the consistence of an extract. One ounce of this extract, mixed with the same quantity of myrrh, and with ten scruples of the powdered leaves of Centaurea benedicta, and made into pills of one grain each, constitutes the preparation known as the *tonic pills of Bacher*, formerly much used in amenorrhœa and dropsy, and probably not without advantage, especially in the former of these diseases. The dose is from ten to twenty pills during the day. An additional

quantity of diluted alcohol might, without disadvantage, be substituted for the wine in the preparation of the extract. W.

EXTRACTUM HYOSCYAMI. *U. S., Lond., Ed., Dub. Extract of Henbane.*

This is prepared from fresh Henbane Leaves in the manner directed by the U. S. Pharmacopœia for extract of stramonium leaves (see *Extractum Stramonii Foliorum*), by the *London* for extract of aconite (see *Extractum Aconiti*), by the *Edinburgh* for extract of hemlock (see *Extractum Conii*), and by the *Dublin* for extract of belladonna (see *Extractum Belladonnæ*).

MM. Solon and Soubeiran have shown that the insoluble matter separated from the expressed juice of henbane by filtering, and that coagulated by heat, are nearly, if not quite, inert; so that the juice may be advantageously clarified before evaporation. (*Amer. Journ. of Pharm.*, viii. 228.) Extract of henbane is derived chiefly from England. It is at present, however, prepared by the Messrs. Tilden & Co., of New York, by the vacuum process. Mr. Brande says that one cwt. of the fresh herb affords between four and five pounds. M. Recluz obtained about one part from sixteen.

The extract, as it reaches us, is of a dark-olive colour almost black, of a narcotic rather unpleasant odour, and a bitterish, nauseous, slightly saline taste. It retains its softness for a long time; but at the end of three or four years becomes dry, and exhibits, when broken, small crystals of nitrate of potassa and chloride of sodium. (*Recluz.*) Like all the inspissated juices it is of variable strength, according to its age, the care used in its preparation, and the character of the leaves from which it was procured. (See *Hyoscyamus.*)* In its use, therefore, it is advisable to begin with a moderate dose, two or three grains for instance, and gradually to increase the quantity till some effect is experienced, and the degree of efficiency of the particular parcel employed is ascertained. It is usually given in pill. It is sometimes used externally for the same purposes as extract of belladonna.

Off. Prep. Pilulæ Colocynthidis et Hyoscyami. W.

EXTRACTUM HYOSCYAMI ALCOHOLICUM. *U.S. Alcoholic Extract of Henbane.*

This is prepared, according to the U. S. Pharmacopœia, from Henbane Leaves, in coarse powder, in the manner directed for alcoholic extract of aconite. (See *Extractum Aconiti Alcoholicum.*)

The alcoholic extract of henbane, if prepared from recently dried leaves, is thought to be more uniform and powerful than the inspissated juice or common extract. It is one of the preparations of the French Codex. The dose is one or two grains, to be gradually increased until its effects are obtained. W.

EXTRACTUM JALAPÆ. *U. S., Lond. Extract of Jalap.*

This is prepared, according to the U. S. Pharmacopœia, from Jalap, in coarse powder, in the manner directed for extract of yellow bark. (See *Extractum Cinchonæ Flavæ.*)

* Much depends on the choice of the leaves; and too little attention is paid to this point. In reference to the biennial plant, there seems to be no doubt that the leaves of the second year are much more efficacious than those of the first, and should, therefore, always be selected. It is stated under Hyoscyamus, in the first part of this work, that the leaves should be gathered soon after the plant has flowered. Mr. Charles Cracknell gives more particular directions. He thinks that the plant is in a fit state for collection only during a very short period, when the flowers at the top are blown, but have not yet begun to fade, and the seed-vessels and seeds which have been formed are still soft and juicy. For other observations on the preparation of this extract, see a paper by Mr. Cracknell in the *Am. Journ. of Pharm.* (23, 245), from *Pharm. Journ. and Trans.*, March, 1851.

"Take of Jalap, in powder, *two pounds and a half;* Rectified Spirit *a gallon* [Imperial measure]; Distilled Water *two gallons* [Imperial measure]. Macerate the Jalap in the Spirit for four days, and pour off the tincture. Boil the residue in the Water down to half a gallon. Filter the tincture and decoction separately; then distil the former and evaporate the latter until they thicken. Lastly, mix the extract with the resin, and evaporate to the proper consistence. Let the extract be kept *soft*, fit for forming pills, and *hard*, so that it may be powdered." *Lond.*

Jalap contains a considerable quantity of starch, which is extracted by decoction, but left behind by cold water. As this principle serves only to impede the filtration or straining, and augment the bulk of the extract, without adding to its virtues, the U. S. process, in which the water is employed at common temperatures, is preferable to the London, in which decoction is resorted to. The use both of alcohol and water is necessary, in order to extract all the medicinal qualities of the drug, and they are employed successively, under the impression that the previous removal of the resin by the former, facilitates the action of the latter. The use of percolation, as directed by the U. S. Pharmacopœia, enables the cold water to extract the soluble parts without the long maceration which would otherwise be necessary. According to Cadet de Gassicourt, water at ordinary temperatures, and in the old mode, acts so slowly, that fermentation takes place before the active matter is all dissolved. Hence, if the extract is prepared without percolation, the residuum, after the tincture has been decanted, should be digested with water at a heat of about 90° or 100° F., which, while it is insufficient for the solution of the starch, enables the solvent to take up the active matter with sufficient rapidity.

One cwt. of jalap affords, according to Mr. Brande, about fifty pounds of aqueous extract and fifteen of resin. The product of the former is somewhat less by infusion than decoction; and the extract is proportionably stronger.

The extract of jalap is of a dark-brown colour, slightly translucent at the edges, and tenacious when not perfectly dry. It contains the resin and gummy extractive, and, consequently, has all the medical properties of the root; but it is not often exhibited alone, being chiefly used as an ingredient of purgative pills, for which it is adapted by its comparatively small bulk. The dose is from ten to twenty grains, or rather more than half that of jalap.

Off. Prep. Pilulæ Catharticæ Compositæ; Pulvis Scammonii Comp. W.

EXTRACTUM *sive* RESINA JALAPÆ. *Ed.* *Extract* or *Resin of Jalap.*

"Take *any convenient quantity* of Jalap, in moderately fine powder; mix it thoroughly with enough of Rectified Spirit to moisten it well; put it in twelve hours into a percolator, and exhaust the powder with Rectified Spirit; distil off the greater part of the Spirit, and concrete the residuum over the vapour-bath to a due consistence." *Ed.*

This process yields the resin of jalap in an impure state. It may be obtained pure by pouring boiling water on the roots, macerating for a day, then cutting them into very thin slices, boiling them three times successively for about ten minutes in water, expressing after each decoction, afterwards boiling them as often and as long in alcohol, and in like manner expressing, finally mixing the tinctures, treating the liquor with animal charcoal, filtering, and evaporating. (Nativelle, *Journ. de Pharm.*, 3e *sér.*, i. 228.) Another mode is to introduce into a displacement instrument, first one part of finely powdered animal charcoal, and afterwards two parts mixed with an equal quantity of powdered jalap, then to pour on alcohol until the liquid which passes equals the jalap, and finally to add to the tincture thus obtained twice its volume of water, so as to precipitate the resin, which is to be washed and dried. (*Christison's Dispensatory.*) The

pure resin is as white as starch, and in doses of from three to five grains is said to purge actively. For use, however, the Edinburgh preparation is sufficiently pure. It is dark-coloured, brittle, and of a shining fracture.

Guaiac is said to be sometimes fraudulently added to the resin of jalap. It may be detected by the green colour it produces, when a few drops of solution of chloride of soda or of lime are added to an alcoholic solution of the suspected resin. (*Journ. de Pharm.*, 3e sér., x. 357.) According to G. A. Kaiser, jalap resin may be distinguished from all other resins by being gradually dissolved by concentrated sulphuric acid, and depositing, after some hours, a brown soft viscid matter. (*Chem. Gaz.*, Jan. 1845, from *Liebig's Annalen.*)

It is now generally believed that the resin of jalap is its sole purgative principle, the gummy extractive being perhaps diuretic. The U. S. or London extract better represents the whole virtues of jalap, and should be preferred when its peculiar hydragogue operation is required. The Edinburgh extract or resin is more powerfully purgative, but is also harsh, and apt to operate painfully. To obviate this effect it is advised that it should be triturated with loaf-sugar, sulphate of potassa, almond emulsion, or other substance calculated to separate its particles. The dose is from four to twelve grains. W.

EXTRACTUM JUGLANDIS. *U.S.* *Extract of Butternut.*

This is prepared from the inner bark of the root of *Juglans cinerea*, in coarse powder, in the manner directed for extract of gentian. (See *Extractum Gentianæ.*)

This extract was formerly for the most part prepared by the country people, who are said to have used the bark of the branches, and even the branches themselves, instead of the inner bark of the root, as directed by the Pharmacopœia; and to have injured the preparation by too much heat. That it should have proved uncertain in the hands of many physicians is, therefore, not a matter of surprise. It should be prepared by the apothecary, and from the inner bark of the root gathered in May or June. Experiments are yet wanting to prove that water is the best solvent of the active principles of this bark. Prof. Procter informs us that he has found an extract of the fresh bark prepared with diluted alcohol to have much more of the pungency of the bark than the officinal.

The extract of butternut is of a black colour, sweetish odour, and bitter astringent taste. In the dose of twenty or thirty grains, it acts as a mild cathartic. (See *Juglans.*) W.

EXTRACTUM KRAMERIÆ. *U. S., Ed.* *Extract of Rhatany.*

This is prepared from Rhatany, in coarse powder (*U. S.*), or in moderately fine powder (*Ed.*), in the manner directed for extract of gentian. (See *Extractum Gentianæ.*)

In selecting a process for the preparation of this extract, it was undoubtedly wise to adopt the mode of displacement, with cold water as the menstruum. (See *page* 436.) It is absolutely necessary to the success of this process, that the root should be well and uniformly comminuted; and the "moderately fine powder" of the Edinburgh Pharmacopœia is, therefore, preferable to the "coarse powder" of our own. The wood of the root yielded to Prof. Procter only 6·8 per cent. of extract, while the bark separated from the wood yielded 33 per cent. As the wood is of difficult pulverization, the inference is obvious, that, in powdering the roots, the ligneous portion may be rejected with advantage. (*Am. Journ. of Pharm.*, xiv. 270.) As a prolonged exposure of the infusion to the air is attended with the absorption of oxygen, and the production of insoluble apotheme, it is desirable that the evaporation should be conducted rapidly or in a vacuum. There scarcely appears to be occasion, in the case of rhatany, for heating and filtering the infusion before evaporation, the only use of which is to get rid of albumen, which is not among the recognised ingredients of the root.

Very inferior extracts of rhatany are often found in the shops. Such is the South American extract, which has been occasionally imported. As the product obtained by decoction is greater than that afforded by the officinal plan, the temptation to substitute the former is not always resisted, although it has been shown to contain nearly 50 per cent. of insoluble matter. Some druggists prepare the extract with an alcoholic menstruum with a view to the greater product; but the extract thus prepared has from 20 to 30 per cent. less of the active principle than the officinal. A substance was shown to us by a respectable apothecary of this city, said to have been imported as extract of rhatany from Europe, which was nearly tasteless, and was plausibly conjectured to be the dried coagulated matter of old tincture of kino.

Extract of rhatany should have a reddish-brown colour, a smooth shining fracture, and a very astringent taste; and should be almost entirely soluble in water. Its virtues may be considered as in proportion to its solubility. It is much used for all the purposes for which the astringent extracts are employed. The dose is from ten to twenty grains.

Off. Prep. Syrupus Krameriæ. W.

EXTRACTUM LATUCÆ. *Lond.* *Extract of Lettuce.*

This extract is prepared by the *London College* from fresh Lettuce leaves in the same manner as extract of aconite. (See *Extractum Aconiti.*)

The claims of this extract to favourable notice are at least very questionable. Consisting chiefly of the common sap of the plant, which is inert, with a variable, but always small proportion of the milky secretion, on which the activity of lettuce depends, it is at best a feeble and uncertain preparation. Lactucarium possesses all its virtues, with more strength and uniformity of action. The dose of the extract is from five to fifteen grains. W.

EXTRACTUM LUPULI. *Lond., Ed.* *Extract of Hops.*

"Take of Hops *two pounds and a half;* boiling Distilled Water *two gallons* [Imperial measure]. Macerate for twenty-four hours; then boil to a gallon, and strain the liquor while hot; lastly, evaporate to the proper consistence." *Lond.*

The *Edinburgh College* prepares this in the same manner as extract of logwood. (See *Extractum Hæmatoxyli.*)

Since the discovery of the fact that the active properties of hops reside chiefly in the lupulin, this extract has not been deemed an eligible preparation, and has been little used. It has the bitterness of the strobiles without their aroma. Lupulin may be advantageously substituted for it in all cases in which it was formerly employed. Mr. Brande says that the average yield of one cwt. of hops is forty pounds of the extract. The dose is from ten to thirty grains.

Under the inappropriate name of *humuline*, an extract has been prepared by first treating hops with alcohol and subsequently with water, evaporating the tincture and infusion separately, and mixing the products. (*Pharm. Journ. and Trans.*, xiii. 231.) W.

EXTRACTUM NUCIS VOMICÆ. *U.S., Lond., Ed.* *Extract of Nux Vomica.*

"Take of Nux Vomica *a pound;* Alcohol *a sufficient quantity.* Expose the Nux Vomica to steam till it is softened; then, having sliced and dried it, grind it into powder. Introduce it into a percolator, and pour Alcohol upon it gradually until the liquid passes without bitterness. Distil off the greater part of the alcohol from the filtered liquor, and evaporate the residue to the proper consistence." *U. S.*

The *Edinburgh College* treats the nux vomica in the same manner, grinding it to powder in a coffee-mill; then exhausts it with rectified spirit, either by percolation or repeated decoction; and completes the process as above directed.

"Take of Nux Vomica *eight ounces;* Rectified Spirit *three pints* [Imperial measure]. Apply steam to the Nux Vomica so that it may be softened. Having cut it into thin slices, bruise, dry, and macerate it for seven days in two pints of the Spirit. Express the tincture and filter. Macerate what remains in the rest of the Spirit for three days; then again express and filter. Having mixed the tinctures, distil off the greater part of the spirit, and evaporate the remainder to the proper consistence." *Lond.*

This extract is an active preparation of nux vomica, though not always of uniform strength, owing to the variable proportion of strychnia in the substance from which it is prepared. M. Recluz obtained from sixteen ounces of nux vomica the average product of one ounce and a quarter. The dose of the extract is from half a grain to two grains, to be repeated three times a day.* W.

EXTRACTUM OPII. *U. S., Lond., Ed.* EXTRACTUM OPII AQUOSUM. *Dub. Extract of Opium.*

"Take of Opium *a pound;* Water *five pints.* Cut the Opium into small pieces, macerate it for twenty-four hours in a pint of the Water, and reduce it to a soft mass by trituration. Express the liquid, and treat the residue with each of the four remaining pints of Water successively in the same manner. Mix the liquors, filter, and evaporate by means of a water-bath to the proper consistence." *U. S.*

"Take of Opium, in powder, *a pound and a half;* Distilled Water *five pints* [Imperial measure]. To the Opium add gradually two pints and a half of the Water, and macerate for twenty-four hours, occasionally stirring with a spatula; then strain. Macerate the residue in the rest of the Water for twenty-four hours and strain. Lastly, evaporate the strained liquors to the proper consistence." *Lond.*

The *Edinburgh* and *Dublin* processes correspond essentially with that of the U. S. Pharmacopœia.

An advantage of this preparation is that, by the solubility of the extract in water, it affords a convenient method of obtaining quickly an aqueous solution of the active ingredients of opium. It is exceedingly doubtful whether anything is left behind after the opium has been exhausted by water, which materially modifies the action of its anodyne principle; and the extract probably has no advantage on this account over opium. Nor has it the advantage of greater uniformity; as the gum, extractive, &c., taken up by the water, bear no fixed proportion to the active ingredients.

Denarcotized Extract of Opium. Under the impression that the stimulating and unpleasant effects of opium are owing to the narcotina, it has been proposed to separate that principle by treating the extract with ether, which dissolves the narcotina and leaves the morphia with the other ingredients. Robiquet employed cold ether; but M. Dublanc, convinced that the whole of the narcotina was not thus extracted, proposed the following plan. "Take of watery extract of opium 16 ounces; dissolve it in 8 ounces of distilled water; introduce the solution into the water-bath of a still; pour upon it 104 ounces of pure ether; distil off 24 ounces of the ether; take apart the apparatus and decant the ether which floats on the top of the extract; wash the latter while hot with the distilled ether; concentrate the residual matter, dissolve it in distilled water, filter

* Professor Procter informs us, as the result of his own observations, that in the alcoholic extract of nux vomica there is a considerable proportion of fixed oil (℥ij from ℥xvi of the seeds), which will not remain mixed with the other ingredients, becoming fluid in summer, and concreting in cold weather. This he thinks should be separated from the extract, and shaken with a little diluted alcohol, which separates any adhering active matter from it. The washings should be evaporated, and the residuum mixed with the extract; the fatty matter being thrown away.—*Note to the tenth edition.*

the solution, and evaporate to a proper consistence." It is very doubtful, however, whether any useful end is gained by this expensive operation, as it is not by any means conclusively settled that narcotina does in fact produce the unpleasant effects which have been attributed to it; and, even admitting the fact, the preparations of morphia, which are of uniform strength, are greatly preferable to the *denarcotized extract.*

The dose of the extract of opium prepared by the U. S., Edinburgh, or Dublin process is about one-half that of opium itself. The London extract, according to Brande, is never stronger, and is sometimes weaker than opium. This statement, however, has reference to the preparation of the Pharmacopœia of 1836. In the present, the maceration is continued longer, but is still probably insufficient. Recluz obtained from sixteen ounces of opium an average product of nine ounces by hot water and six by cold.

Off. Prep. Emplastrum Opii; Vinum Opii. W.

EXTRACTUM PAPAVERIS. *Lond., Ed. Extract of Poppy.*

"Take of Poppy [capsules], freed from their seeds, and bruised, *fifteen ounces;* boiling Distilled Water *a gallon* [Imperial measure]. Macerate for twenty-four hours, then boil down to four pints, and strain the liquor while hot; lastly, evaporate to the proper consistence." *Lond.*

The *Edinburgh* process corresponds closely with the above; boiling water simply, instead of boiling distilled water being employed, and evaporation over the vapour-bath directed.

Mr. Brande observes in relation to this extract, that if prepared over the open fire it is often nearly inert. He states, moreover, that it is apt to be of a troublesome consistence, too hard to be formed into pills, and too tough to be pulverized; and advises that it should always be carefully dried till it becomes sufficiently brittle to admit of being reduced to powder. One cwt. of the capsules, without the seeds, yields, according to this author, the average product of 35 pounds of extract. M. Meurein gives particular directions for making an alcoholic extract of poppy capsules, which may be consulted with advantage by those who may be called on to supply any demand for this preparation. (See *Journ. de Pharm.* 3*e sér.*, xxiii. 341.) We are told that an extract is prepared in this country from the whole herb, cut after the fruit has formed, but while it is yet green. This of course is not the officinal extract, and should not be used as such. The capsules exclusively should be used; and the best time for collecting them is after they have begun to become yellowish, but are not yet dry.

This preparation is little used in the United States. It possesses the virtues of opium, but is much inferior and less uniform in strength. The dose is from five to ten grains. W.

EXTRACTUM PAREIRÆ. *Lond., Ed. Extract of Pareira Brava.*

This is prepared by the *London College* from sliced Pareira Brava in the manner directed for extract of logwood. (See *Extractum Hæmatoxyli.*)

The *Edinburgh College* directs the root to be cut into small chips, dried thoroughly with a gentle heat, then reduced to a moderately fine powder, and treated as directed for the extract of gentian. (See *Extractum Gentianæ.*)

The dose is from ten grains to half a drachm. W.

EXTRACTUM PODOPHYLLI. *U. S. Extract of May-apple.*

This is prepared from the root of *Podophyllum peltatum*, in coarse powder, in the manner directed for the extract of yellow bark. (See *Extractum Cinchonæ Flavæ.*)

It is possessed of the purgative properties of the root, and may be given in the dose of from five to fifteen grains, but is little employed. It might be substituted in all cases for the extract of jalap.

From experiments made by Mr. John R. Lewis, it is probable that the alcoholic extract would be much more powerful as a purgative than the officinal preparation; but it does not follow that it would be more serviceable. (See *Am. Journ. of Pharm.* xix. 170.) W.

EXTRACTUM QUASSIÆ. *U. S., Ed. Extract of Quassia.*

This is prepared, according to the U. S. Pharmacopœia, from the raspings of Quassia, in the manner directed for the extract of gentian. (See *Extractum Gentianæ.*)

The *Edinburgh College* prepares it by cutting the quassia into small chips, drying it thoroughly with a gentle heat, reducing it to a moderately fine powder, and proceeding as directed for the extract of gentian.

According to M. Recluz, sixteen ounces of quassia yield by infusion in water seven drachms of extract; by maceration in alcohol of 19° Baumé, two ounces five drachms and a half. The difference between these quantities is so great that we suspect some mistake in the table of the Dictionnaire des Drogues from which we quote.

The extract of quassia is dark-brown or black, and excessively bitter. It is apt to become dry and disposed to crumble by time. It concentrates a greater amount of tonic power within a given weight than any other extract of the simple bitters; and may, therefore, be given with great advantage in cases in which it is desirable to administer this class of substances in as small a bulk, and with as little inconvenience to the patient as possible. The dose is about five grains, to be given in the form of pill. W.

EXTRACTUM RHEI. *U. S., Lond., Ed., Dub. Extract of Rhubarb.*

"Take of Rhubarb, in coarse powder, *a pound;* Diluted Alcohol *a sufficient quantity.* Mix the Rhubarb with an equal bulk of coarse sand, moisten it thoroughly with Diluted Alcohol, and, having allowed it to stand for twenty-four hours, put it into a percolator, and add Diluted Alcohol gradually until four pints of filtered liquor are obtained; then, by means of a water-bath, evaporate to the proper consistence." *U. S.*

"Take of Rhubarb, in powder, *fifteen ounces;* Proof Spirit *a pint* [Imperial measure]; Distilled Water *seven pints* [Imp. meas.]. Macerate for four days, then strain, and set the liquor by that the dregs may subside. Pour off the clear liquor, and evaporate it to the proper consistence." *Lond.*

"Take of Rhubarb *one pound;* Water *five pints* [Imp. meas.]; cut the Rhubarb into small fragments, macerate it for twenty-four hours in three pints of the Water, filter the liquor through a cloth, and express it with the hands or otherwise moderately; macerate the residuum with the rest of the Water for twelve hours at least, filter the liquor with the same cloth as before, and express the residuum strongly. The liquors, filtered again if necessary, are then to be evaporated together to a proper consistence in the vapour-bath. The extract, however, is obtained of finer quality, by evaporation in a vacuum with a gentle heat." *Ed.*

The *Dublin* process corresponds with that of the Edinburgh College.

Rhubarb yields all its active matter to water and alcohol; but, unless the evaporation is performed with great care and with a moderate heat, it is certain that the purgative principle is, to a greater or less extent, injured or dissipated in the process; and the extract may thus become even less efficient than the root. Among other consequences which result from the boiling temperature, is the formation of a compound of the tannin and starch, which is insoluble in cold water, and upon its precipitation probably carries with it a portion of the purgative principle. There is, moreover, reason to believe that this principle is

volatilizable by heat, and that a portion of it escapes with the vapour. When properly prepared the extract has decidedly the peculiar odour of rhubarb. An advantage which it possesses over the powdered root, independently of its smaller dose, is that it may be given in solution. The dose of the extract is from ten to thirty grains.

Off. Prep. Pilulæ Rhei et Ferri. W.

EXTRACTUM SARSAPARILLÆ. *U. S. Extract of Sarsaparilla.*

The *U. S. Pharmacopœia* prepares this extract from Sarsaparilla, in coarse powder, in the manner directed for alcoholic extract of aconite. (See *Extractum Aconiti Alcoholicum.*)

The watery extract of sarsaparilla has been very properly abandoned by the London and Dublin Colleges in the recent editions of their Pharmacopœias. Water, unless in very large proportion, is incapable of exhausting the root, and the extract could not but suffer in the long process of evaporation. Very different quantities have been obtained from different varieties of sarsaparilla, and even from different parcels of the same variety; but, as the matter taken up by boiling water consists chiefly of starch, no inference, as to the relative value of any particular specimen of the root, can be drawn from a knowledge of the quantity of watery extract which it is capable of affording.

The *spirituous extract* of the U. S. Pharmacopœia, which is the same as that of the French Codex, contains the active matter of the root. Diluted alcohol extracts all the virtues of sarsaparilla, leaving the inert fecula which encumbers the extract obtained by decoction; while the temperature requisite for the concentration of the tincture is insufficient to destroy the active principle. M. Beral obtained from 32 ounces of sarsaparilla about 4 ounces of extract by maceration with diluted alcohol. As the product of this operation is about one-eighth of the sarsaparilla employed, a drachm of the extract represents an ounce of the root. From ten to twenty grains of it may be given three or four times a day. It possesses in a high degree the acrid taste of sarsaparilla. W.

EXTRACTUM *sive* RESINA SCAMMONII. *Ed. Extract* or *Resin of Scammony.*

"Take *any convenient quantity* of Scammony in fine powder; boil it in successive portions of Proof Spirit till the Spirit ceases to dissolve any thing; filter; distil the liquid till little but water passes over. Then pour away the watery solution from the resin at the bottom; agitate the resin with successive portions of boiling water till it is well washed; and lastly, dry it at a temperature not exceeding 240°." *Ed.*

The only advantage of this process is that it separates the active matter of scammony from the impurities with which the drug is generally adulterated. When pure virgin scammony can be procured the extract is unnecessary. Prepared according to the above process, the resin is of a dirty greenish-brown colour, with a feeble odour and taste of scammony, and is very soluble in ether, alcohol, and boiling proof spirit. When purified with animal charcoal it has a pale brownish-yellow colour, and is without odour or taste; but retains its purgative property. The resin of scammony is liable to adulteration. Jalap resin may be detected by its insolubility in rectified ether, which dissolves that of scammony in all proportions. Sulphuric acid is the best test of common rosin or colophony, producing instantaneously with this substance an intense red colour; while in the resin of scammony it causes no immediate change. For the tests of guaiac, the reader is referred to that article in the Materia Medica. (See *Am. Journ. of Pharm.*, xxiv. 158.) When rubbed with unskimmed milk the resin of scammony forms a uniform emulsion, undistinguishable from rich milk itself. This is an excellent mode of administration. The resin should

always be given either rubbed up with some mild powder, or in emulsion. The dose is from five to twelve grains.

Off. Prep. Mistura Scammonii. W.

EXTRACTUM STRAMONII FOLIORUM. *U. S.* *Extract of Stramonium Leaves.*

"Take of Stramonium Leaves *a pound.* Bruise them in a stone mortar, sprinkling on them a little water; then express the juice, and, having heated it to the boiling point, strain, and evaporate to the proper consistence." *U. S.*

Like all the other inspissated narcotic juices, this is an uncertain preparation, varying in strength according to the care used in conducting the process, and the season at which the leaves are collected. The reader will find at page 969, and in the preliminary observations on the Extracts, some general rules which will be found useful in conducting this process, and all those of which it is the officinal type. The insoluble matter separated from the expressed juice by filtering, and that coagulated by heat, may be advantageously rejected; as, according to the observations of MM. Solon and Soubeiran, they are nearly or quite inert. M. Recluz obtained half an ounce of the extract from sixteen ounces of the leaves. The dose is a grain night and morning, to be gradually increased till it affects the system.

Off. Prep. Unguentum Stramonii. W.

EXTRACTUM STRAMONII SEMINIS. *U. S.* EXTRACTUM STRAMONII. *Lond., Ed.* *Extract of Stramonium Seed.*

"Take of Stramonium Seed, ground into powder, *a pound;* Diluted Alcohol *a sufficient quantity.* Having rubbed the powder with *half a pint* of Diluted Alcohol, introduce the mixture into a percolator, and pour upon it gradually Diluted Alcohol till the liquid passes colourless. Distil off the Alcohol from the filtered liquor, and evaporate the residue to the proper consistence." *U. S.*

"Take of Seeds of Stramonium *any convenient quantity;* grind them well in a coffee-mill. Rub the powder into a thick mass with Proof Spirit; put the pulp into a percolator, and transmit Proof Spirit till it passes colourless; distil off the spirit, and evaporate what remains in the vapour-bath to a proper consistence." *Ed.*

"Take of Stramonium seeds *fifteen ounces*; boiling Distilled Water *a gallon* [Imperial measure]. Macerate for four hours in a covered vessel near the fire; then take out the Seeds, and, after having bruised them in a stone mortar, return them to the liquor. Boil down to four pints [Imp. measure], and strain the decoction while hot. Finally, evaporate to the proper consistence." *Lond.*

The U. S. and Edinburgh processes, which may be considered identical, are preferable to the London; as the seeds yield their virtues more freely to spirit than to water alone. According to the table of Recluz, sixteen ounces of the seeds afford two ounces and two drachms of extract by maceration in diluted alcohol, and one ounce and a half by decoction. The dose to begin with is the quarter or half of a grain twice a day, to be gradually increased. W.

EXTRACTUM TARAXACI. *U. S., Lond., Ed.* *Extract of Dandelion.*

"Take of Dandelion, gathered in September, *five pounds.* Slice the Dandelion; bruise it in a stone mortar, sprinkling on it a little water, until reduced to a pulp; then express the juice, strain, and evaporate in a vacuum, or in a shallow dish over a water-bath, constantly stirring, to the proper consistence." *U. S.*

The *London College* prepares it in the same manner as extract of hops (see *Extractum Lupuli*); the *Edinburgh*, from *a pound* of the fresh root and *a gallon* (Imperial measure) of boiling water, as directed for the extract of poppy heads (see *Extractum Papaveris*).

This extract is undoubtedly stronger, prepared from the root alone than from the whole plant. It is important that the root should be collected at the right season. The juice expressed from it in the spring is thin, watery, and of a feeble flavour; in the latter part of summer, and in autumn, thick, opaque, cream-coloured, very bitter, and abundant, amounting to one-third or one-half its weight. It may be collected in August, and afterwards until severe frost. According to Mr. Squire, frost has the effect of diminishing the bitterness and increasing the sweetness of the root. An extract prepared by inspissating this juice, as now directed in the U. S. process, is much more efficient than that prepared in the old way by decoction. The inspissation should be effected by exposing the juice in shallow vessels to a current of warm dry air, or by evaporation in a vacuum, and should not be unnecessarily protracted. Long exposure, during evaporation, changes the bitterness of the juice into sweetness, which is a sign of inferiority. As often found in the shops, the extract is dark-coloured, sweet, and in all probability nearly inert. Mr. Houlton took more than an ounce of it in a day, without any sensible effect. *Pharm.* (*Journ. and Transact.*, i. 421.) When prepared from the root and leaves together, it has a greenish colour. Mr. Brande states that one cwt. of the fresh root affords from twenty to twenty-five pounds of extract by decoction in water. The expressed juice yields from 11 to 25 per cent. of extract, the greatest product being obtained in November, and the least in April and May.*

This extract deteriorates by keeping, and should, therefore, be renewed an-

* *Fluid Extract* or *Preserved Juice of Taraxacum.* The rapid change of the active principle of dandelion, under heat and exposure, renders it extremely difficult to obtain a solid extract preserving the virtues of the plant. Mr. Donovan, therefore, suggests the propriety of keeping the juice in the liquid state, and proposes a plan, by which, as he states, it may be obtained and preserved throughout the year, with nearly all its native efficiency. The whole herb, immediately after collection, is to be washed, bruised, and expressed; and the residue, having been mixed with as much water at 200° as will bring it to the consistence of a pulp, is to be allowed to stand for two hours, and then again expressed. The liquids thus obtained are to be mixed, and very slowly evaporated, in a wide earthen vessel, and with constant agitation, to one-half. The salts are thus obtained, though with little of the bitter principle. To supply this, a quantity of the roots equal to the weight of the herb first employed, is to be bruised and expressed. The resulting juice, which is in small quantity and bitter, is to be set aside; while the residual marc is to be mixed with the concentrated juice already prepared, previously brought to a boiling heat. When cold, the mixture is to be strongly expressed, and the liquor obtained to be mixed with one-sixth of its measure of alcohol. The liquor is then to be poured into quart bottles, but so as not to fill them. These are to be immersed in a vessel containing water as high as the liquid within them, and placed over a fire; the water is to be slowly heated to 180°; the bottles are to be withdrawn; and the reserved juice of the root is to be added to each in equal quantities. The space at first left in the bottles should be such that, after the addition of the juice, and the driving in of the cork, as little as possible should remain. The corks, being now cut off close to the glass, are to be covered with hard sealing-wax; and the bottles set by, inverted, in a cool place. The alcohol used is alone insufficient for the preservation of the juice; and hence the necessity of heating the bottles, and sealing them when quite full, according to *Appert's process.* Each ounce will contain about a drachm of the alcohol. (See *Am. Journ. of Pharm.*, xxiv. 65.)

Professor Procter proposes the following plan. Of the fresh roots collected in September or October, twenty pounds avoirdupois are to be sliced transversely, reduced to a pulpy mass by grinding or contusion, then thoroughly incorporated with four pints of alcohol of 0·835, and set aside in stoneware jars. After a week, or a longer time, the pulpy mass is to be subjected to strong pressure, and the liquid filtered and bottled for use. Even after six months the pulp thus treated preserves the sensible properties of the dandelion in a marked degree. Should the alcohol in the expressed liquor be objected to, it may be partially removed by a gentle evaporation by means of a water-bath until the bulk of the juice has been diminished one-sixth, and then adding eight ounces of sugar for every pint. (*Ibid.*, xxv. 408.) *Note to the tenth edition.*

nually. It is most conveniently given dissolved in cinnamon or mint water. The dose is from a scruple to a drachm three times a day.

Off. Prep. Pilulæ Ferri Sulphatis. W.

EXTRACTUM UVÆ URSI. *Lond.* *Extract of Uva Ursi.*

The *London College* prepares this extract in the manner directed for extract of hops. (See *Extractum Lupuli.*)

The dose is from five to thirty grains. W.

EXTRACTA FLUIDA.

Fluid Extracts.

These were first introduced into the U. S. Pharmacopœia of 1850, as a distinct class of preparations; the fluid extract of sarsaparilla being the only one previously directed, either in our own officinal code or by the British Colleges. Their distinctive character is the concentration of the active ingredients of medicinal substances into a small bulk, in the liquid form. Independently of the greater convenience of administration, the advantages of this class of preparations are, in relation to all of them, that the evaporation not being carried so far as in the ordinary extracts, the active principles are less liable to be injured by heat; and, in relation to a certain portion, the fluid extract of cubebs for example, that they afford the only method of concentration, as it would be impossible to obtain in a solid extract the whole activity of the medicine, depending as it does, in part, upon an essentially liquid substance. The main difficulty in relation to them, is the liability of substances in the liquid state to undergo spontaneous decomposition. This is counteracted in some of the fluid extracts by means of sugar. In others, the nature of the ingredient is preservative. A glance at the several preparations will show that there are two distinct sets of them. In one set, the principles extracted are mainly volatile oil and resin, and the menstruum employed is ether. They have been known for some time in pharmacy by the name of *oleo-resins.* In their preparation, the active matter is readily yielded to ether, while principles which might contribute to the decomposition of the extract are left behind by that menstruum. The low temperature at which the ether evaporates enables the whole of the volatile oil to be retained in the residue; and the preparation keeps well, as it contains no water to favour its decomposition. In the second set of the fluid extracts, the active matter is extracted by diluted alcohol, and the greater part of the alcohol afterwards evaporated. A portion, however, remains, which contributes towards the preservation of the preparation; but this alone is insufficient, and it is necessary to have recourse to sugar, which has the subsidiary advantage of improving the flavour. But in these fluid extracts, instead of two pounds of sugar to each pint of the liquid, as in the case of the ordinary syrups, it is generally sufficient to add an ounce for every fluidounce. Sometimes there is an advantage in adding to the preservative influence of the sugar, that of some other substance having a similar effect, as of Hoffmann's anodyne liquor in the fluid extract of senna. W.

EXTRACTUM CUBEBÆ FLUIDUM. *U. S.* *Fluid Extract of Cubebs.*

"Take of Cubebs, in powder, *a pound;* Ether *a sufficient quantity.* Put the Cubebs into a percolator, and, having packed it carefully, pour Ether gradually upon it until two pints of filtered liquor are obtained; then distil off by means of a water-bath, at a gentle heat, a pint and a half of the ether, and expose the residue, in a shallow vessel, until the whole of the ether has evaporated." *U. S.*

This is one of the *oleo-resins,* and consists mainly of the volatile oil and resin,

with a portion of the cubebin and waxy matter of the cubebs. The consistence differs with the character of the cubebs employed; its degree of fluidity being proportionate to the amount of volatile oil contained in the medicine. The colour is usually brownish, with more or less of a greenish hue, according to the quantity of chlorophylle present, which varies with the character of the cubebs, and with that of the menstruum; pure ether extracting the green colouring matter preferably, while ordinary alcoholic ether extracts also the brown. Cubebs yield from one-eighth to one-fifth of their weight of fluid extract. The preparation is apt in time to deposit waxy matter and crystals of cubebin. It was first introduced into use by Prof. Procter. (See *Am. Journ. of Pharm.*, xviii. 168.) The dose is from five to thirty minims, which may be given suspended in water, or mixed with powdered sugar. W.

EXTRACTUM PIPERIS FLUIDUM. *U. S. Fluid Extract of Black Pepper.*

"Take of Black Pepper, in powder, *a pound;* Ether *a sufficient quantity.* Put the powder into a percolator, and pour Ether gradually upon it until two pints of filtered liquor are obtained. From this distil off, by means of a water-bath, at a gentle heat, a pint and a half of ether, and expose the residue, in a shallow vessel, until the whole of the ether has evaporated, and the deposition of piperin in crystals has ceased. Lastly, separate the piperin by expression through a cloth, and keep the liquid portion." *U. S.*

A substance has long been in use under the name of *oil of black pepper*, which consists mainly of the volatile oil and resin of the pepper, and belongs, therefore, to the oleo-resins. As usually found it is of a thickish consistence and an almost black colour, and is a residue of the process for preparing piperin. The officinal extract has the same general character, but is of more certain strength, and should, therefore, be preferred. It contains almost all the volatile oil and acrid resin of black pepper, with little of the piperin; and as the last mentioned principle, when quite pure, is of doubtful efficacy, the extract may be considered as representing the virtues of the fruit. The colour is greener than that of the common oil of black pepper, and not so dark, owing to the circumstance that ether dissolves the green more readily than the brown colouring matter. A pound of black pepper yields about six drachms of the fluid extract, the dose of which proportionate to the ordinary dose of pepper would be one or two minims. It may be given in emulsion, or may be combined in small proportion with other substances in the form of pill. W.

EXTRACTUM RHEI FLUIDUM. *U. S. Fluid Extract of Rhubarb.*

"Take of Rhubarb, in coarse powder, *eight ounces;* Sugar *five ounces;* Tincture of Ginger *half a fluidounce;* Oil of Fennel, Oil of Anise, each, *four minims;* Diluted Alcohol *two pints*, or *a sufficient quantity.* To the Rhubarb, previously mixed with an equal bulk of coarse sand, add twelve fluidounces of Diluted Alcohol, and allow the mixture to stand for twenty-four hours. Transfer the mass to a percolator, and gradually pour upon it Diluted Alcohol until the liquid which passes has little of the odour or taste of rhubarb. Evaporate the tincture thus obtained, by means of a water-bath, to five fluidounces; then add the Sugar, and, after it is dissolved, mix thoroughly with the resulting Fluid Extract the Tincture of Ginger holding the Oils in solution." *U. S.*

This is a good preparation of rhubarb, the root being nearly exhausted by the menstruum, and the evaporation, if carefully conducted, not injuriously affecting the active principles. It is somewhat stimulant in consequence of the small proportion of alcohol present, and the addition of the volatile oils, and is not applicable, therefore, to acute inflammatory affections. For observations on this

preparation the pharmaceutical reader is referred to papers by Prof. Procter in the *American Journal of Pharmacy* (xix. 182, and xxii. 110). The process yields about eight fluidounces of the preparation, or a fluidrachm for each drachm of the rhubarb. Its purgative dose, if well made from good rhubarb, is half a fluidrachm for an adult, to be proportionably diminished for children. W.

EXTRACTUM SARSAPARILLÆ FLUIDUM. *U.S.*, *Dub.* EXTRACTUM SARSÆ LIQUIDUM. *Lond.* EXTRACTUM SARZÆ FLUIDUM. *Ed.* *Fluid Extract of Sarsaparilla.*

"Take of Sarsaparilla, sliced and bruised, *sixteen ounces;* Liquorice Root, bruised, Bark of Sassafras Root, bruised, each, *two ounces;* Mezereon, sliced, *six drachms;* Sugar *twelve ounces;* Diluted Alcohol *eight pints.* Macerate all the ingredients together, excepting the Sugar, for fourteen days; then express and filter. Evaporate the liquid, by means of a water-bath, to *twelve fluidounces;* add the Sugar to it while still hot; and remove from the bath as soon as the Sugar is dissolved." *U. S.*

"Take of Sarsa *three pounds and a half;* Distilled Water *five gallons* [Imperial measure]; Rectified Spirit *two fluidounces.* Boil the Sarsa in three gallons of the Water to twelve pints [Imp. meas.]; pour off the liquor, and strain while hot. Again boil the Sarsa in the remainder of the Water to one-half, and strain. Mix the liquors, evaporate to eighteen fluidounces, and, when the extract has cooled, mix the Spirit with it." *Lond.*

"Take of Sarza, in chips, *one pound;* Boiling Water *six pints* [Imperial measure]. Digest the root for two hours in four pints of the Water; take it out, bruise it, replace it, and boil for two hours; filter and squeeze out the liquid; boil the residuum in the remaining two pints of Water, and filter and squeeze out this liquor also; evaporate the united liquors to the consistence of thin syrup; add, when the product is cool, as much Rectified Spirit as will make in all sixteen fluidounces. Filter. This fluid extract may be aromatized with volatile oils or warm aromatics." *Ed.*

"Take of Sarsaparilla *one pound* [avoirdupois]; Boiling Water *eight pints* [Imp. meas.]; Rectified Spirit *as much as is sufficient.* Digest the Sarsaparilla in five pints of the Water for two hours, at a temperature near 212°, and then decant. Add the rest of the Water, digest again for two hours, and decant. Evaporate the mixed liquors by a steam or water heat to the consistence of a thin syrup, and, when the product has cooled, add as much Rectified Spirit as will make the entire twenty [fluid]ounces." *Dub.*

The British Colleges all prepare a simple fluid extract of sarsaparilla. That of the Dublin College is to be preferred, as the long boiling to which the other Colleges subject the root is avoided, and digestion, which experience has shown to be less injurious, is substituted. Nevertheless, the extract would probably have been more efficient, if diluted alcohol had been directed as the solvent.

The U. S. fluid extract is a compound preparation, intended to represent in a concentrated state the compound decoction of sarsaparilla, having all its ingredients with the exception of the guaiacum wood, which probably adds little to the efficacy of the decoction. The preparation was originally proposed by Wm. Hodgson, jun. (*Journ. of the Phil. Col. of Pharm.*, ii. 285); and the officinal process differs from his mainly by the omission of the guaiacum wood, the resin of which, separating during the evaporation, somewhat embarrassed the process, without adding to the virtues of the extract. We greatly prefer this fluid extract to that of the British Colleges. If the effects of a simple extract of sarsaparilla are desired, they can be obtained by having recourse to the solid officinal extract of the U. S. Pharmacopœia. The dose is a fluidrachm, equivalent to a drachm of the root, three or four times a day. W.

EXTRACTUM SENNÆ FLUIDUM. *U. S. Fluid Extract of Senna.*

"Take of Senna, in coarse powder, *two pounds and a half;* Sugar *twenty ounces;* Oil of Fennel *a fluidrachm;* Compound Spirit of Ether *two fluidrachms;* Diluted Alcohol *four pints.* Mix the Senna with the Diluted Alcohol, and, having allowed the mixture to stand for twenty-four hours, introduce it into a percolator, and gradually pour in water mixed with one-third of its bulk of alcohol, until a gallon and a half of liquid shall have passed. Evaporate the liquid by means of a water-bath to twenty fluidounces, filter, then add the Sugar, and, when it is dissolved, the Compound Spirit of Ether holding the Oil of Fennel in solution." *U. S.*

This preparation was originally suggested by Mr. Charles Ellis, of Philadelphia, subsequently modified by the late Mr. Duhamel, of the same place, and adopted by the framers of the U. S. Pharmacopœia. The use of the compound spirit of ether is to prevent fermentation. A fluid extract is largely prepared in England by evaporating the infusion of senna in vacuo. For a formula by Mr. Duncan, of Edinburgh, see the *Medical Examiner* (vi. 250). The dose of the U. S. fluid extract is half a fluidounce for an adult. W.

EXTRACTUM SPIGELIÆ ET SENNÆ FLUIDUM. *U. S. Fluid Extract of Spigelia and Senna.*

"Take of Pinkroot, in coarse powder, *a pound;* Senna, in coarse powder, *six ounces;* Sugar *a pound and a half;* Carbonate of Potassa *six drachms;* Oil of Caraway, Oil of Anise, each, *half a fluidrachm;* Diluted Alcohol *a sufficient quantity.* Mix the Pinkroot and Senna with two pints of Diluted Alcohol, and, having allowed the mixture to stand for two days, transfer it to a percolator, and gradually pour upon it Diluted Alcohol until half a gallon of liquid has passed. Evaporate the liquid, by means of a water-bath, to a pint; then add the Carbonate of Potassa, and, after the sediment has dissolved, the Sugar previously triturated with the Oils. Lastly, dissolve the Sugar with a gentle heat." *U. S.*

This fluid extract combines the cathartic property of senna with the anthelmintic virtues of pinkroot, and is a very good vermifuge, being generally acceptable to the stomach, and, what is of no little importance in such medicines, not offensive to the taste. It has been in use in Philadelphia for several years, and with satisfactory results. The use of the carbonate of potassa is to enable the resinous matter which is deposited during evaporation to be dissolved, and also to counteract the griping property of the senna. The whole product of the process should be about a pint and a half. The dose is half a fluidounce for an adult, a fluidrachm for a child two years old. W.

EXTRACTUM VALERIANÆ FLUIDUM. *U.S. Fluid Extract of Valerian.*

"Take of Valerian, in coarse powder, *eight ounces;* Ether *four fluidounces;* Alcohol *twelve fluidounces;* Diluted Alcohol *a sufficient quantity.* Mix the Ether and Alcohol, and, having incorporated the Valerian with one half of the mixture, introduce the mass into a percolator, and gradually pour in the remainder. Then add Diluted Alcohol until the whole liquid which has passed shall amount to a pint. Put the ethereal liquid thus obtained into a shallow vessel, and allow it to evaporate spontaneously until reduced to five fluidounces. Upon the mass in the percolator pour gradually Diluted Alcohol until ten fluidounces of tincture have passed. With this mix the five fluidounces left after the spontaneous evaporation, taking care to dissolve in a little alcohol any oleo-resinous matter which may have been deposited, and to add it to the rest. Allow the mixture to stand, with occasional agitation, for four hours, and then filter.

The resulting Fluid Extract should measure a pint; and, if it be less than that quantity, the deficiency should be supplied by the addition of Alcohol." *U. S.*

This is a preparation representing in a concentrated state the virtues of valerian, and may be used when the influence of that medicine is desired. (See papers by Mr. Evan T. Ellis in the *American Journal of Pharmacy*, xix. 83, and by Prof. Procter, *ibid.*, 184.) The dose is one or two fluidrachms. W.

FERRUM.

Preparations of Iron.

FERRI PULVIS. *U. S.*, *Dub.* *Powder of Iron.* *Reduced Iron.* *Iron by Hydrogen.* *Quevenne's Iron.*

Take of Subcarbonate of Iron, previously calcined in an open vessel, *two pounds and a half*, or *a convenient quantity*. Into a wrought iron reduction tube, of about four inches in diameter, introduce the Subcarbonate, contained in an incomplete sheet-iron tube, open at both ends, made by bending the iron into the form of a cylinder, and of such a size as to fill loosely about seven-eighths of the reduction tube. Place the reduction tube longitudinally in an oblong charcoal furnace; and, by means of a self-regulating generator of hydrogen, pass through it a stream of that gas, previously purified by bubbling successively through Solution of Subacetate of Lead, diluted with three times its volume of water, and through milk of lime, severally contained in half-gallon bottles, about one-third filled. Connect with the further extremity of the reduction tube a lead tube bent so as to dip into water. Make all the junctions air-tight by appropriate lutes; and, when the hydrogen has passed long enough to fill the whole of the apparatus, to the exclusion of atmospheric air, light the fire, and bring that part of the reduction tube occupied by the Subcarbonate to a dull red heat, which must be kept up so long as the bubbles of hydrogen, breaking from the water covering the orifice of the lead tube, are smaller than those passing through the milk of lime. When the reduction is completed, remove the fire, and allow the whole to cool to the ordinary temperature, keeping up, during the refrigeration, a moderate current of hydrogen through the apparatus. Lastly, withdraw the reduced iron from the reduction tube, detach it from the sheet-iron tube, and, having powdered it, keep it in well-stopped bottles. When two pounds and a half of Subcarbonate of Iron are operated on, the process occupies from five to eight hours." *U. S.*

"Take of Peroxide of Iron, Zinc, in small pieces, Oil of Vitriol, Water, each, *a sufficient quantity*. Introduce into a gun-barrel as much of the Peroxide of Iron as will occupy the length of about ten inches, confining it to the middle portion of the barrel by plugs of asbestos. Let the gun-barrel be now placed in such a furnace as is used for organic analysis, one end of it being fitted by means of a cork into a bent adapter whose further extremity dips in water, while the other end (of barrel) is connected with a bottle containing the Zinc and Water, with the intervention, however, of a desiccating tube including fragments of caustic potash, and a small bottle half filled with oil of vitriol. Matters being thus arranged, a little Oil of Vitriol is to be poured into the bottle containing the Water and Zinc, with the view of developing a sufficiency of hydrogen to expel the air from the interior of the apparatus. As soon as this object is considered to have been accomplished, the part of the tube containing the Peroxide of Iron must be surrounded with ignited charcoal, and, when it is thus brought to a low red heat, the Oil of Vitriol is to be gradually added to the Zinc, so as to cause a steady current of hydrogen to pass through the oil of vitriol and de-

siccation tube into the gun-barrel. As soon as the reduction of the Oxide is completed, which may be judged to have taken place when the gas bubbles escape at apparently the same rate through the water in which the adapter terminates, and through the bottle containing the oil of vitriol, the fire is to be removed (a slow current of hydrogen being still continued), and when the gun-barrel has assumed the temperature of the air its metallic contents should be extracted, and preserved in an accurately stopped bottle." *Dub.*

This is a new preparation of the U. S. and Dublin Pharmacopœias of 1850, and consists of metallic iron in fine powder, obtained by reducing the sesquioxide by hydrogen at a dull-red heat. The subcarbonate of the U. S. Pharmacopœia, which is essentially the sesquioxide of iron, is deprived of water by calcination, and then subjected to the reducing influence of a stream of hydrogen, purified from sulphuretted hydrogen and acid by passing successively through a solution of subacetate of lead and milk of lime. The hydrogen unites with the oxygen of the sesquioxide to form water, and leaves the iron in the metallic state. The subcarbonate should be perfectly free from sulphate of soda, which it is apt to contain when imperfectly washed. If this salt be present it will be reduced by the hydrogen to the state of sulphuret of sodium, which will contaminate and spoil the metallic iron formed. The heat should be carefully regulated; for if it fall below dull redness, part of the oxide will escape reduction; and if it exceed that point considerably, the particles of reduced iron will agglutinate, and not be readily pulverizable. The Dublin process is not so well fitted for practical purposes as that of the U. S. Pharmacopœia. The directions given in the Dublin formula to dry the hydrogen are unnecessary. On the subject of powder of iron, manufacturing chemists will find it useful to consult the paper of MM. Soubeiran and Dublanc, in which full directions are given for purifying the hydrogen, constructing the furnace, regulating the heat, and avoiding explosions. (*Amer. Journ. of Pharm.*, xviii. 303, from the *Journ. de Pharm.*, viii. 187.) Prof. Procter, of Philadelphia, has made some improvements in the process of Soubeiran and Dublanc, which he has communicated in a paper, embracing many useful details. (*Amer. Journ. of Pharm.*, xix. 11.)

Properties. Powder of iron is tasteless, and of an iron-gray colour. If black the preparation is to be rejected as not being fully deoxidized. When thrown into a dilute acid, it causes a lively effervescence of hydrogen. A small portion of it, struck on an anvil with a smooth hammer, forms a scale, having a brilliant metallic lustre. On account of its great liability to oxidation, it should be kept in a dry bottle, well stopped. A black powder, having a composition corresponding with that of the magnetic oxide of iron, has been recently sold in London and Edinburgh under the name of Quevenne's iron. (See the *Pharm. Journ. and Trans.* for Jan., Feb., and March, 1854.) The spurious powder may be known by its having a black instead of an iron-gray colour, and by its effervescing but slightly with acids. In the process for making reduced iron, part of the sesquioxide almost always escapes full deoxidation, and comes out of the tube of a black colour. This part should be rejected, instead of being sold as reduced iron, as appears to have been done by some London manufacturing chemists.

Medical Properties. Powder of iron, reduced from the oxide by hydrogen, was first prepared for medicinal purposes by MM. Quevenne and Miquelard, of Paris. It has been used by Raciborski and other physicians in anæmia, and, generally, in those diseases characterized by a deficiency of colouring matter in the blood. In two cases of enlarged spleen, following intermittent fever in anemic subjects, M. Coste found it to act with remarkable efficacy. In view of the peculiar state of aggregation of its particles, this preparation is undoubtedly the best form of metallic iron for medicinal use. The dose is from three to six grains several times a day, given in powder or pill. B.

TINCTURA FERRI ACETATIS. *Dub. Tincture of Acetate of Iron.*

"Take of Sulphate of Iron *eight ounces* [avoirdupois]; Distilled Water *half a pint* [Imperial measure]; Pure Sulphuric Acid *six fluidrachms* [Imp. meas.]; Pure Nitric Acid *half a fluidounce* [Imp. meas.]; Acetate of Potash *eight ounces* [avoird.]; Rectified Spirit *half a gallon* [Imp. meas.]. To nine [fluid]ounces of the Water add the Sulphuric Acid, and in the mixture, with the aid of heat, dissolve the Sulphate of Iron. Add next the Nitric Acid, first diluted with the remaining [fluid]ounce of Water, and evaporate the resulting solution to the consistence of a thick syrup. Dissolve this in one quart [two pints, Imp. meas.], and the Acetate of Potash in the remainder of the Spirit, and, having mixed the solutions, and shaken the mixture repeatedly in a large bottle, let the whole be thrown upon a calico filter. When any further liquid ceases to trickle through, subject the filter, with its contents, to expression, and, having cleared the turbid tincture thus procured by filtration through paper, let it be added to that already obtained. The sp. gr. of this tincture is 0·891." *Dub.*

This preparation is a tincture of the teracetate of sesquioxide of iron. The first step in making it is to convert the sulphate of protoxide of iron into the tersulphate of the sesquioxide by the action of sulphuric and nitric acids, with the aid of heat, in the usual way. The salt thus formed is then dissolved in half the rectified spirit, the acetate of potassa in the other half. The spirituous saline solutions having been mixed, a double decomposition of the salts takes place, resulting in the formation of teracetate of sesquioxide of iron which dissolves in the spirit, and sulphate of potassa which precipitates, being insoluble in that menstruum. By filtration, therefore, the sulphate of potassa is removed, and the clear liquid constitutes the tincture under notice. As there is an excess of sulphate of protoxide of iron taken, the tersulphate of the sesquioxide into which it is converted, is more than sufficient to decompose all the acetate of potassa. Accordingly, the portion of the tersulphate not expended in the double decomposition, being soluble in rectified spirit, remains in solution along with the teracetate in the tincture.

Properties. This tincture is a transparent liquid, of a deep-red colour, and strong chalybeate taste. It is said to form an agreeable chalybeate. The dose is from twenty drops to a teaspoonful, sufficiently diluted with water. B.

FERRI CARBONAS SACCHARATUM. *Ed., Dub.;* FERRI CARBONAS CUM SACCHARO. *Lond. Saccharine Carbonate of Iron. Carbonate of Iron with Sugar.*

"Take of Sulphate of Iron *four ounces;* Carbonate of Soda *four ounces and a quarter;* Sugar *two ounces*; boiling Distilled Water *four pints* [Imp. meas.]. Dissolve separately the Sulphate and Carbonate in two pints of the Water. Mix the solutions while still hot, and set the mixture by that the Carbonate of Iron may subside. Then, having poured off the supernatant liquor, wash frequently the precipitated Carbonate. To this add the Sugar, dissolved in two fluidounces of Water, and evaporate the mixture by means of a water-bath until the powder is dry. Keep this in a well stopped bottle." *Lond.*

"Take of Sulphate of Iron *four ounces;* Carbonate of Soda *five ounces;* Pure Sugar *two ounces;* Water *four pints* [Imp. meas.]. Dissolve the Sulphate and Carbonate, each, in two pints of the water; add the solutions and mix them; collect the precipitate on a cloth filter, and immediately wash it with cold water, squeeze out as much of the water as possible, and without delay triturate the pulp which remains with the Sugar previously in fine powder. Dry the mixture at a temperature not much above 120°." *Ed.*

The Dublin process is substantially the same as the Edinburgh, and, therefore, need not be given.

When solutions of sulphate of iron and carbonate of soda are mixed together, there are formed, by double decomposition, sulphate of soda which remains in solution, and carbonate of protoxide of iron which falls as a pale-bluish precipitate. This precipitate begins immediately to alter in nature by the absorption of oxygen, and, if washed and dried in the ordinary way, becomes sesquioxide of iron, associated with a small quantity of the carbonate of the protoxide which has escaped change; in other words, it is converted into the subcarbonate of iron of the U. S. Pharmacopœia. (See *Ferri Subcarbonas.*) As the preparations of iron containing the protoxide are most esteemed, the change which this precipitate undergoes was always matter of regret, and various attempts were made to prevent it. Now saccharine matter has been ascertained to possess the property of preventing this change; and, in the preparation under consideration, its power is brought into play of preventing the protoxide of iron of the carbonate as first precipitated from passing into sesquioxide, with loss of carbonic acid.

Dr. Becker, a German physician, was the first to suggest the use of saccharine matter as a means of protection against the absorption of oxygen; and the idea was carried out by Klauer, a German chemist, who first made the saccharine carbonate of iron. In the London process the washed precipitate is immediately mixed with the sugar in the form of syrup. In the Edinburgh formula, it is pressed so as to free it from water as far as possible, and then incorporated with the sugar in fine powder. The mode of treating the precipitate, directed in the London formula, is that recommended by Mr. R. Phillips, jun., and is preferable to the treatment by expression, which exposes it for a longer period to the action of the air. The final drying heat should not exceed 130°. The protection from oxidation, however, is more complete, when both the materials and product of the process are maintained constantly in contact with saccharine matter, by using weak syrup both for dissolving the salts and for washing the precipitate, after the improved method of Vallet, of Paris. This improved method of proceeding is adopted for forming the U. S. pills of carbonate of iron, or Vallet's ferruginous pills. (See *Pilulæ Ferri Carbonatis, U. S.*)

Properties. Saccharine carbonate of iron is a grayish-green powder, permanent in the air, having a sweetish, styptic taste, and wholly and readily soluble in muriatic acid, with brisk effervescence. Its composition is not well made out. The Edinburgh College defines it to be a "carbonate of protoxide of iron in an undetermined state of combination with sugar and sesquioxide of iron." The presence of sesquioxide of iron is a defect, which is avoided in Vallet's ferruginous pills.

Medical Properties. This preparation is an excellent chalybeate, possessing the advantages of having nearly all the iron in it in the state of protoxide, and of being readily soluble in acids. Originally introduced into the officinal list by the Edinburgh College, it appears for the first time in the Dublin and London Pharmacopœias of 1850 and 1851. It is probably more active than the subcarbonate of iron, and must be used in a smaller dose. It is, however, inferior to Vallet's ferruginous mass, in the preparation of which the anti-oxidizing influence of saccharine matter is more fully applied. The dose of the saccharine carbonate of iron is from five to thirty grains, given in the form of pill.

Off. Prep. Pilulæ Ferri Carbonatis, *Ed.* B.

TINCTURA FERRI CHLORIDI. *U. S.* Tinctura Ferri Sesquichloridi. *Lond., Dub.* Ferri Muriatis Tinctura. *Ed. Tincture of Chloride of Iron. Tincture of Muriate of Iron.*

"Take of Subcarbonate of Iron *half a pound;* Muriatic Acid *a pint;* Alcohol *three pints.* Pour the Acid upon the Subcarbonate of Iron, in a glass or porcelain vessel, mix them, and, when effervescence has ceased, apply a gentle heat,

and continue it, stirring occasionally, until the carbonate is dissolved; then filter the solution, and mix it with the alcohol." *U. S.*

"Take of Sesquioxide of Iron [Subcarbonate, *U. S.*] *six ounces;* Hydrochloric Acid *a pint* [Imperial measure]; Rectified Spirit *three pints* [Imp. meas.]. Mix the Sesquioxide with the Acid, and digest with a sand-bath, occasionally stirring, till it is dissolved. Then to the solution, after it has cooled, add the Spirit, and filter." *Lond.*

"Take of Red Oxide [Subcarbonate] of Iron *six ounces;* Muriatic Acid (commercial) *one pint* [Imp. meas.]; Rectified Spirit *three pints* [Imp. meas.]. Add the Oxide to the Acid in a glass vessel; digest with a gentle heat, and occasional agitation, for a day, or till most of the Oxide be dissolved; then add the Spirit, and filter." *Ed.*

"Take of Iron Wire *eight ounces* [avoirdupois]; Pure Muriatic Acid *one quart* [two pints, Imp. meas.]; Pure Nitric Acid *eighteen fluidrachms* [Imp. meas.]; Distilled Water *one pint* [Imp. meas.]; Rectified Spirit *one pint and a half* [Imp. meas.]. Dilute the Muriatic Acid with the Water, and, having poured the mixture on the Iron, apply a gentle heat till the metal is dissolved. Next add the Nitric Acid in successive portions, and then evaporate at a gentle heat until the solution is reduced to one pint. Finally mix this in a bottle with the Spirit, and, after the mixture has stood for twelve hours, draw off the clear tincture. The sp. gr. of this tincture is 1·237." *Dub.*

The subcarbonate of iron of the shops consists of sesquioxide of iron, mixed with a variable, but always small proportion of carbonate of the protoxide. When acted on by muriatic acid it dissolves with effervescence, in consequence of the escape of carbonic acid; and a solution of the sesquichloride of iron, with a little protochloride, is obtained. When the muriatic acid employed is of the officinal strength (sp. gr. 1·16), the quantity directed in the U. S. formula dissolves nearly all the subcarbonate, leaving behind, according to Mr. Phillips, less than one scruple, including accidental impurities. A reaction appears to take place between the muriatic acid and the alcohol, as the preparation has a decided ethereal odour. On exposure, the small quantity of protochloride of iron present is converted, by the absorption of oxygen, into sesquichloride and sesquioxide, the latter of which is precipitated unless there be an excess of muriatic acid present. In the U. S. formula no such excess exists, and the tincture may consequently deposit, upon standing, a little sesquioxide of iron, and become in the same proportion more feeble; but this is a very slight objection, and is easily obviated, if thought advisable, by adding sufficient muriatic acid to redissolve the precipitate. The London and Edinburgh preparations, which have a considerable excess of acid, are liable to the more serious objection of being thus rendered more irritant to the stomach. It is important that the apothecary should employ muriatic acid of the officinal specific gravity, as otherwise his preparation will be of uncertain strength. A want of attention to this circumstance is probably the cause that the tincture, as found in the shops, is very unequal. Of four specimens examined by Mr. Phillips, one yielded from half a fluidounce 20 grains of sesquioxide of iron, another 12·1 grains, a third 11·3 grains, and the fourth only 9·3 grains. A specimen prepared by himself, precisely according to the directions of the London Pharmacopœia of 1824, which are at present those of our own national standard, had the sp. gr. 0·994, and yielded, from half a fluidounce, 16·8 grains of sesquioxide. The present London preparation, according to the same authority, has the sp. gr. 0·992, and would afford, from half a fluidounce, upon the addition of potassa, nearly 15 grains of sesquioxide. The process of the Dublin Pharmacopœia of 1850 is quite new. In the first step of it a solution of protochloride of iron is formed, which is subsequently converted by the reaction of nitric acid into a solution of the sesquichloride, to which the

alcohol is added. The strength of the resulting tincture is more than thrice that of the other British preparations, and nearly thrice that of the U. S. tincture.

Properties. Tincture of chloride of iron is of a reddish-brown, somewhat yellowish colour, a sour and very styptic taste, and an odour resembling that of muriatic ether. The sesquichloride of iron, which results from its evaporation, is a deliquescent compound, of a dark-orange colour, scarcely crystallizable, and consisting of two eqs. of iron 56, and three of chlorine 106·26=162·26. The tincture is decomposed by the alkalies, alkaline earths and their carbonates, astringent vegetable infusions, and the mucilage of gum Arabic, which produces with it a brown semi-transparent jelly. All these substances are, therefore, incompatible with it in prescriptions.*

Medical Properties and Uses. This is one of the most active and certain preparations of iron, usually acceptable to the stomach, and much employed for the purposes to which the chalybeates generally are applied. It has been particularly commended as a tonic in scrofula, in which it was formerly often given, jointly with the solution of chloride of calcium, or chloride of barium. It is supposed to be diuretic, and to have a peculiar influence on the urinary passages. Hence it has been employed in gleet, old gonorrhœa, and leucorrhœa; and is said to be useful in dysury dependent on spasmodic stricture of the urethra, in the dose of ten drops repeated every ten minutes, till some effect is experienced. In hemorrhages from the uterus, kidneys, and bladder, it is thought to act advantageously, but should be confined to those of a passive character, or employed only after sufficient depletion. Externally it is sometimes used for the destruction of venereal warts, and as a styptic in cancerous and fungous ulcers. It has recently been employed with success, as an injection in aneurismal tumours. (See *Ranking's Abstract*, xviii. 120.) The dose of the U. S. tincture is from ten to thirty minims, which may be gradually increased to one or even two fluidrachms, two or three times a day. It is given diluted with water. W.

FERRI CITRAS. *U. S. Citrate of Iron.*

"Take of Citric Acid *five ounces and a half;* Sulphate of Iron *twelve ounces;* Distilled Water *five fluidounces.* Dissolve the Acid in the Water. Then prepare from the Sulphate the Hydrated Oxide of Iron, according to the formula for that substance. To the solution of the Acid, heated to about 150°, and maintained at that temperature, gradually add the Hydrated Oxide, in its moist and recent state, as long as it is dissolved, and until the Acid is fully saturated. Filter the liquid, and, having evaporated it to the consistence of a thick syrup, spread it in layers on glass or porcelain plates, so that, when dried, it may form thin laminæ, which are to be detached from the plates, and broken into pieces of convenient size." *U. S.*

In this process a strong solution of citric acid, heated to 150°, is accurately saturated with moist and recent hydrated sesquioxide of iron. The heat directed promotes the solution of the sesquioxide; but a boiling temperature is to be avoided, as it renders the oxide less readily soluble. Citrate of iron, as thus prepared, is in thin transparent pieces, of a beautiful garnet-red colour. It is an uncrystallizable acid salt, slowly soluble in cold, but readily soluble in boil-

* *Bestucheff's tincture*, which is much used in Europe, is simply a solution of sesquichloride of iron in a mixture of one measure of ether and three or four measures of alcohol. Fr. Mayer recommends that the sesquichloride should be prepared by passing chlorine through a solution of the protochloride, until a solution of the red ferrocyanuret of potassium no longer produces a blue precipitate, and then evaporating by a water-bath. In this mode crystals of the sesquichloride are obtained, one ounce of which is to be dissolved in twelve ounces of ether, mixed with four times its bulk of alcohol. The solution may be rendered colourless, if desired, by exposure to the direct rays of the sun. (*N. Y. Journ. of Pharm.*, i. 233.)

ing water, and possessing a mild chalybeate taste. It consists of one eq. of citric acid 165, and one of sesquioxide of iron 80=245.

Citrate of iron was introduced to the notice of the profession, in 1831, by M. Béral, of Paris. It is a pleasant chalybeate, and is best given in the form of pill. The dose is five grains, repeated several times a day. B.

FERRI AMMONIO-CITRAS. *Lond., Dub. Ammonio-citrate of Iron.*

"Take of Sulphate of Iron *twelve ounces;* Carbonate of Soda *twelve ounces and a half;* Citric Acid *six ounces;* Solution of Ammonia *nine fluidounces* [Imp. meas.]; boiling Distilled Water *twelve pints* [Imp. meas.]. Dissolve separately the Sulphate and Carbonate in six pints of the Water. Mix the solutions while still hot, and set the mixture by that the precipitate may subside. Having poured off the supernatant liquor, wash the precipitate frequently with water, throw in the Acid, and dissolve by the aid of heat. When the solution has cooled, add the Ammonia, and evaporate to the consistence of syrup. Pour this in thin layers on earthenware plates, dry with a gentle heat, and preserve the product in a well stopped bottle." *Lond.*

The *Dublin College* dissolves its hydrated peroxide of iron, freshly made, in a solution of citric acid, and boils for twenty minutes. The cool solution, after the addition of ammonia in slight excess, is dried in thin layers, so as to form scales.

In the London process, by double decomposition between sulphate of iron and carbonate of soda, carbonate of protoxide of iron is first formed, which, by the exposure to the air during washing, becomes the sesquioxide with loss of carbonic acid. To this oxide, while still moist, the citric acid is added, and the whole is dissolved by the aid of heat, the moisture present and the water of crystallization of the acid being sufficient to effect the solution. In this manner the citrate of sesquioxide of iron is formed, the salt described in the last article. Now this is an acid salt, and when the excess of acid in it is neutralized with ammonia, the ammonio-citrate of iron is formed, from which the greater part of the ammonia is driven off when dried with a gentle heat.

Properties, &c. Ammonio-citrate of iron is in garnet-red scales, having a slightly chalybeate taste, and forming a solution of a clear ruby colour. It is much more readily soluble in water than the citrate of iron described in the last article. It is neutral to test paper, and not rendered blue by the addition of ferrocyanuret of potassium. It is decomposed by potassa and lime-water, which throw down sesquioxide of iron and evolve ammonia. The London College states that 100 grains of the salt, dissolved in water and treated with potassa, yield about 34 grains of sesquioxide of iron. This salt forms a pleasant chalybeate. Its ready solubility gives it an advantage over the citrate. The dose is five grains, repeated several times a day, and given in solution. According to Dr. Paris it may be united with the carbonated alkalies without decomposition, and given in a state of effervescence with citric acid. B.

FERRI ET POTASSÆ TARTRAS. *U. S.* Ferri Potassio-tartras. *Lond.* Ferrum Tartarizatum. *Ed., Dub. Tartrate of Iron and Potassa. Tartarized Iron.*

"Take of Sulphate of Iron *eight ounces;* Bitartrate of Potassa *seven ounces;* Distilled Water *half a gallon.* Prepare from the Sulphate the Hydrated Oxide of Iron, according to the formula for that substance. Mix the Bitartrate of Potassa with the Distilled Water, heat the mixture to 140°, and, keeping it at that temperature, add gradually the Hydrated Oxide, frequently stirring, until it ceases to be dissolved. Then filter the solution, evaporate it by means of a water-bath to the consistence of Syrup, and spread it upon plates of glass or porcelain, so that it may dry in the form of scales." *U. S.*

"Take of Sulphate of Iron *four ounces;* Sulphuric Acid *half a fluidounce;* [Imp. meas.]; Nitric Acid *a fluidounce* [Imp. meas.]; Solution of Ammonia *ten fluidounces* [Imp. meas.]; Bitartrate of Potassa, powdered, *two ounces;* Distilled Water *four gallons* [Imp. meas.]. Dissolve the Sulphate with the Sulphuric Acid in a pint of the Water; then, applying heat, add gradually the Nitric Acid. Boil down the solution to the consistence of syrup, and mix it with the rest of the Water. Then add the Ammonia, in order to throw down the sesquioxide of iron. Wash this and set it aside for twenty-four hours. Then heat the Bitartrate, mixed with half a pint of Distilled Water, to 140°, and to this mixture add the moist sesquioxide, the water which floats over it having been poured off. Separate the part of the sesquioxide which fails to be dissolved by straining through a cloth; then evaporate the clear liquor until the salt is dry. The Potassio-tartrate of Iron may also be dried in the manner directed for Ammonio-citrate of Iron." *Lond.*

"Take of Sulphate of Iron *five ounces;* Bitartrate of Potash *five ounces and one drachm;* Carbonate of Ammonia, in fine powder, *a sufficiency.* Prepare the Rust of Iron from the Sulphate as directed under Ferrugo, and without drying it. Mix the pulpy mass with four pints [Imp. meas.] of Water; add the Bitartrate; boil till the Rust of Iron is dissolved; let the solution cool; pour off the clear liquid, and add to this the Carbonate of Ammonia so long as it occasions effervescence. Concentrate the liquid over the vapour-bath to the consistence of a thick extract, or till the residuum becomes on cooling a firm solid, which must be preserved in well-closed vessels." *Ed.*

"Take of Sulphate of Iron *eight ounces* [avoirdupois]; white Bitartrate of Potash *five ounces* [avoird.]; Distilled Water *one pint and a half* [Imp. meas.]. From the Sulphate of Iron prepare Hydrated Peroxide of Iron by the [Dublin] process, and having, immediately after it is washed, placed it with the Bitartrate of Potash and Water in a porcelain capsule, apply heat to the mixture (taking care, however, that the temperature does not rise beyond 150°), and stir it occasionally for six hours. Let the solution, after it has cooled down to the temperature of the atmosphere, be decanted off any undissolved oxide of iron, and, having transferred it in small quantities to delf dinner plates, let it be evaporated to dryness at a heat not exceeding 150°. Lastly, chip off the film of dry salt which adheres to the plates, and preserve it in well stopped bottles." *Dub.*

The object of these processes is to combine the excess of acid in the bitartrate of potassa with sesquioxide of iron. In all of them the plan of Soubeiran is adopted; namely, that of dissolving the moist hydrated sesquioxide to saturation in a mixture of the bitartrate and water, aided by a moderate heat. The sesquioxide is now obtained, in all the Pharmacopœias, from the tersulphate of sesquioxide of iron, which is precipitated either by ammonia (*U.S., Lond., Ed.*), or by solution of potassa (*Dub.*). Potassa is not a good precipitant; because the alkali adheres obstinately to the precipitated sesquioxide, and cannot be completely separated even by repeated washings. The necessary hydrated sesquioxide is made in the body of the London formula; this College not having it as the product of a separate process. The sesquioxide should be gradually added to the bitartrate and water, heated to 140°, as recommended by Soubeiran, at which temperature the oxide dissolves more readily and in larger quantity than when ebullition is employed. In the U.S. and Dublin formulæ, the liquid is poured out on a plane surface, so as to dry in scales; and the London College gives this as an alternative method of drying. The present formulæ of the U.S., London, and Dublin Pharmacopœias are much superior to those of former editions of those works.

Dr. Ure has proposed the *tartrate of protoxide of iron* for medical use. He makes it by acting on clean iron filings, or bits of iron wire, with a solution of

tartaric acid. It is a pulverulent salt, insoluble in water, and possessing a mild chalybeate taste.

Properties. Tartrate of iron and potassa, as obtained by the U. S and Dublin formulæ, is in transparent scales of a ruby-red colour, and wholly soluble in about four parts of water. It has a slightly chalybeate taste. Its solution does not change the colour of litmus, and at common temperatures is not precipitated by potassa, soda, or ammonia. Ferrocyanuret of potassium does not render it blue, unless an acid be added. The non-action of this test shows that the iron is in a peculiar state of combination. It is incompatible with astringent vegetable infusions, which give rise to a dark-coloured precipitate. When heated with potassa, 100 grains of the salt yield a precipitate of about 34 grains of sesquioxide of iron. (*Lond. Pharm.* 1851.)

Composition. Prepared according to the U. S., London, or Dublin formula, it consists of one eq. of tartrate of sesquioxide of iron, and one of tartrate of potassa. When of this composition it contains 34 per cent. of sesquioxide of iron. The Edinburgh preparation contains only about 18 per cent. of sesquioxide.

Medical Properties. Tartrate of iron and potassa is an agreeable chalybeate, and, when made according to the U. S., London, or Dublin formula, may be depended upon for activity and uniformity of composition. From its slight taste and ready solubility, it is one of the best ferruginous preparations for children. The dose for an adult is from ten grains to half a drachm, given in solution, or combined with an aromatic or bitter in the form of bolus. B.

FERRI FERROCYANURETUM. *U.S.* *Ferrocyanuret of Iron. Pure Prussian Blue.*

"Take of Sulphate of Iron *four ounces;* Sulphuric Acid *three fluidrachms and a half;* Nitric Acid *six fluidrachms*, or *a sufficient quantity;* Ferrocyanuret of Potassium *four ounces and a half;* Water *two pints.* Dissolve the Sulphate of Iron in a pint of the Water, and, having added the Sulphuric Acid, boil the solution. Pour into it the Nitric Acid, in small portions, boiling the liquid for a minute or two after each addition, until a dark colour is no longer produced; then allow it to cool. Dissolve the Ferrocyanuret of Potassium in the remainder of the Water, and add this solution gradually to the first liquid, agitating the mixture after each addition; then pour it upon a filter. Wash the precipitate with boiling water, until the washings pass tasteless. Lastly, dry it and rub it into powder." *U. S.*

In the process above given, the sulphate of protoxide of iron in solution is first acidulated with sulphuric acid, and then converted into the tersulphate of the sesquioxide by means of nitric acid. The object of the addition of the sulphuric acid, is to provide for the higher saturating power of the sesquioxide over the protoxide, and thus to prevent the precipitation of the subsulphate of the sesquioxide. The tersulphate of the sesquioxide may be obtained, without the use of nitric acid, by treating the sulphate of the protoxide, previously dried, with boiling sulphuric acid. (Levol, *Journ. de Pharm.*, xviii. 343.) The tersulphate is then decomposed by the gradual addition of the solution of ferrocyanuret of potassium. Three eqs. of ferrocyanuret, and two of tersulphate of sesquioxide of iron, are mutually decomposed, with the result of forming one eq. of Prussian blue, or the 3–4 ferrocyanuret of iron, which precipitates, and six. eqs. of sulphate of potassa, which remain in solution. Ferrocyanogen is a tercyanuret of iron ($FeCy_3$); and, representing it by its symbol Cfy, we may compactly express the above reaction by the following equation; $3CfyK_3$ and $2(Fe_2O_3,3SO_3)=3Cfy,4Fe$ and $6(KO,SO_3)$. Prussian blue contains the elements of six eqs. of water, which cannot be separated without the destruction of the compound. Adding these elements, we may suppose it to become a hydroferrocyanate of the sesquioxide of iron, represented by the formula, $3CfyH_3$,

Fe_4O_6. From the formula given for the anhydrous compound (3Cfy,4Fe), it is evident that it contains nine eqs. of cyanogen and seven of iron.

Preparation for Use in the Arts. Prussian blue is manufactured on the large scale as follows. A mixture made of equal parts of carbonate of potassa (pearl-ash of commerce), and animal matter, such as dried blood, hair, the shavings of horn, &c., is calcined at a red heat in an iron vessel, until it becomes pasty. The mass, when cold, is thrown, by portions at a time, into twelve or fifteen times its weight of water, with which it is stirred for half an hour. The whole is then put upon a linen filter; and the clear solution obtained is precipitated by a mixed solution of two parts of alum and one of the sulphate of protoxide of iron. An effervescence occurs, due principally to carbonic acid; and a very abundant precipitate is thrown down, of a blackish-brown colour. This precipitate is washed, by decantation, by means of a large quantity of water, which is renewed every twelve hours. By these washings, which last from twenty to twenty-five days, the precipitate becomes, successively, greenish-brown, bluish, and finally deep-blue. When of the latter colour, it is collected and allowed to drain upon a cloth, after which it is divided into cubical masses and dried.

Properties. Pure Prussian blue is a tasteless powder, insoluble in water and alcohol, and having a rich deep-blue colour. It is insoluble in dilute acids, decomposed by fuming nitric acid, and dissolved without decomposition by strong sulphuric acid, forming a white mass of the consistence of paste, from which the Prussian blue may be precipitated unchanged by water. Concentrated muriatic acid decomposes it, dissolving sesquioxide of iron, and liberating hydroferrocyanic acid. Boiled with red oxide of mercury it generates bicyanuret of mercury. (See *Hydrargyri Cyanuretum.*) By the contact of a red-hot body it takes fire and burns slowly, leaving a residue of sesquioxide of iron. When it is heated in close vessels, water, hydrocyanic acid, and carbonate of ammonia are evolved, and carburet of iron is left. Its composition has been given above. The Prussian blue of commerce was discovered by accident, in 1710, by Diesbach, a preparer of colours at Berlin. It has the same general properties as the pure substance. It occurs in small rectangular masses, which are heavier than water, and have a fracture presenting a bronzed appearance. Besides the constituents of pure Prussian blue, it always contains alumina, derived from the alum employed in its manufacture, and which serves to give it body as a pigment, and uncombined sesquioxide of iron. These substances may be detected by boiling the pigment with dilute muriatic acid, and precipitating the filtered solution with ammonia. Pure Prussian blue, treated in this manner, yields no precipitate.

Medical Properties, &c. Prussian blue is supposed to act as a tonic, febrifuge, and alterative. Dr. Zollickoffer, of Maryland, has recommended it as a remedy in intermittent and remittent fevers, and deems it to be particularly adapted to such cases occurring in children, on account of the smallness of the dose and its want of taste. He considers it more certain, prompt, and efficacious than the bark; while it has the advantage of being admissible in the state of pyrexia, and of not disagreeing with the most irritable stomach. It has also been used by Dr. Kirchoff, of Ghent, in epilepsy with good success. Dr. Bridges, of this city, exhibited it in a case of severe and protracted facial neuralgia, with considerable relief, after the usual remedies in this complaint had been tried with little or no benefit. It is sometimes employed as an application to ill-conditioned ulcers, mixed with some simple ointment, in the proportion of a drachm to the ounce. The dose of pure Prussian blue for an adult is from three to five grains, repeated several times a day, and gradually increased until some obvious effect is produced.

Off. Prep. Hydrargyri Cyanuretum. B.

FERRI IODIDUM. *U. S., Ed., Dub. Iodide of Iron.*

"Take of Iodine *two ounces;* Iron Filings *an ounce;* Distilled Water *a pint and a half.* Mix the Iodine with a pint of the Distilled Water, in a porcelain or glass vessel, and gradually add the Iron Filings, stirring constantly. Heat the mixture gently until the liquid acquires a light-greenish colour; then filter, and, after the liquid has passed, pour upon the filter the remainder of the Distilled Water boiling hot. When this has passed, evaporate the filtered liquor at a temperature not exceeding 212°, in an iron vessel, to dryness. Keep the dry Iodide in a closely stopped bottle." *U. S.*

"Take *any convenient quantity* of Iodine, Iron Wire, and Distilled Water, in the proportions for making Solution [Syrup] of Iodide of Iron. Proceed as directed for that process; but before filtering the solution, concentrate it to one-sixth of its volume, without removing the excess of Iron Wire. Put the filtered liquor quickly in an evaporating basin, along with twelve times its weight of quicklime around the basin, in some convenient apparatus, in which it may be shut up accurately in a small space, not communicating with the general atmosphere. Heat the whole apparatus in a hot air-press, or otherwise, until the water be entirely evaporated; and preserve the dry iodide in small well closed vessels." *Ed.*

"Take of Pure Iodine *one ounce* [avoirdupois]; Filings, or thin Turnings of wrought Iron, separated from impurities by a magnet, *half an ounce* [avoird.]; Distilled Water *five ounces* [avoird.]. Introduce the Iodine, Iron, and four ounces of the Water into a Florence flask, and, having heated the mixture gently for ten minutes, boil until the solution loses its red colour. Pass the liquid now through paper into a second flask, washing the filter with the remaining ounce of Water, and, by means of a regulated heat, boil down the liquor until a drop of it taken out on the end of an iron wire solidifies on cooling. When the flask has assumed the temperature of the air, let the iodide of iron be extracted from it (by breaking the flask if necessary), and, after it has been submitted to powerful pressure, enveloped in blotting paper, let it be enclosed in a well stopped bottle." *Dub.*

In these processes iron is made to unite with iodine by the intervention of water, and the combination takes place readily and quickly. The liquid at first is red or orange-coloured, from the circumstance that all the iodine has not united with the iron; but after the application of heat it becomes fully saturated and limpid, and assumes a greenish colour. It is now a solution of iodide of iron, and yields the solid salt by evaporation. The proportion of the iron taken is half the weight of the iodine. Fine iron wire, recently cleaned, is directed by the Edinburgh College on account of its purity; but iron filings dissolve more readily, and, if carefully selected, will be sufficiently pure. It is exceedingly difficult to obtain this salt in the solid state perfectly pure, so great is the proneness of its solution to absorb oxygen, whereby the iodide becomes, in part, converted into sesquioxide. This change is prevented to a certain extent in the process of the U. S. Pharmacopœia, by evaporating to dryness in an *iron* vessel; and in the process of the Edinburgh College, by concentrating the solution, before filtering, in contact with the excess of iron wire, and afterwards evaporating it in a hot air-press, subjected to the drying influence of quicklime.

The process of the Edinburgh College for iodide of iron is that of the Messrs. T. & H. Smith, of Edinburgh. These chemists have since recommended the following improved process, which more effectually excludes atmospheric air. Boil, in a Florence flask, six drachms of pure iron filings with two ounces and a quarter of iodine, in four and a half ounces of distilled water, until the liquid loses its dark colour. Then filter the liquid rapidly into another flask, and evaporate it at a boiling heat, until its green shade passes into black. After this period, the heat is kept up as long as the evaporation of moisture continues, which may be ascertained by its condensation on a cold piece of glass, placed,

from time to time, over the mouth of the flask. When this ceases, the flask contains pure, anhydrous, spongy iodide of iron, which, when cold, is to be removed by breaking the flask, bruised coarsely in a warm dry mortar, and enclosed immediately in small well-corked bottles. If it is wished to obtain the iodide as a crystallized hydrate, the heat is to be withdrawn as soon as the liquid is sufficiently concentrated to congeal, in a dry and hard crust, on the end of an iron wire, dipped into it.

Properties. Iodide of iron is a crystalline substance, exceedingly deliquescent, of a greenish-black colour, and styptic, chalybeate taste. "When carefully prepared by the Edinburgh formula, it has a dark grayish-black metallic appearance, and irregularly foliated texture, not unlike iodine itself." (*Christison's Dispensatory.*) Its solution, by evaporation with as little contact of air as possible, affords transparent, green, tabular crystals. When heated moderately it fuses, and, on cooling, becomes an opaque crystalline mass, having an iron-gray colour and metallic lustre. At a higher temperature it emits violet-coloured vapours, and the iron is left in the state of sesquioxide. It is very soluble both in water and alcohol. When recently prepared it is wholly soluble in water, forming a pale-green solution; but if made for some time, it almost unavoidably contains some sesquioxide of iron from a partial decomposition, and will not be entirely soluble. M. Lecoq, of Saint-Quentin, has proposed to preserve it in a wide-mouthed, ground-stoppered bottle, covered with a layer of reduced iron, which cannot decompose it, and which at the same time protects it from the action of the air. When the iodide is wanted, the iron is removed with a bone spatula, or a little brush. (*Journ. de Pharm.*, Feb. 1853, p. 135.) The aqueous solution is very liable to spontaneous decomposition, becoming at last orange-red from the generation of free iodine, and depositing sesquioxide of iron. According to Mr. Richard Phillips, jun., the first step in this change is the formation of protoxide of iron and hydriodic acid, from the decomposition of water. As the protoxide immediately begins to be converted into sesquioxide by absorbing oxygen from the air, and in this state is precipitated, the hydriodic acid is set free; and hence is accounted for the acidity of the solution from the first moment the sesquioxide is deposited. Afterwards, the hydriodic acid is decomposed by the action of air, and iodine liberated. When the solution is prevented from generating free iodine, by placing in it a coil of iron wire, according to the plan of Mr. Squire, the iron acts by combining with the iodine of nascent hydriodic acid, and not with nascent iodine. (*Pharm. Journ. and Trans.*, iv. 19.) The plan of Mr. Squire does not prevent the deposition of sesquioxide, and has, therefore, been superseded by the use of saccharine matter, which affords a better protection to the solution. (See *Liquor Ferri Iodidi.*) Iodide of iron is incompatible with alkalies and their carbonates, with lime-water, and with all other substances by which sulphate of iron is decomposed. When crystallized it consists of one eq. of iodine 126·3, one of iron 28, and five of water 45=199·3.

Medical Properties and Uses. Iodide of iron was first employed in medicine by Dr. Pierquin in 1824. It was first used in the United States in 1832 by Professor Samuel Jackson, of this city, at whose request it was prepared in solution by Mr. E. Durand. The late Dr. A. T. Thomson, of London, presented it to the notice of the profession in England, as a remedy, in 1834. Its powers are those of a tonic, alterative, diuretic, and emmenagogue. As a therapeutic agent, it acts more like the preparations of iron than like those of iodine. It sometimes sharpens the appetite and promotes digestion, and occasionally acts as a laxative and diuretic. When it does not operate on the bowels, it generally augments the urine. Its use blackens the stools and lessens their fetor. It is chiefly employed in scrofulous complaints, swellings of the cervical glands, visceral obstructions attended with deficient action, chlorosis, atonic amenorrhœa,

and leucorrhœa. In the two diseases last mentioned, Dr. Pierquin employed it with success. In obstinate syphilitic ulcers, M. Baumes, of Lyons, used it with satisfactory results. He gave it in the form of pill, conjoined with extract of opium, and sometimes increased the dose to 20 grains in the course of twenty-four hours. In secondary syphilis, occurring in debilitated and scrofulous subjects, Ricord has found it a valuable remedy. The dose is a grain, gradually increased to eight or more. For forming enemata, injections for the vagina, and lotions for ulcers, one or two drachms of the salt may be dissolved in a pint of water. It should never be given in the form of pill, unless protected by saccharine matter, on account of its deliquescent property, and its proneness to decomposition; and even when thus protected, the pills become soft and lose their shape. Messrs. T. and H. Smith, of Edinburgh, have given a formula for pills of this kind, made from the anhydrous iodide of iron with refined sugar and honey. A similar pill had been previously devised by Dupasquier, and improved by Mr. H. W. Worthington, of this city, in which the protecting substances are honey and tragacanth. M. Blancard has proposed a pill of iodide of iron, made directly from its elements, protected by honey, brought to a pilular consistence with powder of marshmallow, rolled in the powder of reduced iron, and varnished with a thin coating of resin, by dipping it once or twice in an ethereal solution of the balsam of Tolu. Dr. D. F. Wright, of Memphis, Tenn., has given a formula for a similar pill, made extemporaneously from reduced iron, and protected by honey and an excess of iron. (See *Am. Journ. of Pharm.*, Jan. 1854, p. 6.) Prof. Procter is in the habit of introducing a small proportion of reduced iron into the mass, when iodide of iron is extemporaneously prescribed in pill. In view of the serious objections which apply to the solid iodide of iron, it might well be dispensed with, and the syrup or saccharine solution substituted. The London College has omitted the solid iodide from its Pharmacopœia of 1851. Solutions for external use may be formed by reducing the U. S. saccharine solution (*Liquor Ferri Iodidi*) with water to any desired extent, at the moment of using them; and, in cases in which it might be desirable to give the salt in the solid state, the officinal *syrup* could be reduced to a saccharine mass proper for making pills by evaporation to dryness. (See *Pilulæ Ferri Iodidi.*) B.

LIQUOR FERRI IODIDI. *U. S.* Syrupus Ferri Iodidi. *Lond., Dub.* Ferri Iodidi Syrupus. *Ed.* *Solution of Iodide of Iron. Syrup of Iodide of Iron.*

"Take of Iodine *two ounces;* Iron Filings *an ounce;* Sugar, in powder, *twelve ounces;* Distilled Water *a sufficient quantity.* Mix the Iodine with five fluidounces of Distilled Water, in a porcelain or glass vessel, and gradually add the Iron Filings, stirring constantly. Heat the mixture gently until all the Iodine is dissolved, or until the liquid acquires a light greenish colour. Then filter the solution into a glass bottle, containing the Sugar, and, after it has passed, pour Distilled Water gradually upon the filter until the filtered liquor, including the Sugar, measures twenty fluidounces. Lastly, shake the bottle until the Sugar is dissolved, and keep it closely stopped." *U. S.*

"Take of Iodine *an ounce;* Iron Wire *three drachms;* Distilled Water *twelve fluidounces* [Imp. meas.], or *a sufficient quantity;* Sugar *ten ounces.* Mix the Iodine and Iron with eight fluidounces of the Water, and heat until the solution acquires a greenish colour; then filter. Evaporate the solution to about four fluidounces, and throw in the Sugar. Then, when the syrup has grown cold, add sufficient Water to make it measure fifteen fluidounces [Imp. meas.], and keep it in a black glass bottle, well stopped." *Lond.*

"Take of Iodine (dry) *two hundred grains;* fine Iron Wire, recently cleaned, *one hundred grains;* White Sugar, in powder, *four ounces and a half;* Distilled Water

six fluidounces [Imperial measure]. Boil the Iodine, Iron, and Water together in a glass matrass, at first gently, to avoid the expulsion of Iodine vapour, afterwards briskly, until about two fluidounces of liquid remain. Filter this quickly, while hot, into a matrass containing the Sugar; dissolve the Sugar with a gentle heat, and add Distilled Water, if necessary, to make up six fluidounces. Twelve minims contain one grain of Iodide of Iron." *Ed.*

"Take of Pure Iodine *five drachms* [avoirdupois]; Iron Turnings, separated by a magnet, *three drachms* [Dub. weight]; Distilled Water *two ounces* [avoird.]; Simple Syrup *six fluidounces* [Imp. meas.]. Introduce the Iodine, Iron, and Water into a glass flask, and apply a moderate heat until the solution loses its red colour. Filter the solution while hot into a bottle containing the Syrup, mix with agitation, and add distilled Water, to make up eight fluidounces [Imp. meas.]. One fluidrachm contains about five grains of Iodide of Iron." *Dub.*

These preparations furnish a solution of iodide of iron, rendered more permanent by sugar. The mode of making the iodide is precisely the same as that given under the head of *Ferri Iodidum.* The Edinburgh College directs the iodine to be dry; because, if moist, as the British iodine often is, less iodide of iron will be formed, and the syrup will be proportionably weaker. (See *Iodinium Purum.*) In all the processes an excess of iron is taken, the excess being greatest in the Dublin formula, and least in the London. A moderate excess of iron is useful in preventing the solution of iodide of iron from undergoing any change from the absorption of oxygen during filtration, before it comes in contact with the sugar. Assuming that the iodine without loss is all converted into iodide of iron, it is easy to calculate the strength of the several officinal solutions. Thus it will be found that the U. S. solution contains 7¼ grains, and those of the British Colleges about 5 grains of the dry iodide to the fluidrachm. In the British preparations sufficient sugar is used to constitute a syrup; in the U.S. preparation, much less sugar is directed. According to Mr. W. Tozier, of Kingstown, Ireland, the proportion of sugar in the British formulæ is not sufficient fully to protect the iodide from change; and, if this statement be accurate, the saccharine strength of the U. S. preparation must be deemed altogether inadequate. Prof. Procter is of opinion that the iodide of iron in the U. S. formula would be better protected by more sugar. A coil of iron wire, or a strip of bright iron, immersed in the solution, assists in preserving it from change.

The plan of protecting the solution of iodide of iron from change by saccharine matter originated with M. Frederking, of Riga, who published a formula for the purpose in *Buckner's Repertorium* in 1839. The same plan was proposed in a paper by Prof. Procter, contained in the *Amer. Journ. of Pharmacy* for April 1840. In the *Journal de Pharmacie* for March 1841, Dr. Dupasquier, of Lyons, claims to have made a pure iodide of iron, protected by syrup of gum, as early as 1838. In the *Pharm. Journ. and Trans.* for August 1841, the late Dr. A. T. Thomson gave a paper in which he confirmed the results of Frederking and Procter, and proposed a formula for a *strong syrup*, which is the basis of that adopted in the British Pharmacopœias.

Properties. The *U. S. solution of iodide of iron* is a transparent liquid, free or nearly so from sediment, and of a pale-green colour. It becomes brown on the addition of sulphuric acid, and emits violet vapours when heated. It should not contain any free iodine, which, if present, may be detected by the production of a blue colour with starch. The *syrup of the British Colleges* is a transparent liquid, either colourless or pale yellowish-green, and without sediment even when exposed to the air. When concentrated it becomes brown, and, when evaporated to dryness, it forms a mass which may be called the *saccharine iodide*, and which is not entirely soluble again, a little sesquioxide of iron being left. This saccharine iodide, being protected by the sugar it contains, is not

liable to the objections which apply to the pure solid salt, and may be made into pills. (See *page* 1005.)

Medical Properties. These have been detailed under the head of *Ferri Iodidum.* The dose of the U. S. *solution* is from 20 to 50 drops, sufficiently diluted with water; that of the *syrup* of the British Colleges, one-half larger. The dilution should be made at the moment it is taken; and, in order to guard against injury to the teeth, the mouth should be carefully washed after each dose. B.

LIQUOR FERRI NITRATIS. *U. S.* FERRI PERNITRATIS LIQUOR. *Dub. Solution of Nitrate of Iron. Solution of Pernitrate of Iron. Solution of Ternitrate of Sesquioxide of Iron.*

"Take of Iron Wire, cut in pieces, *an ounce;* Nitric Acid [sp. gr. 1·42] *three fluidounces;* Distilled Water *a sufficient quantity.* Mix the Acid with a pint of Distilled Water, add the Iron, and agitate occasionally until gas ceases to be disengaged; then filter the solution, and add to it sufficient Distilled Water to make it measure thirty fluidounces." *U. S.*

"Take of fine Iron Wire, free from rust, *one ounce* [avoirdupois]; Pure Nitric Acid [sp. gr. 1·5] *three fluidounces* [Imp. meas.]; Distilled Water *a sufficient quantity.* Into the Acid, first diluted with sixteen ounces [avoird.] of the Water, introduce the Iron Wire, and leave them in contact until gas ceases to be disengaged. Filter the solution, and to it add as much Water as will make its bulk one pint and a half [Imp. meas.]. The specific gravity of this Solution is 1·107." *Dub.*

Upon a comparison of these formulæ, it will be found that the U. S. process differs from the Dublin in substituting the troy for the avoirdupois ounce of iron, and three wine fluidounces of nitric acid, sp. gr. 1·42, for three Imperial fluidounces of the same acid, sp. gr. 1·5. These variations from the Dublin formula increase the iron taken 42½ grains, and lessen the weight of the acid; for three wine fluidounces of nitric acid, sp. gr. 1·42, weigh 27½ grains less than the three Imp. fluidounces of the acid, sp. gr. 1·5. The comparative deficiency of acid in the U. S. formula is much greater than this, when the sp. gr. of the U. S. acid compared with that of the Dublin acid, is taken into account. These differences, however, do not appear material; for, on the supposition that the preparation contains the ternitrate of sesquioxide of iron, there is not enough acid taken in either formula to dissolve all the iron. To produce this salt, four eqs. of nitric acid may be supposed to react with two eqs. of iron. One eq. of the nitric acid, with evolution of nitric oxide, will be expended in converting the iron into sesquioxide, with which the three remaining eqs. of acid will unite. $4NO_5$ and $2Fe=Fe_2O_3,3NO_5$ and NO_2.

This solution was introduced to the notice of the profession by Mr. William Kerr, of Scotland, in 1832. As made by Mr. Kerr, it is a transparent liquid of a beautiful dark-red colour, and a very astringent but not caustic taste. Its sp. gr., as made by the Dublin formula, is 1·107. It is apt to become turbid on keeping, and to deposit a subnitrate of the sesquioxide. To obviate this liability to change, Mr. Kerr always added a small portion of muriatic acid. Prof. Procter attains the same end by adding the iron gradually, filtering immediately after all the iron has been thrown in, heating the filtrate gently in a capsule or flask, and carefully dropping in nitric acid, with stirring, avoiding an excess, until a drop of the solution, tested with ammonia, yields a red precipitate, without any tinge of black. By thus preventing a prolonged contact between the salt formed and metallic iron, but little protoxide is generated; and this is subsequently turned into sesquioxide and saturated by the careful addition of nitric acid. (See *Am. Journ. of Pharm.* Oct. 1851, p. 313.) Solution of nitrate of iron, made by Prof. Procter's modified formula, has a bright Madeira wine colour,

and keeps very well. When treated with ammonia, it yields a red precipitate of sesquioxide of iron. The late Mr. Duhamel, of Philadelphia (*Am. Journ. of Pharm.*, xvii. 92) proposed to render the solution permanent by preparing it as a syrup; but it is well known that his syrup would not keep.* *Ternitrate of sesquioxide of iron*, as described by Mr. J. M. Ordway, of Massachusetts, is in the form of oblique rhombic prisms, which are either colourless or of a delicate lavender colour. It is somewhat deliquescent, and very soluble in water, but sparingly soluble in nitric acid. It consists of three eqs. of nitric acid, one of sesquioxide of iron, and eighteen of water. (*Silliman's Journ.*, Jan. 1850.)

Medical Properties. This solution is considered to act as a tonic and astringent. Dr. R. J. Graves, of Dublin (*Am. Journ. of Med. Sci.*, xviii. 216, from the *Lond. Med. and Surg. Journ.*), praises it as a remedy in chronic diarrhœa, especially when occurring in delicate and nervous women, in which there is no thirst, redness of tongue, tenderness of the abdomen on pressure, or other indication of inflammation. Mr. Kerr attributed to it the property of diminishing the irritability of the intestinal mucous membrane. It is particularly applicable to the treatment of mucous diarrhœa, attended with pain, but not to cases in which ulcerations of the intestines exist. Dr. T. C. Adams, of Michigan (*Amer. Journ. of Med. Sci.*, xxiv. 61), also reports favourably of this remedy in chronic diarrhœa, considering it, like Mr. Kerr, to act as a sedative as well as astringent. He employed it, likewise, with good effect in menorrhagia, and both internally and by injection in leucorrhœa, when occurring in pale, exsanguine, and feeble subjects. The dose, according to Dr. Graves, is seven or eight drops, gradually increased to fifteen, sufficiently diluted, in the course of the day. Dr. Adams, however, gave it in doses of ten drops, two, three, or four times a day, and sometimes increased it to twenty-five drops. As an injection he employed it sufficiently diluted to cause only a slight heat and smarting in the vagina. B.

FERRI OXIDUM HYDRATUM. *U. S.* Ferrugo. *Ed.* Ferri Peroxydum Hydratum. *Dub.* *Hydrated Oxide of Iron. Hydrated Peroxide of Iron. Hydrated Sesquioxide of Iron.*

"Take of Sulphate of Iron *four ounces;* Sulphuric Acid *three fluidrachms and a half;* Nitric Acid *six fluidrachms*, or *a sufficient quantity;* Solution of Ammonia *a sufficient quantity;* Water *two pints.* Dissolve the Sulphate of Iron

* Prof. Procter has proposed the following formula for preparing a *syrup of the nitrate of protoxide of iron*, a preparation considerably used, in Philadelphia, as an astringent in chronic diarrhœa. Take of iron wire, in pieces (card teeth), *two ounces;* nitric acid (sp. gr. 1·42) *three fluidounces;* water *thirteen fluidounces;* sugar, in powder, *two pounds.* Put the iron in a wide-mouthed bottle, kept cool by standing in cold water, and pour upon it three fluidounces of water. Then mix the acid with ten fluidounces of water, and add the mixture in portions of half a fluidounce to the iron, agitating frequently until the acid is saturated, using litmus paper. When the saturation is complete, filter the solution into a bottle containing the sugar, and marked to contain thirty fluidounces. If the whole does not measure that bulk, pass water through the filter to make up the deficiency. When all the sugar is dissolved, strain if necessary, and introduce the syrup into suitable vials, and seal them. This syrup is thick, permanent, of a light-greenish colour, perfectly transparent, neutral, and yields a greenish precipitate with ammonia. (*Am. Journ. of Pharm.*, Oct. 1851, p. 314.) Mr. W. W. D. Livermore has given a formula for a similar syrup. (*Ibid.* p. 315.) These syrups should not contain an excess of acid; for if they do, they are apt to deposit, after keeping, white granular masses of grape sugar, as observed by Mr. W. Tozier, of Kingstown, Ireland, in consequence of the action of the acid upon the cane sugar. According to Mr. Joseph Laidley, of Richmond, Va., the so-called syrup of the nitrate of sesquioxide of iron is an unscientific preparation, containing protoxide if an excess of acid is avoided, and liable to let fall a precipitate of oxalate of iron when the acid is in excess. These objections do not apply to Prof. Procter's syrup, containing the protoxide; and hence Mr. Laidley believes that the only nitrate, proper to be formed into a syrup, is the nitrate of the protoxide, where alone the protective action of sugar is required. (*Ibid.*, March, 1853, p. 97.)—*Note to the tenth edition.*

in the Water, and, having added the Sulphuric Acid, boil the solution; then add the Nitric Acid in small portions, boiling the liquid for a minute or two after each addition, until the acid ceases to produce a dark colour. Filter the liquid, allow it to cool, and add Solution of Ammonia in excess, stirring the mixture briskly. Wash the precipitate with water until the washings cease to yield a precipitate with chloride of barium, and keep it in close bottles with water sufficient to cover it." *U. S.*

"Take of Sulphate of Iron *four ounces;* Sulphuric Acid (commercial) *three fluidrachms and a half* [Imp. meas.]; Nitric Acid (D. 1·380) *nine fluidrachms* [Imp. meas.]; Stronger Aqua Ammoniæ *three fluidounces and a half* [Imp. meas.]; Water *two pints* [Imp. meas.]. Dissolve the Sulphate in the Water, add the Sulphuric Acid, and boil the solution; add then the Nitric Acid in small portions, boiling the liquid for a minute or two after each addition, until it acquires a yellowish-brown colour, and yields a precipitate of the same colour with ammonia. Filter, allow the liquid to cool, and add in a full stream the Aqua Ammoniæ, stirring the mixture briskly. Collect the precipitate on a calico filter; wash it with water till the washings cease to precipitate with nitrate of baryta; squeeze out the water as much as possible, and dry the precipitate at a temperature not exceeding 180°. When this preparation is kept as an antidote for poisoning with arsenic, it is preferable to preserve it in the moist state, after being simply squeezed." *Ed.*

"Take of Sulphate of Iron *eight ounces* [avoirdupois]; Pure Sulphuric Acid *six fluidrachms* [Imp. meas.]; Pure Nitric Acid *half a fluidounce* [Imp. meas.]; Solution of Caustic Potash *one quart* [two pints, Imp. meas.]; Distilled Water *twelve ounces* [avoird.]. To ten ounces of the Water add the Sulphuric Acid, and in the mixture with the aid of heat dissolve the Sulphate of Iron. Mix the Nitric Acid with the remainder of the Water, and, having added the Diluted Acid to the solution of Sulphate of Iron, concentrate by boiling, until, upon the sudden disengagement of much gas, the liquid passes from a dark to a red colour. Let this be now poured into the Solution of Caustic Potash, and, when the mixture has been well stirred, place it on a calico filter, and let the precipitate be washed with distilled water until the liquid which passes through ceases to give a precipitate when dropped into a solution of chloride of barium. Lastly, enclose the precipitate, while in the pasty state, in a porcelain pot whose lid is made air-tight by a luting of lard, so as to prevent the loss of water by evaporation." *Dub.*

This preparation was introduced into the officinal catalogues on account of its importance as an antidote to the poison of arsenious acid. The first step of the processes is to convert the sulphate of protoxide of iron into the tersulphate of the sesquioxide, precisely as is done in the U. S. formula for pure Prussian blue. The sesquioxide is then thrown down in the hydrated state by the addition of ammonia in excess in the U. S. and Edinburgh formulæ, and by potassa in the Dublin. The precipitate is then washed with water to remove adhering sulphate of ammonia or of potassa, until the washings cease to precipitate with a barytic salt. In the U. S. Pharmacopœia the precipitate is directed to be kept in close bottles with sufficient water to cover it, in which state it is most convenient for use as an antidote. The Edinburgh College directs it to be kept in two states; dried at a temperature not exceeding 180° for use as a medicine, and in the moist state as an antidote.

Besides having this antidote ready formed in the pulpy state, it is the duty of the apothecary to be always prepared to make it, by keeping the necessary solutions for its precipitation. These are the tersulphate of sesquioxide of iron in solution, made as directed in the above formulæ, and solution of ammonia. In relation to this subject the reader is referred to a paper, by Prof. Procter, in the *Am. Journ. of Pharm.* for March, 1853, p. 104.

Properties. Hydrated oxide of iron, as directed to be kept by the U. S. formula, is a soft, moist, reddish-brown magma. If dried at a heat not exceeding 180°, and afterwards pulverized, it forms a reddish-brown powder, not attracted by the magnet, being the sesquioxide in the state of hydrate, containing about 18 per cent. of water. In this state it is wholly and readily soluble in muriatic acid without effervescence. If exposed to a red heat, it loses the combined water, and becomes the anhydrous sesquioxide, less easily soluble in acids, improper for medicinal use, and altogether without effect as an antidote. Hydrated oxide of iron consists of one eq. of sesquioxide 80, and two of water 18=98, and is represented by the formula Fe_2O_3+2HO.

Medical Properties and Uses. The hydrated oxide, being readily soluble in acids, would no doubt form, in the dry state, a good ferruginous preparation for medicinal employment. Its antidotal powers in cases of poisoning by arsenic, the manner in which it acts, the circumstances which impair its efficiency, and the mode of using it, are fully explained under the head of arsenious acid, *page* 27. Its power of rendering arsenious acid insoluble is readily shown by agitating a solution of the acid with a considerable excess of the moist oxide, filtering, and then testing the filtered solution for the acid; when not a trace of the metal can be detected, even by sulphuretted hydrogen. The hydrated oxide, as obtained by the U. S. and Edinburgh formulæ, contains a little ammonia, which is thought by some to assist its antidotal powers. At least it has been ascertained that the sesquioxide, precipitated by potassa, as directed by the Dublin College, is a less efficient antidote to arsenic than when ammonia is used as the precipitant, and must be employed in quantities three or four times as large to produce the same effect. The dry hydrate, rubbed up with water, is in the same proportion weaker than the pulpy hydrate. It has already been mentioned, under arsenious acid, that the officinal subcarbonate of iron (formerly called precipitated carbonate) possesses antidotal powers to arsenic, though in an inferior degree; but this statement will not apply to it, after having been exposed to a red heat, to which it is improperly subjected by some manufacturing chemists. By ignition it becomes anhydrous, and is rendered altogether inefficient as an antidote.

Off. Prep. Ferri Peroxydum. B.

FERRI OXIDUM NIGRUM. *Ed.* *Black Oxide of Iron.*

"Take of Sulphate of Iron *six ounces;* Sulphuric Acid (commercial) *two fluidrachms and two fluid scruples;* Pure Nitric Acid *four fluidrachms and a half;* Stronger Aqua Ammoniæ *four fluidounces and a half;* boiling Water *three pints* [Imperial measure]. Dissolve half the Sulphate in half the boiling Water, and add the Sulphuric Acid; boil; add the Nitric Acid by degrees, boiling the liquid after each addition briskly for a few minutes. Dissolve the rest of the Sulphate in the rest of the boiling Water; mix thoroughly the two solutions; and immediately add the Ammonia in a full stream, stirring the mixture at the same time briskly. Collect the black powder on a calico filter; wash it with water till the water is scarcely precipitated by a solution of nitrate of baryta, and dry it at a temperature not exceeding 180°." *Ed.*

The black oxide of iron of the Edinburgh College is here made by the process of Wöhler, which consists in precipitating by ammonia a solution of the mixed sulphates of protoxide and sesquioxide of iron. Half the sulphate of iron taken in the formula, after having been dissolved in water, is acidulated with sulphuric acid, and converted into the tersulphate of the sesquioxide by means of nitric acid. The object of the addition of the sulphuric acid is explained under the head of Prussian blue. (See *Ferri Ferrocyanuretum.*) The other half of the sulphate is dissolved in water, and the two solutions, being thoroughly mixed, form a compound solution of sulphate of the protoxide and tersulphate of the sesquioxide of iron. From this the ammonia throws down, at the same moment, both the protoxide and sesquioxide, which unite chemically to form the black

oxide of the Edinburgh College. According to Mr. Phillips, the black oxide may be readily obtained by mixing boiling solutions of equivalents of carbonate of soda and sulphate of protoxide of iron, and adding, by small portions at a time, somewhat less than an eq. of chlorate of potassa. If a whole eq. of the chlorate be added, and at once, the hydrated sesquioxide would be obtained.

Properties. The black oxide of iron of the Edinburgh College is a dark grayish-black powder, unchangeable in the air, and strongly magnetic. When dried in mass and then broken, it presents a shining fracture. It is wholly soluble in muriatic acid without effervescence, and may be thrown down again as a black precipitate by ammonia. When heated in close vessels it suffers no change except the loss of water; but in open vessels it absorbs oxygen, and is converted entirely into sesquioxide. It consists of two eqs. of protoxide of iron, one of sesquioxide, and two of water, and its formula is $2FeO,Fe_2O_3+2HO$. It is perceived by the above symbols, that the two oxides are united in it in such proportions as to contain, each, the same quantity of iron; and this composition corresponds with what it should be, according to the direction given in the formula to divide the sulphate of iron into two equal portions.

Medical Properties. The Ed. black oxide is a valuable chalybeate, having the merit of uniform composition and permanency under the influence of air and moisture. The dose is from five to twenty grains, two or three times a day. B.

FERRI OXYDUM MAGNETICUM. *Dub. Magnetic Oxide of Iron. Martial Ethiops.*

"Take of Sulphate of Iron *twelve ounces* [avoirdupois]; Solution of Caustic Potash *fifty-four ounces* [avoird.]; Distilled Water *a sufficient quantity.* Convert, as is directed in the formula for *Ferri Peroxydum Hydratum*, eight ounces of the Sulphate of Iron into a persulphate. To the solution thus obtained add the four remaining ounces of the Sulphate of Iron, first dissolved in half a pint [Imp. meas.] of Distilled Water. Mix well the resulting liquid with the Solution of Caustic Potash, and, having boiled for five minutes in an iron vessel, collect the precipitate on a calico filter, and wash it with boiling distilled water, until the liquid which passes through ceases to give a precipitate when dropped into a solution of chloride of barium. Lastly, let the precipitate be dried by a steam or water heat, and, having been first reduced to a fine powder, let it be enclosed in a well stopped bottle." *Dub.*

In this formula, two-thirds of the sulphate of protoxide of iron taken is converted into tersulphate of the sesquioxide. The remaining third of the sulphate is then dissolved in water, and mixed with the solution of the tersulphate. A compound solution is thus obtained, containing two-thirds of the iron in the state of sesquioxide, and one-third in that of protoxide. When this solution is treated with potassa, a mixed precipitate of one eq. of sesquioxide and one of protoxide is thrown down. Now such a compound oxide corresponds in composition with the native magnetic black oxide. The precipitate is washed to remove sulphate of potassa, and the washings are known to be completed, when the chloride of barium ceases to give a precipitate with them.

Properties, &c. The artificial magnetic oxide of iron of the Dublin College is a dark grayish-black powder, having the same general appearance as the Edinburgh black oxide. It is formed almost always to some extent in the process for making reduced iron, in consequence of the partial deoxidation of part of the sesquioxide by the hydrogen. (See *Ferri Pulvis*, p. 995.) It differs from the Edinburgh black oxide in composition, containing one eq. of protoxide to one of sesquioxide; whereas the Edinburgh oxide contains two eqs. of protoxide to one of sesquioxide. The Dublin preparation has the same medical properties as the corresponding one of the Edinburgh College. The dose is from five to twenty grains given several times a day. B.

FERRI PEROXYDUM. *Dub. Peroxide of Iron. Sesquioxide of Iron.*

"Take of Hydrated Peroxide of Iron *any convenient quantity.* Place it in an oven on a few folds of filtering paper, and, when it has become dry to the touch, transfer it to a covered crucible, and expose it for a few minutes to an obscure red heat." *Dub.*

This is the former Dublin red oxide of iron under a new name, and formed by a better process. The dried hydrated oxide loses, by ignition, its combined water, and is converted into the pure sesquioxide.

Properties, &c. This oxide is a reddish-brown, tasteless, insoluble powder, identical with the colcothar of commerce. It should not be deliquescent, and should dissolve in muriatic acid without effervescence. If it contain copper, its muriatic solution will deposit this metal on a bright piece of iron. It consists of two eqs. of iron 56, and three of oxygen 24=80. It is, therefore, a sesquioxide. As it is anhydrous, it has no effect as an antidote to arsenious acid. This oxide is not used as a medicine, and is employed by the Dublin College only in making iron plaster and powder of iron, for which purposes other forms of oxidized iron would answer as well. The former Dublin *Rubigo Ferri* or *rust of iron,* formed by exposing moistened iron wire to the air till converted into rust, is essentially the sesquioxide, containing a little carbonate of the protoxide.

Off. Prep. Emplastrum Ferri; Ferri Pulvis. B.

FERRI PHOSPHAS. *U. S. Phosphate of Iron.*

"Take of Sulphate of Iron *five ounces;* Phosphate of Soda *six ounces;* Water *a gallon.* Dissolve the Sulphate of Iron and Phosphate of Soda, severally, in four pints of the Water; then mix the solutions, and set the mixture by that the powder may subside; lastly, having poured off the supernatant liquor, wash the Phosphate of Iron with hot water, and dry it with a gentle heat." *U. S.*

This preparation is the result of a double decomposition between the saline materials employed. As the medicinal phosphate of soda is the tribasic phosphate, having the composition, $2NaO,HO,PO_5$, it follows that it requires two eqs. of sulphate of protoxide of iron for its decomposition, as shown by the following equation. $2(FeO,SO_3)$ and $2NaO,HO,PO_5=2FeO,HO,PO_5$ and $2(NaO,SO_3)$. The resulting salts, therefore, are one eq. of tribasic phosphate of iron, the salt under notice, and two eqs. of sulphate of soda, which are washed away. If the ferruginous sulphate be a perfect sulphate of the protoxide, the precipitate as first thrown down will be white; but it quickly absorbs oxygen and becomes bluish-white. It is in the form of a powder of a bright slate colour, insoluble in water, but soluble in acids. When perfect, it consists of one eq. of phosphoric acid, two of protoxide of iron, and one of basic water; but generally it contains some phosphate of the sesquioxide ($2Fe_2O_3,3HO,3PO_5$).

Phosphate of iron, dissolved to saturation in a boiling solution of metaphosphoric acid (HO,PO_5), under the name of *superphosphate of iron,* was brought forward as a new remedy, in Jan. 1851, by Dr. Routh, of London. Mr. Thomas Greenish, of the same city (*Pharm. Journ. and Trans.*, May, 1851), states that the solution of the salt, on cooling, hardens into a mass of a pilular consistence, soluble in water in all proportions, and free from any disagreeable or inky taste. From this superphosphate Mr. Greenish has prepared a syrup, containing five grains of the salt to the fluidrachm.

If two eqs. of tersulphate of sesquioxide of iron be decomposed by three eqs. of pyrophosphate of soda, one eq. of pyrophosphate of sesquioxide of iron is precipitated, and six eqs. of sulphate of soda remain in solution. $2(Fe_2O_3,3SO_3)$ and $3(2NaO,PO_5)=2Fe_2O_3,3PO_5$ and $6(NaO,SO_3)$. This ferruginous pyrophosphate is soluble in an excess of pyrophosphate of soda; and this and similar solutions of pyrophosphates were proposed as medicines by Persoz in 1848. Mr.

Alex. Ure, of London (*Pharm. Journ. and Trans.* for Dec. 1851), tried the solution of the ferruginous pyrophosphate, calling it *soda-pyrophosphate of iron*, in scrofula, and found it a mild and efficient chalybeate. In this instance the sulphate of soda, resulting from the double decomposition, was not separated. The same solution has been prepared as a syrup by M. Soubeiran, under the name of *syrup of pyrophosphate of iron.* (*Journ. de Pharm.*, 3*e sér.* xxiii. 62.)*

Medical Properties. Phosphate of iron possesses the general properties of the ferruginous preparations, and has been given with advantage in amenorrhœa and some forms of dyspepsia. It was introduced into the U. S. Pharmacopœia at the suggestion of the late Dr. Hewson, of this city, who found it, after an extensive experience, to be a valuable chalybeate. The dose is from five to ten grains. B.

FERRI SUBCARBONAS. *U. S.* Ferri Sesquioxidum. *Lond.* Ferri Oxidum Rubrum. *Ed.* Ferri Carbonas. *Dub. Subcarbonate of Iron. Sesquioxide of Iron. Red Oxide of Iron. Precipitated Carbonate of Iron.*

"Take of Sulphate of Iron *eight ounces;* Carbonate of Soda *nine ounces;* boiling Water *a gallon.* Dissolve the Sulphate of Iron and Carbonate of Soda, severally, in four pints of the Water; then mix the solutions, and having stirred the mixture, set it by that the powder may subside; lastly, having poured off the supernatant liquor, wash the Subcarbonate of Iron with hot water, wrap it in bibulous paper, and dry it with a gentle heat." *U. S.*

"Take of Sulphate of Iron *four pounds;* Carbonate of Soda *four pounds and two ounces;* boiling Water *six gallons* [Imp. meas.]. Dissolve the Sulphate and Carbonate, separately, in three gallons of the Water. Mix the solutions together while yet hot, and set them by that the precipitate may subside. Having poured off the supernatant liquor, wash the precipitate repeatedly with water, and dry it." *Lond.*

"Take of Sulphate of Iron *four ounces;* Carbonate of Soda *five ounces;* boiling Water *half a pint* [Imp. meas.]; cold Water *three pints and a half* [Imp. meas.]. Dissolve the Sulphate in the boiling Water, add the cold Water, and then the Carbonate of Soda, previously dissolved in about thrice its weight of water. Collect the precipitate on a calico filter; wash it with water till the water is but little affected with solution of nitrate of baryta, and dry it in the hot air-press, or over the vapour-bath." *Ed.*

"Take of Sulphate of Iron *eight ounces* [avoird.]; Crystallized Carbonate of Soda of Commerce *ten ounces* [avoird.]; Distilled Water *two gallons* [Imp. meas.]. Dissolve each salt in one-half of the Water, and, both solutions being raised to the boiling temperature, mix them, and set the whole to rest in a covered vessel for six hours. The supernatant solution having been drawn off with a syphon, the precipitate is to be drained on a calico filter, and then subjected to strong expression. Finally, let it be dried at a temperature not exceeding 212°, pulverized, and preserved in a well stopped bottle." *Dub.*

When the solutions of carbonate of soda and sulphate of iron are mixed together, a hydrated carbonate of protoxide of iron, of a pale-bluish colour, is

* M. Soubeiran's formula is as follows: Add 55 *grains* of tersulphate of sesquioxide of iron, dissolved by a gentle heat, in 2 *fluidounces* of water, to 462 grains of crystallized pyrophosphate of soda, dissolved in 7½ *fluidounces* of water and 3½ of mint water, and mix. So soon as the precipitate formed redissolves, filter the solution, and add to the filtrate 19 *ounces troy* of white sugar, which must be allowed to dissolve without heat. The dose of this syrup, which is easy to take, is a tablespoonful, containing about a third of a grain of iron in the state of a double pyrophosphate. For a formula for a compound syrup of phosphate of iron by Mr. Wiegand, and for some remarks on the pharmacy of the phosphates by Prof. Procter, see the *Am. Journ. of Pharm.* for March, 1854, pp. 111 and 112.—*Note to the tenth edition.*

thrown down, and sulphate of soda remains in solution. The equivalent quantities of the *crystallized* salts for mutual decomposition are 139 of the sulphate and 143·3 of the carbonate. Taking the quantity of sulphate of iron at 8 parts, the London Pharmacopœia orders of carbonate of soda 8½ parts, the U. S. Pharmacopœia 9 parts, and the Edinburgh and Dublin 10 parts. The proportion of the London College coincides most nearly with the equivalents. The precipitate, during the washing and drying, absorbs oxygen, and loses nearly all its carbonic acid, whereby it is converted almost entirely into sesquioxide of iron. This being the chemical nature of the preparation, the London College has given it the name of *Ferri Sesquioxidum;* but, as this is applicable to the red oxide obtained by calcining the sulphate, or igniting the hydrated sesquioxide, the U. S. name of *Ferri Subcarbonas*, adopted in allusion to the small quantity of carbonic acid present in it, is more distinctive. Carbonate of potassa will answer to decompose the ferruginous sulphate; but carbonate of soda is preferred, because it produces in the double decomposition sulphate of soda, which, from its greater solubility, is more readily washed away than sulphate of potassa.

Properties. Subcarbonate of iron is a reddish-brown powder, of a disagreeable, slightly styptic taste; insoluble in water, and not readily dissolved by any acid except the muriatic, with which it effervesces slightly. After precipitation from its muriatic solution by ammonia or potassa, either of which throws down the sesquioxide of iron, the supernatant liquor should give no indications of containing any metal in solution by the test of sulphuretted hydrogen or ferrocyanuret of potassium. It is incompatible with acids and acidulous salts. In composition it is a hydrated sesquioxide of iron, containing a little protoxide and carbonic acid.

Medical Properties and Uses. Subcarbonate of iron is tonic, alterative, and emmenagogue, and is employed for all the purposes to which the preparations of iron are generally applicable. It was recommended by Mr. Carmichael in cancer, and is said sometimes to prove useful. Mr. Hutchinson brought it into notice as a remedy for neuralgia; and an extensive experience with it in that disease has established its value. It is also useful in chorea, in chlorosis, and, generally, in those diseases in which the blood is deficient in colouring matter. It has been used by Dr. Woollam, Dr. Shearman, Dr. Elliotson, and others in traumatic tetanus, with success in twelve cases and failure in three. In the second stage of hooping-cough, Dr. Steymann represents it to be a prompt and efficacious remedy. When prescribed as a tonic, the usual dose is from five to thirty grains three times a day, given in pill or powder, and frequently combined with aromatics and vegetable tonics. In neuralgia, chorea, and tetanus, it is administered in doses of from one to two teaspoonfuls. No nicety need be observed in the dose; its only obvious effect in very large doses being a slight nausea, and a sense of weight at the stomach. It blackens the stools.

The subcarbonate of iron acts as an antidote to the poison of arsenious acid, provided it has not been exposed to a red heat; and, though not so powerful as the hydrated oxide in the form of magma, should always be used till the latter can be procured. (See *page* 28.)

Off. Prep. Emplastrum Ferri; Ferri Pulvis; Ferrum Ammoniatum; Tinctura Ferri Chloridi. B.

FERRI SULPHAS. *U. S., Lond., Ed., Dub. Sulphate of Iron. Green Vitriol.*

"Take of Iron Wire, cut in pieces, *twelve ounces;* Sulphuric Acid *eighteen ounces;* Water *a gallon.* Mix the Sulphuric Acid and Water, and add the Iron; then heat the mixture until effervescence ceases. Pour off the solution, and, having added half a drachm of Sulphuric Acid, filter through paper, allowing the lower end of the funnel to touch the bottom of the receiving ves-

sel. Evaporate the filtered liquor in a matrass until sufficiently concentrated; then set it aside in a covered vessel to crystallize. Drain the crystals in a funnel, dry them on bibulous paper, and keep them in closely stopped bottles." *U. S.*

"Take of Commercial Sulphate of Iron *four pounds;* Sulphuric Acid *a fluidounce* [Imp. meas.]; Iron Wire *an ounce;* Distilled Water *four pints* [Imp. meas.]. Mix the Acid with the Water, and add to them the Sulphate and Iron; then apply heat, stirring occasionally, until the Sulphate is dissolved. Filter the solution while yet hot, and set aside to crystallize. Pour off the liquor, and evaporate it that crystals may again form. Dry all the crystals." *Lond.*

"If the Sulphate of Iron of Commerce be not in transparent green crystals, without efflorescence, dissolve it in its own weight of boiling water, acidulated with a little Sulphuric Acid; filter, and set the solution aside to crystallize. Preserve the crystals in well closed bottles." *Ed.*

"Take of Iron Wire, or turnings of wrought Iron, *four ounces* [avoird.]; Oil of Vitriol of Commerce *four fluidounces* [Imp. meas.]; Distilled Water *one pint and a half* [Imp. meas.]. Pour the Water on the Iron placed in a porcelain capsule, add the Oil of Vitriol, and, when the disengagement of gas has nearly ceased, boil for ten minutes. Filter now through paper, and, having separated the crystals which, after the lapse of twenty-four hours, will have been deposited from the solution, let them be dried upon blotting-paper placed upon a porous brick, and then preserved in a well stopped bottle." *Dub.*

The object of the U. S. and Dublin processes is to make a pure sulphate of the protoxide of iron by direct combination. Sulphuric acid, in a concentrated state, acts but imperfectly on iron; but when diluted, a vigorous action takes place, the oxygen of the water converts the metal into protoxide, with which the sulphuric acid unites, and hydrogen is evolved. The equivalent quantities for mutual reaction are 28 of iron to 49 of acid. This proportion is one part of iron to one and three-quarters of acid. The *U. S.* proportion is one part of iron to one and a half of acid, and gives a quantity of iron one-sixth more than the acid can dissolve. The *Dublin* College uses an excess of acid, the weight of acid taken being 7·38 avoirdupois ounces, instead of 7. An excess of iron, however, is desirable; as it tends to secure the production of a perfect sulphate of the protoxide. The remaining steps of the U. S. process are peculiar, and are intended to secure the formation of a salt entirely free from sesquioxide, by the method of Bonsdorff. This chemist found that, when a perfect sulphate of protoxide of iron was formed in solution by heating dilute sulphuric acid with an excess of iron, it might be crystallized free from sesquioxide, provided a little excess of sulphuric acid were added to the liquid before filtration, in order to hold in solution any sesquioxide that may have been formed; at the same time avoiding, as much as possible, the contact of the air. Hence the directions in the U. S. formula to acidulate with sulphuric acid, to cause the funnel to touch the bottom of the receiving vessel, which avoids the dropping of the liquid through the air, and to cover the vessel containing the concentrated liquid, when it is set aside to crystallize. The *London* formula proceeds upon the plan of purifying the commercial sulphate. The salt is dissolved in water, acidulated with a quantity of sulphuric acid, equal to about $\frac{1}{27}$th of the weight of the salt. A portion of iron is placed in the solution to precipitate copper, should this happen to be an impurity, and to convert any sesquioxide of iron present into protoxide. The latter effect is produced as a consequence of the decomposition of water, the nascent hydrogen of which reduces the sesquioxide to protoxide. Heat is then applied, and the solution is filtered hot and set aside to crystallize. The *Edinburgh* College purifies the commercial sulphate in a similar manner, but gives less precise directions, and omits the use of metallic iron.

Properties. Sulphate of iron is in the form of transparent crystals, efflorescent in the air, of a pale bluish-green colour, and having the shape of oblique

rhombic prisms. It has a styptic taste, and an acid reaction. As prepared by Bonsdorff's method, it is blue verging to green. When it becomes more green than blue, or entirely green, an indication is afforded that it contains some sesquioxide. By exposure to the air the crystals absorb oxygen, and become first green, and ultimately covered with a yellow efflorescence of subsulphate of the sesquioxide, insoluble in water. Sometimes the crystals are quite permanent when made by Bonsdorff's method, owing to the slight excess of acid which they contain. Sulphate of iron is soluble in about twice its weight of cold water, and in three-fourths of its weight of boiling water, but is insoluble in alcohol. The aqueous solution is bluish-green; but by standing it attracts oxygen, and is rendered first green and then reddish, depositing, in the mean time, a portion of sesquisulphate of the sesquioxide, having the composition $2Fe_2O_3,3SO_3+8HO$. (Wittstein, *Chem. Gaz.*, May 15, 1849, from *Buchner's Repert.*) When heated moderately, it parts with six-sevenths of its water of crystallization, and becomes grayish-white. (See *Ferri Sulphas Exsiccatum.*) At a red heat it loses its acid, and is converted into the anhydrous sesquioxide of iron, called *colcothar.* It is incompatible with the alkalies and their carbonates, soaps, lime-water, the chlorides of calcium and barium, the borate and phosphate of soda, nitrate of silver, and the acetate and subacetate of lead. It is decomposed also by astringent vegetable infusions, the tannic and gallic acids of which form, if any sesquioxide be present, a black compound of the nature of ink. To what extent this change lessens the medicinal activity of the salt, is not well ascertained. Sulphate of iron, as kept in the shops, is often the impure commercial sulphate, which is not fit for medicinal use. (See *Ferri Sulphas Venalis*, page 348.) The perfectly pure salt is precipitated white by ferrocyanuret of potassium; but that of ordinary purity gives a greenish precipitate, more or less deep, with this test, owing to the presence of some sesquioxide of iron. Copper may be detected by immersing in the solution a bright piece of iron; on which a cupreous film will be deposited. Both copper and zinc may be discovered by sesquioxidizing the iron by boiling the solution of the salt with nitric acid, and then precipitating the iron by an excess of ammonia. If the filtered solution be blue, copper is present; and if it contain zinc, this will be separated in flakes of white oxide, on expelling the excess of ammonia by ebullition. Sulphate of iron, when crystallized, consists of one eq. of acid 40, one of protoxide 36, and seven of water 63=139, and its formula is FeO,SO_3+7HO.

Medical Properties and Uses. Sulphate of iron is astringent and tonic. In large doses it is apt to produce nausea and vomiting, and griping of the bowels; and its use, when long continued, injures the stomach. It has been recommended as a remedy for the scrofulous diathesis, conjoined with extract of bark. As an astringent it is given in diseases attended with immoderate discharges, such as passive hemorrhages, colliquative sweats, diabetes, chronic mucous catarrh, leucorrhœa, gleet, &c. As a tonic it is used in dyspepsia, and in the debility following protracted diseases. In amenorrhœa with deficient action, it is frequently resorted to with advantage, either alone, or conjoined with the fetid and stimulant gums. Externally, the solution is used in eruptions of the face, chronic ophthalmia, leucorrhœa, and gleet, made of various strengths, from one or two, to eight or ten grains of the salt to the fluidounce of water. The dose is from one to five grains in the form of pill, preferably made from the dried sulphate. (See *Ferri Sulphas Exsiccatum.*) If given in solution, the water should be previously boiled to expel the air, which, if allowed to remain, would partially decompose the salt. Taken in an overdose it acts as a poison.

Off. Prep. Ferri Ammonio-citras; Ferri Carbonas Saccharatum; Ferri Citras; Ferri et Potassæ Tartras; Ferri Ferrocyanuretum; Ferri Oxidum Hydratum; Ferri Oxidum Nigrum; Ferri Oxydum Magneticum; Ferri Phosphas; Ferri

Subcarbonas; Ferri Sulphas Exsiccatum; Ferri Valerianas; Mistura Ferri Composita; Pilulæ Aloës et Ferri; Pil. Ferri Carbonatis; Pil. Ferri Compositæ; Pil. Ferri Iodidi; Tinctura Ferri Acetatis. B.

FERRI SULPHAS EXSICCATUM. *Ed.* FERRI SULPHAS SICCATUM. *Dub.* *Dried Sulphate of Iron.*

"Expose *any convenient quantity* of Sulphate of Iron to a moderate heat in a porcelain or earthenware vessel, not glazed with lead, till it is converted into a dry grayish-white mass, which is to be reduced to powder." *Ed.*

"Take of Granulated Sulphate of Iron *any convenient quantity.* Expose the salt in a porcelain capsule to an oven heat not exceeding 400°, until aqueous vapours cease to be given off, and, having then reduced it to a fine powder, preserve it in a well stopped bottle." *Dub.*

In these processes six eqs. out of seven of the water of crystallization of the salt are driven off. The heat should not exceed 400°, otherwise the salt itself would suffer decomposition. Dried sulphate of iron is used for making pills, the crystallized sulphate not being well adapted for that purpose. In prescribing the dried sulphate it is necessary to recollect that three grains are equivalent to five of the crystallized salt.

Off. Prep. Pilulæ Ferri Sulphatis; Pil. Rhei et Ferri. B.

FERRI SULPHAS GRANULATUM. *Dub.* *Granulated Sulphate of Iron.*

"Take of Iron Wire, or turnings of wrought Iron, *four ounces* [avoirdupois]; Oil of Vitriol of Commerce *four fluidounces* [Imp. meas.]; Distilled Water *one pint and a half* [Imp. meas.]; Rectified Spirit *ten fluidounces* [Imp. meas.]. Pour the Water on the Iron placed in a porcelain capsule, add the Oil of Vitriol, and, when the disengagement of gas has nearly ceased, boil for ten minutes. Filter now through paper into a vessel containing eight [fluid]ounces of the Spirit, and stir the mixture as it cools, in order that the salt may be obtained in minute granular crystals. Let these, deprived by decantation and draining of the adhering liquid, be washed on a funnel or small percolator with the remainder of the Spirit; and, when rendered quite dry by repeated pressure between folds of filtering paper, and subsequent exposure for twenty-four hours beneath a glass bell over a common dinner-plate half filled with oil of vitriol, let them be preserved in a well-stopped bottle." *Dub.*

The directions given in the first part of this new process are precisely the same as those laid down by the Dublin College for making sulphate of iron; but the hot solution of the iron in the sulphuric acid, instead of being allowed to filter into an empty vessel, is made to drop into a portion of rectified spirit, the mixture being stirred while it cools. The proportion of acid taken by the College forms an excess; and the filtrate is consequently an acid solution of sulphate of protoxide of iron, mixed with spirit. The stirring during cooling finely granulates the salt, which separates in a perfectly pure state; the spirit holding in solution any tersulphate of sesquioxide of iron which may have been formed, and the excess of acid dissolving any free sesquioxide. This process, in its main features, is the same as that of M. Berthemot. (See *eighth ed. of this work.*)

Properties, &c. Granular sulphate of iron is a crystalline granular powder of a bluish-white colour. When carefully dried and kept it undergoes no change. It appears to have been introduced into the officinal catalogue of the Dublin Pharmacopœia of 1850, as the best form of the sulphate for conversion into the officinal dried salt; and its peculiar state of aggregation would seem to fit it for that purpose.

Off. Prep. Ferri Sulphas Siccatum. B.

FERRI SULPHURETUM. *Ed., Dub. Sulphuret of Iron.*

"The best Sulphuret of Iron is made by heating an iron rod to a full white heat in a forge, and rubbing it with a roll of sulphur over a deep vessel filled with water to receive the fused globules of Sulphuret which form. An inferior sort, good enough, however, for pharmaceutic purposes, is obtained by heating one part of Sublimed Sulphur and three of Iron Filings in a crucible in a common fire till the mixture begins to glow, and then removing the crucible and covering it until the action, which at first increases considerably, shall come to an end." *Ed.*

"Take of rods of Iron, of the size employed in the manufacture of nails, *any convenient number*. Having raised them to a strong red or white heat, apply them in succession by their heated extremities to sticks of Sulphur, operating so that the melted Sulphuret, as it is formed, may drop into a stone cistern filled with water, and be thus protected from oxidation. The water being poured off, let the product be separated from the Sulphur with which it is mixed, and, when dried, let it be enclosed in a well stopped bottle." *Dub.*

Iron and sulphur form a number of sulphurets, among which the most important are the protosulphuret and sesquisulphuret, corresponding with the protoxide and sesquioxide of iron, the bisulphuret or *cubic pyrites*, and *magnetic pyrites*, which is a compound of five eqs. of protosulphuret, and one of bisulphuret. When the sulphuret is obtained by the application of solid sulphur to white-hot iron, the product corresponds in composition with magnetic pyrites; but, when procured by heating flowers of sulphur with an excess of iron filings, as is directed in the second of the Edinburgh processes, a protosulphuret is generated mixed with metallic iron. When sulphur is applied to white-hot iron, the metal appears to become hotter, burns with scintillations in the vapour of the sulphur, and forms instantly the sulphuret, which, being comparatively fusible, melts into globules, and drops into the water, which serves to extinguish them.

Properties, &c. The officinal sulphuret of iron has a yellowish colour and the metallic lustre. When obtained over water it is in the form of brownish-yellow globules, having a somewhat crystalline texture. When pure it furnishes a yellow powder, and dissolves in dilute sulphuric or muriatic acid without leaving a residue of sulphur, and with the production of hydrosulphuric acid gas (sulphuretted hydrogen), free from admixture of hydrogen. As prepared, however, by the officinal processes, it is not entirely soluble in dilute sulphuric acid, a portion of uncombined sulphur being left. The fused globules have the composition of $5FeS+FeS_2$, or, according to some, $5FeS+Fe_2S_3$. This preparation is employed exclusively as a pharmaceutical agent, for the production of hydrosulphuric acid gas. It may be made to yield this gas by the action of diluted sulphuric acid. During the reaction water is decomposed; its hydrogen combines with the sulphur to form hydrosulphuric acid, while the oxygen converts the iron into protoxide, with which the sulphuric acid unites. *Hydrosulphuric acid* is a colourless gas, having a smell like that of putrid eggs. Its sp. gr. is 1·1782. It saturates bases, with which it forms salts called *hydrosulphates*, *sulphohydrates*, or *hydrosulphurets*. It consists of one eq. of sulphur 16, and one of hydrogen 1=17.

Off. Prep. Ammoniæ Hydro-sulphuretum. B.

FERRI VALERIANAS. *Dub. Valerianate of Iron.*

"Take of Valerianate of Soda *five ounces and three drachms* [Dub. weight]; Sulphate of Iron *four ounces* [avoird.]; Distilled Water *one pint* [Imp. meas.]. Let the Sulphate of Iron be converted into a persulphate, as directed in the formula for *Ferri Peroxydum Hydratum*, and, by the addition of distilled water, let the solution of the persulphate be augmented to the bulk of eight [fluid]ounces [Imp. meas.]. Dissolve the Valerianate of Soda in ten [fluid]ounces of the Water, then mix the two solutions cold, and, having placed the precipitate which

forms upon a filter, and washed it with the remainder of the Water, let it be dried by placing it for some days rolled up in bibulous paper on a porous brick. This preparation should be kept in a well stopped bottle." *Dub.*

This is a new officinal of the Dublin Pharmacopœia of 1850. The first step in the process for making it is to convert the sulphate of protoxide of iron into the tersulphate of sesquioxide. Then by a double decomposition between this salt and valerianate of soda, sulphate of soda is formed in solution, and tervalerianate of sesquioxide of iron precipitates. The proper relative proportion of the reacting salts is three equivalents of valerianate of soda, and one of tersulphate of sesquioxide of iron; and the resulting salts are three eqs. of sulphate of soda, and one of tervalerianate of sesquioxide of iron.

Properties, &c. This salt is in the form of a dark tile-red, loose, amorphous powder, having a faint odour and taste of valerianic acid. It is insoluble in cold water, and decomposed by boiling water, which extracts all its acid, and leaves the sesquioxide of iron behind. It is soluble in alcohol. Citrate and tartrate of iron, impregnated with oil of valerian, have been fraudulently sold for valerianate of iron. The genuine salt may be distinguished from these substitutions by being insoluble in water and soluble in alcohol, and by the action of a little dilute muriatic acid, which sets free the valerianic acid, readily recognised by its disagreeable odour, which is quite distinct from that of the oil of valerian. In relation to the modes of distinguishing the true from the spurious valerianates, see the *Pharm. Journ. and Trans.*, viii. 577. Valerianate of iron has been given in hysterical affections, complicated with chlorosis. The dose is about a grain repeated several times a day. B.

FERRUM AMMONIATUM. *U. S.* FERRI AMMONIO-CHLORIDUM. *Lond. Ammoniated Iron. Ammonio-chloride of Iron.*

"Take of Subcarbonate of Iron *three ounces;* Muriatic Acid *ten fluidounces;* Muriate of Ammonia *two pounds and a half;* Distilled Water *four pints.* Mix the Subcarbonate of Iron with the Muriatic Acid in a glass vessel, and digest for two hours; then add the Muriate of Ammonia, previously dissolved in the Distilled Water, and, having filtered the liquor, evaporate to dryness. Rub the residue to powder." *U. S.*

The process of the *London College* is essentially the same as the above, of which it is the original. The College, instead of a digestion of two hours, directs that it should continue until the sesquioxide (subcarbonate) is dissolved.

By the mutual action of muriatic acid and the sesquioxide of iron of the subcarbonate, water and sesquichloride of iron are formed; and the solution of the latter, being evaporated along with that of the muriate of ammonia, yields a mixture of the two salts. If any carbonate of iron be present in the subcarbonate, a portion of protochloride of iron must also be formed, which, however, would probably be converted into sesquichloride during the operation. The preparation was formerly made by subliming a mixture of red oxide (sesquioxide) of iron and muriate of ammonia. A portion of the muriate of ammonia was decomposed, the ammonia escaping, and the muriatic acid reacting upon the sesquioxide of iron so as to form water and sesquichloride of iron, the latter of which was sublimed with the undecomposed muriate of ammonia. By this mode of preparation the proportion between the two salts was variable. The present officinal plan has the double advantage of uniformity in the result, and greater facility in the process. There is no reason to believe that the sesquichloride of iron and muriate of ammonia are chemically combined in the preparation. According to Mr. Phillips, they are in the proportion of 15 parts of the sesquichloride to 85 of the muriate.

Properties. Ammoniated iron, thus prepared, is in crystalline grains, of a fine reddish-orange colour, and a sharp styptic saline taste. It is entirely soluble

in water and diluted alcohol, is deliquescent, and should be kept in well stopped bottles. By the alkalies and their carbonates, and by lime-water, it is decomposed, with the precipitation of about seven per cent. of sesquioxide of iron; and potassa in excess occasions the evolution of ammonia. Like the other chalybeates, it is incompatible with vegetable astringents. As procured by sublimation, it is of a yellow colour, and feeble odour, and is probably the result of a chemical reaction between the ingredients.

Medical Properties and Uses. This preparation unites aperient properties with those belonging to the chalybeates generally, and is said to have been used with advantage in amenorrhœa, epilepsy, scrofula, rickets, &c.; but it is at best uncertain, and is now very seldom prescribed. The sublimed preparation was formerly employed under the names of *flores martiales* and *ens martis*. From four to twelve grains may be given in the form of pill, electuary, or solution, several times a day.

Off. Prep. Tinctura Ferri Ammonio-chloridi. W.

TINCTURA FERRI AMMONIO-CHLORIDI. *Lond. Tincture of Ammonio-chloride of Iron.*

"Take of Ammonio-chloride of Iron [Ammoniated Iron] *four ounces;* Proof Spirit, Distilled Water, each, *a pint* [Imperial measure]. Dissolve and filter." *Lond.*

This is simply a solution of the preceding preparation in diluted alcohol. It has no special claims to attention.* W.

VINUM FERRI. *Lond. Wine of Iron.*

"Take of Iron Wire *an ounce;* Sherry Wine *two pints* [Imp. meas.]. Digest for thirty days, and filter." *Lond.*

A preparation under the name of Vinum Ferri was officinal in the London Pharmacopœia of 1824, but dismissed in that of 1836. It was made originally by a faulty process, in which a moistened mixture of iron and cream of tartar, exposed to the air for six weeks, was acted on with abundance of weak spirit, which failed to dissolve all the iron. The preparation admitted into the London Pharmacopœia of 1851 is much more entitled to the name of Vinum Ferri than the discarded one, and is made by a better process. It may be presumed that so much of the iron as is necessary to convert the tartar of the wine into tartrate of iron and potassa is dissolved. This must be but a small proportion of the iron taken; so that the preparation is a weak solution of tartrate of iron and potassa in wine. Wine of iron is a feeble chalybeate, and, on account of the variable quality of sherry wine, of unequal strength. It is applicable to cases requiring the use of iron, and in which the stimulant effect of the wine may be useful, or, at least, is not contra-indicated. The dose is from one to two tablespoonfuls, given several times a day. A good substitute for wine of iron may be made by dissolving an ounce of tartrate of iron and potassa in twelve fluidounces of water, previously mixed with an equal measure of sherry wine. The dose of this preparation, each fluidounce of which will contain a scruple of the double salt, is about the same as that of Vinum Ferri. B.

* As now directed by the London College, it is only half as strong as the preparation of the former Pharmacopœia, in which a pint of proof spirit was employed as the menstruum with the same amount of the chalybeate. As formerly prepared it was liable to the formation of a deposit, to prevent which the College ordered equal measures of proof spirit and water, without intending to alter the strength. It was, therefore, by inadvertence that each of the liquids was directed, in the existing formula, in the quantity of a pint, instead of half a pint. Such at least is the statement made by authority in the *London Pharm. Journ. and Trans.* (xi. 67,) Aug. 1851; and the statement is confirmed in the last edition of Philip's translation of the London Pharmacopœia (p. 290.)

GLYCERINA.

Glycerin.

GLYCERINA. *U. S., Dub. Glycerin. Sweet Principle of Oils.*

"Take of Lead Plaster, recently prepared and yet fluid, Boiling Water, each, *a gallon*. Mix them, stir briskly for fifteen minutes, then allow them to cool, and pour off the supernatant liquid. Evaporate this until it has the specific gravity 1·15, and pass a current of sulphohydric acid slowly through it until a black precipitate is no longer produced. Filter, and boil until the sulphohydric acid is driven off. Lastly, evaporate the liquid until it ceases to lose weight." *U. S.*

The Dub. College places glycerin in the Materia Medica catalogue, with this explanation:—"A sweet principle produced during saponification, sp.gr. 1·260."

In the process for making lead plaster, litharge, olive oil, and water are boiled together, with the result of decomposing the oil, the oily acids of which unite with the oxide of lead to form the plaster. At the same time the sweet principle of the oil, called glycerin, which was previously united to the oily acids to constitute the oil, is set free, becomes hydrated, and dissolves in the water. (See *Emplastrum Plumbi.*) It follows, therefore, that the plaster, while still hot and in the liquid state, contains an aqueous solution of glycerin, diffused through it. It is the plaster in this state that is made use of for preparing the latter substance in the U. S. formula. Accordingly, when the liquid plaster is mixed with an equal measure of boiling water, and the mixture stirred briskly, a solution of glycerin is obtained; which, after having been decanted, and evaporated to a limited extent, is freed from lead by sulphuretted hydrogen. The liquid is then filtered to separate sulphuret of lead, boiled to free it from sulphuretted hydrogen, and finally evaporated to expel the water, which is known to be all removed when it ceases to lose weight.

Glycerin was discovered by Scheele, by whom it was called the sweet principle of oils. It is produced, not only during the saponification of the fats and oils by oxide of lead in forming lead plaster, but also during the same process, when effected by potassa and soda in the manufacture of soap; the alkalies uniting with the oily acids, and setting the glycerin free. Hence soap-makers' waste forms the most abundant source of glycerin; but the substance from this source is apt to have more or less odour, which even percolation through animal charcoal does not always remove. A method of purifying glycerin from soap-makers' waste is given by M. Bruère-Perrin. (See *Am. Journ. of Pharm.*, xx. 549.)*

* Dr. Campbell Morfit has devised the following process for making pure glycerin on the large scale. Melt *one hundred pounds* of tallow, lard, or pressed lard in a clean iron-bound barrel by the direct application of a current of steam, and add to the melted liquid *fifteen pounds* of lime, previously slaked and made into a milk with *two and a half gallons* of water. Then cover the vessel, and continue the steaming for several hours, or until the completion of the saponification. This is known to be completed, when a portion of the cooled soap gives a smooth shining surface on being scraped with the nail, and breaks with a cracking noise. By this treatment the fat is decomposed, the oily acids unite with the lime to form an insoluble lime soap, and the liberated glycerin remains in solution in the water, along with the excess of lime. After the liquid has been sufficiently boiled, it is allowed to cool and settle, and then strained through a crash cloth. The strained liquid, containing only the glycerin and excess of lime, is carefully concentrated by steam heat, treated with a current of carbonic acid to remove the lime as carbonate of lime, boiled again to decompose any bicarbonate of lime that may have been formed, and allowed to repose. The supernatant clear liquid is finally decanted or strained off from the precipitated carbonate of lime, and concentrated, if necessary, to drive off any excess of water. The residue of the process, the lime soap, is sold to the stearic candle makers, or reconverted into saleable fat. Dr. Morfit has found his process for glycerin to combine the advantages of saving time, labour, and money. (*Silliman's Journal*, 2nd ser., xv. 429.—*Note to the tenth edition.*)

Properties, &c. Glycerin is a colourless or straw-coloured syrupy liquid, without smell when pure, unctuous to the touch, and having a very sweet taste. Its sp. gr. is 1·25, U. S., 1·26 *Dub.* It is soluble in all proportions in water and alcohol, but insoluble in ether. Notwithstanding its syrupy consistence it acts much in the same way as water, as a solvent of salts. It is not susceptible of becoming rancid, or of fermenting spontaneously. When exposed to a full red heat, it takes fire, and continues to burn with a blue flame. It does not evaporate on exposure to the air, and cannot be distilled without decomposition. It unites with sulphuric acid forming the *sulphoglyceric acid*, which is capable of combining with bases, giving rise to soluble salts called *sulphoglycerates*, having considerable analogy to the sulphovinates. By a mixture of sulphuric and nitric acids it is converted into an explosive and extremely poisonous liquid, called *pyroglycerin.* (Sobrero, *Journ. de Pharm.*, April, 1850.) M. Berthelot, of Paris, has recently (1853) succeeded in combining glycerin with a number of acids, both organic and mineral, forming neutral compounds. Among other acids, he has combined it with the fatty acids, producing, by synthesis, the organic fatty substances stearin, margarin, olein, &c. (*Chem. Gaz.*, No. 15, 1853, from the *Comptes Rendus.*) When diluted with water it affords no precipitate with hydrosulphate of ammonia or ferrocyanuret of potassium, showing the absence of lead and iron. It consists of one eq. of the hypothetical radical glyceryle (C_6H_7), united with five eqs. of oxygen, and one of water. Its formula, therefore, is $C_6H_7O_5+HO$.

Medical Properties. Glycerin is considered emollient and antiseptic. It was first used as a remedy externally, for dryness and deficient cerumen in the external ear. From its antiseptic and undrying properties, Mr. Startin, surgeon, of London, was led to suppose that it might prove useful, as an external application, in eruptions attended with fetid discharges, or with preternatural dryness or harshness of the skin. The results of his trials answered his expectations. In several diseases of the skin, such as pityriasis, lepra, psoriasis, lichen in its dry stage, and prurigo, he used it with benefit. He also found it a useful addition to lotions in the incrusted form of lupus or herpes exedens, and in various syphilitic and strumous eruptions. In the cases in which it was tried, it acted as a soothing application. It may be added to poultices and lotions in a proportion varying from one-fourth to one-sixteenth. Its effect on poultices is to keep them soft for a long time. Since the publication of the last edition of this work, glycerin has been used by a number of physicians, in a great variety of affections of the skin, as a softening and soothing application, and generally with satisfactory results. In certain cases of deafness, in which the auditory canal is dry, or obstructed by hardened wax, Dr. David Steel, of Petersburg, Va., has found glycerin useful, inserted into the canal by means of a piece of cotton, saturated with it. (*Stethoscope*, Feb. 1853, p. 101.) From its extensive solvent powers, and its intermediate qualities between those of water and oil, glycerin forms, according to M. Cap, of Paris, an excellent excipient for many medicines. It may be prepared as an ointment, for which formulæ are given by Mr. J. Laidley, and by Mr. J. H. Ecky. (See *Am. Journ. of Pharm.* xii., 118, and xxv. 27.)*

Pills and extracts, incorporated with a small proportion of glycerin, are preserved soft and free from mouldiness. B.

* Mr. Ecky's *glycerin ointment* is made as follows: Take of spermaceti *half an ounce;* white wax *a drachm;* oil of almonds *two fluidounces;* glycerin *a fluidounce.* Melt the spermaceti and wax with the oil of almonds by a moderate heat. Then, having poured the melted liquid into a wedgwood mortar, add the glycerin, and rub until the ingredients are thoroughly mixed and cold. This ointment may be used with advantage in chaps and excoriations.

GUMMI-RESINÆ et RESINOSA.

Gum-resins and Resinous Substances.

Gum-resins are concrete natural juices of plants, obtained by spontaneous exudation or incision, and consisting of gum and resin, associated for the most part with more or less essential oil, and frequently with other substances, such as extractive, bassorin, starch, wax, and various salts. The gum and resin are essential ingredients, but exist in very different proportions in the different varieties. All the gum-resins are partially soluble in alcohol and in water, but completely so in neither of these liquids. Diluted alcohol, on the contrary, dissolves them almost entirely, especially if assisted by heat. With water they form an opaque emulsion; the resin, essential oil, and other insoluble constituents being held in suspension by the dissolved gum. They are to a certain extent soluble in vinegar. Upon several of them, especially myrrh and ammoniac, carbonate of potassa so reacts as to render them soluble in water, or capable of being permanently retained in suspension by that liquid. A good method of effecting their suspension in any watery vehicle, is to rub them with a few drops of pure almond oil so as to form a smooth paste, and then very gradually add the liquid, continuing the trituration.

They are often so impure from admixture of vegetable and mineral substances, as to be unfit for use until purified. Various modes of effecting this object have been practised. Some of the gum-resins, as galbanum, are so far fusible, that they may be rendered sufficiently liquid by heat to admit of straining through a hempen cloth. Care should be taken in this process not to apply too great a heat, and it is best that the liquefaction should be effected by means of a water-bath. But several of them, as assafetida and ammoniac, are not sufficiently fusible at the temperature of boiling water to admit of being strained with facility. As they are usually brittle and pulverizable when very cold, they may be freed from the coarser impurities by powdering them in the winter season, and sifting the powder, which afterwards agglutinates with warmth. This plan is recommended by Mr. Brande in relation to assafetida, ammoniac, and galbanum. When boiled with hot water any of the gum-resins, though not dissolved, will form a semi-liquid mass capable of being strained; and this is the mode now adopted by the London College for their purification. It is liable to the objection that a portion of the volatile oil, upon which their medical virtues in part depend, is driven off; and the gum-resins thus prepared are adapted more especially for external use. The French pharmaceutists purify these substances by dissolving them in diluted alcohol, filtering, and evaporating the solution. This process, though liable in a still greater degree than that of the London College to the objection of diminishing the virtues of the medicine by driving off the essential oil, has the advantage of completely separating all insoluble substances, however minutely divided, such as fine sand or other earth, which might pass through the pores of a hempen strainer. For internal use, it is best to select the gum-resin of such quality as not to require purification. W.

AMMONIACUM PRÆPARATUM. *Lond. Prepared Ammoniac.*

"Take of lump Ammoniac *a pound;* Water *sufficient to cover the Ammoniac.* Heat the Ammoniac with the Water till they are mixed. Strain the mixture through a hair sieve, and evaporate by means of a water bath, stirring constantly, so that upon cooling it may become hard." *Lond.*

Off. Prep. Mistura Ammoniaci.

ASSAFŒTIDA PRÆPARATA. *Lond. Prepared Assafetida.*

"Prepare this in the manner directed for *Prepared Ammoniac.*" *Lond.*

Off. Prep. Enema Assafœtidæ; Pilula Galbani Composita.

GALBANUM PRÆPARATUM. *Lond. Prepared Galbanum.*

"Prepare this in the manner directed for *Prepared Ammoniac.*" *Lond.*

Off. Prep. Emplastrum Galbani; Pilula Galbani Composita.

PIX BURGUNDICA PRÆPARATA. *Lond. Prepared Burgundy Pitch.*

"Prepare this in the manner directed for *Prepared Ammoniac.*" *Lond.*

This is not a very scientific mode of purifying Burgundy pitch; and is altogether unnecessary. It may be very readily melted by the heat of a water-bath, and then strained through linen or canvas.

Off. Prep. Emplastrum Cumini; Emplastrum Picis. W.

SAGAPENUM PRÆPARATUM. *Lond. Prepared Sagapenum.*

"Prepare this in the manner directed for *Prepared Ammoniac.*" *Lond.*

Off. Prep. Confectio Rutæ; Pilula Galbani Composita.

STYRAX PURIFICATA. *U. S.* STYRAX PRÆPARATA. *Lond.* EXTRACTUM STYRACIS. *Ed. Purified Storax. Prepared Storax.*

"Take of Storax, Alcohol, each, *a sufficient quantity.* Dissolve the Storax in the Alcohol, and strain the solution; then distil off the Alcohol with a gentle heat, until the Storax acquires the proper consistence." *U. S.*

"Take of Storax *a pound;* Rectified Spirit *four pints* [Imperial measure]. Dissolve and strain through linen; then with a gentle heat distil the greater part of the spirit: evaporate what remains by means of a water-bath to the proper consistence." *Lond.*

"Take *any convenient quantity* of Storax, in fine powder. Exhaust it by boiling it in successive quantities of Rectified Spirit; filter the spirituous solutions; distil off the greater part of the Spirit; evaporate the remainder over the vapour-bath to the consistence of a thin extract." *Ed.*

Storax, as found in the shops, is usually so much adulterated as to render its purification necessary, before it can be applied to the purposes for which it is officinally directed. As it is wholly soluble in alcohol, and little of its active matter is driven off at the boiling point of that fluid, there can be no chemical objection to the above process. Another method, sometimes followed, is to express, between heated iron plates, the balsam from the foreign matters with which it is associated; but, if the process be not very carefully conducted, the heat employed to melt the storax will be sufficient to dissipate a portion of the benzoic acid, which is one of its essential ingredients.

Off. Prep. Pilula Styracis Composita; Tinctura Benzoini Composita. W.

THUS PRÆPARATUM. *Lond. Prepared Frankincense.*

"Take of Frankincense *a pound;* Water *sufficient to cover the Frankincense.* Heat the Frankincense in the Water till it liquefies, and strain through a hair sieve; then, when it has cooled, pour off the Water, and keep the Frankincense for use." *Lond.*

Off. Prep. Emplastrum Ferri; Emplast. Galbani; Emplast. Opii; Emplast. Picis; Emplast. Potassii Iodidi.

HYDRARGYRUM.

Preparations of Mercury.

HYDRARGYRUM PURUM. *Dub. Pure Mercury.*

"Take of Quicksilver of Commerce *three pounds* [avoirdupois]; Pure Muriatic Acid *half a fluidounce* [Imp. meas.]; Distilled Water *two ounces* [avoird.]. Having introduced the Quicksilver into a small glass retort, over the body of which a hood of sheet iron is supported, let the heat of a gas lamp be applied

until two-thirds of the metal has distilled over. Boil this for a few minutes with the Acid and Water, and having, by repeated affusion of distilled water, and decantation, removed the entire of the Acid, let the metal be poured into a capsule, and dried by the application of heat." *Dub.*

The mercury of commerce is usually sufficiently pure for pharmaceutical purposes; but occasionally it contains foreign metals, such as lead, tin, zinc, and bismuth, and hence the direction for its purification. Mercury, being much more volatile than the contaminating metals, rises first in distillation, while they are left behind. But it is necessary to avoid pushing the distillation too far; for in that event, some of the foreign metals are apt to be carried over. The Dublin College, on account of this danger, directs only two-thirds of the mercury to be distilled. The distilled product is boiled for a few minutes with dilute muriatic acid, which, while it does not attack the mercury, dissolves any contaminating metals which may have passed over. The distillation is directed to be performed from a glass retort over a gas lamp; but it is more conveniently conducted from an iron retort, over a common fire, into water contained in a receiver. In small operations a wash-hand basin will answer for a receiver. For other methods of purifying mercury, see *Hydrargyrum.* Millon has ascertained the curious fact, that the presence of so small a quantity as one-thousandth or one ten-thousandth of lead or zinc in mercury raises its boiling point. As it is difficult and troublesome to purify mercury by distillation, it is better to purchase pure samples of the metal, which may be always found in the market. For the properties and tests of pure mercury, see *Hydrargyrum.*

M. Violette has made known a new method of distilling mercury, or amalgamated silver, which presents many advantages. It consists in subjecting the metal, in iron vessels, to a current of high pressure steam, which serves the double purpose of imparting the necessary heat, and carrying over the mercurial vapour by a mechanical agency. (*Philos. Mag.*, Dec. 1850, from *Comptes Rendus.*)

Off. Prep. Arsenici et Hydrargyri Hydriodatis Liquor; Emplastrum Hydrargyri; Hydrargyri Iodidum Viride; Hydrargyri Oxydum Rubrum; Hydrargyri Pernitratis Liquor; Hydrargyrum cum Cretâ; Hydrargyrum cum Magnesiâ; Pilulæ Hydrargyri; Unguentum Hydrargyri. B.

HYDRARGYRI CHLORIDUM CORROSIVUM. *U.S.* Hydrargyri Bichloridum. *Lond.* Sublimatus Corrosivus. *Ed.* Sublimatum Corrosivum. *Dub.* *Corrosive Chloride of Mercury. Bichloride of Mercury. Corrosive Sublimate.*

"Take of Mercury *two pounds:* Sulphuric Acid *three pounds;* Chloride of Sodium *a pound and a half.* Boil the Mercury with the Sulphuric Acid until a white dry mass is left. Rub this, when cold, with the Chloride of Sodium, in an earthenware mortar; then sublime with a gradually increasing heat." *U. S.*

The London process is the same as the above, the twenty-one and a half Imperial fluidounces of sulphuric acid, taken by the College, being equivalent to three pounds.

"Take of Mercury *four ounces;* Sulphuric Acid (commercial) *two fluidounces and three fluidrachms;* Pure Nitric Acid *half a fluidounce;* Muriate of Soda *three ounces.* Mix the Acids; add the Mercury; dissolve it with the aid of a moderate heat; and then raise the heat so as to obtain a dry salt. Triturate this thoroughly with the Muriate of Soda, and sublime in a proper apparatus." *Ed.*

"Take of Sulphate of Mercury *ten pounds;* Dried Chloride of Sodium *five pounds.* Reduce each salt to a fine powder, and, having mixed them carefully by trituration in a mortar, let the mixture be introduced into an iron pot lined with clay, and by a regulated heat, applied through the intervention of sand, let the corrosive sublimate be sublimed into an earthen head placed over the pot,

and connected to it by means of lute. The product should be preserved in an opaque bottle." *Dub.*

In order to understand the above processes, which are the same in principle, it is necessary to premise that corrosive sublimate is a bichloride of mercury, consisting of two eqs. of chlorine and one of mercury. By boiling sulphuric acid in excess with mercury to dryness, a white salt is formed, which is a bisulphate of the deutoxide of mercury. (See *Hydrargyri Sulphas.*) When this is mixed with chloride of sodium (common salt), and the mixture exposed to a subliming heat, a mutual decomposition takes place. The chlorine of the common salt combines with the mercury, and sublimes as bichloride of mercury; while the sodium, oxygen of the deutoxide of mercury, and sulphuric acid unite to form sulphate of soda, which remains behind. The quantities for mutual decomposition are two eqs. of chloride of sodium, consisting of two eqs. of chlorine and two of sodium; and one eq. of bisulphate of deutoxide of mercury, consisting of one eq. of mercury, two of oxygen, and two of sulphuric acid. The two eqs. of chlorine combine with the one eq. of mercury, to form one eq. of corrosive sublimate; and the two eqs. severally, of sodium, oxygen, and sulphuric acid form, by their union, two eqs. of dry sulphate of soda. The *Edinburgh* formula is very much changed from that given in the previous edition of the Ed. Pharmacopœia. It is characterized by the small quantity of mercury taken, and by the use of nitric acid to assist the sulphuric in oxidizing the metal. The *Dublin* formula is peculiar in ordering the bisulphate of the deutoxide of mercury ready formed, under the name of sulphate of mercury, instead of preparing it as the first step of the process, as is done in the processes of the other Pharmacopœias. (See *Hydrargyri Sulphas.*)

The names given in the several Pharmacopœias to this important chloride, unfortunately, do not correspond. It is called a chloride, as it is admitted to be, in the U. S. and London Pharmacopœias, and corrosive sublimate, irrespective of chemical nomenclature, in the Edinburgh and Dublin. We should be sorry to share the opinion of the Edinburgh College that the adoption of the modern chemical nomenclature, to express pharmaceutical substances, was a great error, on account of its liability to change. Systematic nomenclature belongs to science, and its change is the inevitable consequence of the progress of the latter. In respect to the London name of *bichloride*, we think it not sufficiently distinct from *chloride*, adopted by the same College for calomel. We prefer the U. S. designation with the epithet *corrosivum*, as serving to call attention to the deleterious nature of the compound.

Preparation on the Large Scale, &c. The first step is to form the bisulphate of the deutoxide of mercury, which is effected by heating the sulphuric acid and metal together in an iron pot, so arranged as to carry off the unwholesome fumes of sulphurous acid which are copiously generated. The dry salt obtained is then mixed with the common salt, and the mixture sublimed in an iron pot lined with clay, and covered by an inverted earthen pan. The late Dr. A. T. Thomson, of London, took out a patent for forming corrosive sublimate, on the large scale, by the direct combination, by combustion, of gaseous chlorine with heated mercury. The product is stated to be perfectly pure, and to be afforded at a lower price than the sublimate made in the usual way. In order that the combination may take place, the mercury need not be heated to its boiling point, but only to a temperature between 300° and 400°. According to Dr. Maclagan, corrosive sublimate, made by this process, is liable to the objection that a proportion of calomel is always formed, occasionally amounting to ten per cent.

It may sometimes be useful to know how to make a small quantity of corrosive sublimate on an emergency. This may be done by dissolving deutoxide of mercury (red precipitate) in muriatic acid, evaporating the solution to dryness,

dissolving the dry mass in water, and crystallizing. Here a double decomposition takes place, resulting in the formation of water and the bichloride.

Properties. Corrosive chloride of mercury, as obtained by sublimation, is in the form of colourless crystals, or of white, semi-transparent, crystalline masses, of the sp. gr. 5·2, permanent in the air, and possessing an exceedingly acrid, styptic, metallic, durable taste. It dissolves in a little less than twenty parts of cold water, and in three of boiling water. A boiling saturated solution, upon cooling, lets it fall in a confused mass of crystals. It is soluble also in two and a third parts of cold alcohol, in about its own weight of boiling alcohol, and in three parts of ether. The latter solvent is capable of removing corrosive sublimate, to a considerable extent, from its aqueous solution, when agitated with it. Sulphuric, nitric, and muriatic acids dissolve it without alteration. When heated it melts, and readily sublimes in dense, white, acrid vapours, which condense, on cool surfaces, in white shining needles. Its aqueous solution renders green the syrup of violets, and is precipitated brick-red, becoming yellow, by the fixed alkalies and alkaline earths, and white by ammonia. (See *Hydrargyrum Ammoniatum.*) The former precipitate is the hydrated deutoxide of mercury, which has the property of emitting oxygen, and of being reduced to metallic globules, when exposed to heat. This oxide is formed in the process for preparing the *aqua phagedænica*, which is obtained by mixing a drachm of corrosive sublimate with a pint of lime-water. Corrosive sublimate forms with muriate of ammonia and chloride of sodium, compounds which are more soluble than the uncombined mercurial salt. It is on this account that aqueous solutions of sal ammoniac, or of common salt dissolve much more corrosive sublimate than simple water. The combination of corrosive sublimate with muriate of ammonia was formerly called *sal alembroth*, or *salt of wisdom.* (See *Liquor Hydrargyri Bichloridi.*) According to F. Hinterberger, corrosive sublimate is capable of combining with quinia and cinchonia. (*Chem. Gaz.*, ix. 211.)

Corrosive sublimate has the property of retarding putrefaction. Animal matters, immersed in its solution, shrink, acquire firmness, assume a white colour, and become imputrescible. On account of this property it is usefully employed for preserving anatomical preparations.

Tests of Purity and Incompatibles. Pure corrosive chloride of mercury sublimes, when heated, without residue, and its powder is entirely and readily soluble in ether. Consequently, if a portion of any sample should not wholly dissolve in ether, or if it should not evaporate entirely, the presence of some impurity is proved. If calomel be present, it will not be wholly soluble in water. Corrosive sublimate is incompatible with many of the metals, with the alkalies and their carbonates, with soap, lime-water, tartar emetic, nitrate of silver, the acetates of lead, the sulphurets of potassium and sodium, and with all the hydrosulphates. It is also decomposed by many vegetable and some animal substances. According to the late Dr. A. T. Thomson, it produces precipitates in infusions or decoctions of the following vegetable substances;—chamomile, horse-radish, columbo, catechu, cinchona, rhubarb, senna, simaruba, and oak-bark. The experiments of M. Mialhe and M. Lepage have shown that corrosive sublimate is slowly converted into calomel by syrup of sarsaparilla and syrup of honey, but undergoes no alteration by contact with pure syrup. B.

Medical Properties and Uses. Corrosive sublimate is a very powerful preparation, operating quickly, and, if not properly regulated, producing very violent effects. It is less apt to salivate than most other mercurials. In minute doses, suitably repeated, it may exert its peculiar influence without any obvious alteration of the vital functions, except, perhaps, a slight increase in the frequency of the pulse, and in the secretions from the skin and kidneys. Sometimes, however, it purges; but this effect may be obviated by combining it with a little

opium. In larger doses it occasions nausea, vomiting, griping pain in the bowels, diarrhœa, and other symptoms of gastric and intestinal irritation; and in still larger quantities produces all the effects of a violent corrosive poison. It has long been used as a remedy in syphilis, in all stages of which it is highly recommended by some authors. It is said to remove the symptoms more speedily than other mercurials; while its action is less unpleasant, as the mouth is less liable to be made sore. For the latter reason it has been much employed by empirics, and is an ingredient in most of those nostrums which have at various periods gained a temporary popularity as anti-venereals. But while it is extolled by some authors, others, among whom is Mr. Pearson, of London, deny its extraordinary merits, and maintain that, though occasionally useful in arresting the progress of the complaint, particularly in the secondary stage, it does not produce permanent cures, and, in the primary stage, often fails altogether. On the whole it appears to be best adapted to secondary syphilis, in which it occasionally does much good. It is also used advantageously in some chronic cutaneous affections, and in obstinate chronic rheumatism. It is usually associated with alterative or diaphoretic medicines, such as the antimonials, and the compound decoction or syrup of sarsaparilla; and, in order to obviate the irritation it is apt to produce, it may often be advantageously united with opium, or extract of hemlock. There is no doubt that many of the substances in connexion with which it is employed, alter its chemical condition; but it does not follow that, even in its altered state, it may not be very useful as a remedy.

Externally employed, corrosive sublimate is stimulant and escharotic. A solution in water, containing from an eighth to half a grain in the fluidounce, is employed as an injection in gleet, as a gargle in venereal sore-throat, and as a collyrium in chronic venereal ophthalmia. A stronger solution, containing one or two grains in the fluidounce, is an efficacious wash in lepra, and other scaly eruptions. Dissolved in water, in the proportion of five or ten grains to the fluidounce, it may be used with much benefit in venereal ulcers of the throat, to which it should be applied by means of a camel's hair pencil. With lime-water it forms the *aqua phagedænica* of the older writers, employed as a wash for ill-conditioned ulcers. The powdered chloride has been used as an escharotic; but is, in general, inferior to nitrate of silver or caustic potassa. In *onychia maligna*, however, it is employed with great advantage, mixed with an equal weight of sulphate of zinc, and sprinkled thickly upon the surface of the ulcer, which is then to be covered with a pledget of lint saturated with tincture of myrrh. The whole diseased surface is thus removed, and the necessity of resorting to the knife avoided. This practice was first introduced, we believe, by the late Dr. Perkins, of Philadelphia, and was highly recommended by Dr. Physick. We have employed it in several instances with complete success.

The dose of corrosive sublimate is from the twelfth to the quarter of a grain, repeated three or four times a day, and given in pill, or dissolved in water or spirit. The pill, which is the preferable form, is usually prepared with crumb of bread; and care should be taken that the medicine be equally diffused through the pilular mass, before it is divided. Mucilaginous drinks are usually given to obviate the irritating effects of the medicine.

Toxicological Properties. Swallowed in poisonous doses, it produces burning heat in the throat, excruciating pain in the stomach and bowels, excessive thirst, anxiety, nausea and frequent retching with vomiting of bloody mucus, diarrhœa and sometimes bloody stools, small and frequent pulse, cold sweats, general debility, difficult respiration, cramps in the extremities, faintings, insensibility, convulsions, and death. The mucous membrane of the stomach exhibits on dissection all the signs of the operation of a violent corrosive poison. These symptoms are sometimes followed or conjoined with others indicating an excessive

mercurial action upon the system, such as inflammation of the mouth and salivary glands, profuse salivation, fetid breath, &c. A case is on record of death, in an infant, from the constitutional effects of corrosive sublimate sprinkled upon an excoriated surface. In the inferior animals, in whatever mode introduced into the system, it is said to occasion irritation of the stomach and rectum, inflammation of the lungs, oppression of the brain, and depression if not inflammation of the heart. (*Christison.*) In the treatment of poisoning by corrosive sublimate, Orfila recommends the free use of the white of eggs beat up with water. The albumen forms an insoluble and comparatively innocent compound with the corrosive sublimate; and the liquid by its bulk dilutes the poison, and distends the stomach so as to produce vomiting. It is, however, asserted by M. Lassaigne that this compound of albumen and corrosive sublimate, when recently precipitated, is soluble in acid and alkaline liquids, and in solutions of the chlorides of potassium, sodium, and calcium. (See *Journ. de Pharm.*, xxiii. 510.) It is, therefore, important, at the same time that the antidote is used, to evacuate the stomach before the newly formed compound can be dissolved. If eggs cannot be procured, wheat flour may be substituted; gluten having, according to M. Taddei, the same effect as albumen. Milk has also been recommended, in consequence of the insoluble compound which casein forms with the poison. Besides the antidotes mentioned, Peruvian bark, meconic acid, protosulphuret of iron, and iron filings have been proposed, all of which have the property of decomposing corrosive sublimate. The protosulphuret of iron was found quite successful by M. Mialhe in experiments upon dogs, if given immediately after the poison was swallowed, but failed when delayed for 10 minutes. It is of the utmost importance that whatever antidote is used should be given without delay, and in this respect the one nearest at hand may be considered the best. Should neither of the substances mentioned be attainable, mucilaginous drinks should be largely administered; and, in any event, the patient should be made to drink copiously, so long as vomiting continues, or till the symptoms are relieved. Should he be unable to vomit, the stomach should be washed out by means of the stomach pump. The consecutive inflammation should be treated with general or local bleeding, fomentations, and cooling mucilaginous drinks, and the attendant nervous symptoms should be alleviated by opiates. W.

Tests for Corrosive Sublimate. On account of the extreme virulence of this chloride as a poison, the reagents by which it may be detected form a subject of study of the utmost importance, as connected with medico-legal investigations. The best tests for determining its mercurial nature, mentioned in the order of their delicacy, are ferrocyanuret of potassium, lime-water, carbonate of potassa, iodide of potassium, ammonia, sulphuretted hydrogen, and protochloride of tin. *Ferrocyanuret of potassium* gives rise to a white precipitate (ferrocyanuret of mercury), becoming slowly yellowish, and at length pale-blue. *Lime-water* throws down a yellow precipitate of hydrated deutoxide. *Carbonate of potassa* causes a brick-red precipitate of carbonate of mercury. *Iodide of potassium* produces a very characteristic pale-scarlet precipitate of biniodide of mercury. This precipitate frequently appears at first yellow. *Ammonia* gives rise to a fine, white, flocculent precipitate, the officinal ammoniated mercury, or white precipitate. *Sulphuretted hydrogen* occasions a black precipitate of bisulphuret of mercury; and the same precipitate is thrown down by hydrosulphate of ammonia. Finally, *protochloride of tin* causes a grayish-black precipitate (mercury in a finely divided state), and, as a test, is not liable to any fallacy. Taking the results of Devergie, the relative delicacy of these tests may be expressed numerically as follows:—Ferrocyanuret of potassium $1\frac{1}{2}$; lime-water 4; carbonate of potassa 7; iodide of potassium 8; ammonia 36; sulphuretted hydrogen or hydrosulphate of ammonia 60; and protochloride of tin 80. To the above the following tests

may be added, easily applied even by one unacquainted with chemistry. *A bright plate of copper*, immersed in a solution containing corrosive sublimate, is instantly tarnished, and, after the lapse of half an hour, becomes covered with a grayish-white powder. *A polished piece of gold*, moistened with the mercurial solution, and touched through the liquid with a piece of iron, contracts a white stain. This test, which was proposed by Mr. Sylvester and simplified by Dr. Paris, is conveniently applied by moistening, with the suspected solution, a gold coin or ring, and touching it through the moistened spot with the point of a penknife. The object of the iron is to form with the gold a simple galvanic circle, which enables the latter metal to precipitate the mercury on its surface. Nearly all the above tests merely show the mercurial nature of the substance acted on. To determine whether the metal is united with chlorine, the mercurial liquid may be precipitated by lime-water, and the filtered solution, acidulated with nitric acid, then tested with nitrate of silver. If the mercury is in the state of chloride, the filtered solution will be one of chloride of calcium, which, with nitrate of silver, will yield a heavy white precipitate (chloride of silver), insoluble in nitric acid, but soluble in ammonia. The nitrate of silver may be added directly to the mercurial liquid; and, if it contain corrosive sublimate, chloride of silver will fall, but probably mixed with calomel.

By the combined indications of the foregoing tests, corrosive sublimate may be infallibly detected, unless it exists in very minute quantity, associated with organic substances, by which its presence is often greatly obscured. When it exists in organic mixtures, made by boiling the contents or substance of the stomach in distilled water, Dr. Christison recommends that a preliminary trial be made with the protochloride of tin, on a small portion filtered for the purpose. If this causes a grayish-black colour, he shakes the mixture, as recommended by Orfila, with a fourth of its bulk of ether, which dissolves the corrosive sublimate and rises to the surface. The ethereal solution is then evaporated to dryness, and the dry salt obtained is dissolved in hot water, whereby a pure solution is procured, in which the poison may be readily detected by the ordinary tests. If the trial test should produce a light gray colour, the corrosive sublimate is indicated in still less quantity, and Dr. Christison recommends to proceed in the following manner. Treat the unfiltered mixture with protochloride of tin, as long as any precipitate is formed, which will have a slate-gray colour. Collect, wash, and drain it on a filter, and, having removed it without being dried, boil it, in a glass flask, with a moderately strong solution of caustic potassa, until all the lumps disappear. The alkali will dissolve all animal and vegetable matter; and, on allowing the solution to remain at rest, a heavy grayish-black powder will subside, which consists chiefly of metallic mercury, and in which small globules of the metal may sometimes be seen with the naked eye, or by the aid of a magnifier.

Off. Prep. Hydrargyri Iodidum Rubrum; Hydrargyrum Ammoniatum; Liquor Hydrargyri Bichloridi. B.

LIQUOR HYDRARGYRI BICHLORIDI. *Lond. Solution of Bichloride of Mercury.*

"Take of Bichloride of Mercury [corrosive sublimate], Hydrochlorate of Ammonia, each *ten grains;* Distilled Water *a pint* [Imperial measure]. Dissolve." *Lond.*

This solution was intended to facilitate the dispensing of corrosive sublimate in small doses. The muriate of ammonia has been substituted for the alcohol formerly added to the solution, probably in order to prevent the decomposition of the bichloride. A solution of corrosive sublimate in water alone, under the influence of light, deposits calomel, while muriatic and chloric acids remain in the water; nor is this decomposition prevented by the addition of alcohol. The

dose of the solution, of which a fluidounce contains half a grain of corrosive sublimate, is from one to four fluidrachms, taken in flaxseed tea. W.

HYDRARGYRI CHLORIDUM MITE. *U. S.* HYDRARGYRI CHLORIDUM. *Lond.* CALOMELAS. *Ed., Dub. Mild Chloride of Mercury. Calomel.*

"Take of Mercury *four pounds;* Sulphuric Acid *three pounds;* Chloride of Sodium *a pound and a half;* Distilled Water *a sufficient quantity.* Boil two pounds of the Mercury with the Sulphuric Acid, until a dry white mass is left. Rub this, when cold, with the remainder of the Mercury, in an earthenware mortar, until they are thoroughly mixed. Then add the Chloride of Sodium, and rub it with the other ingredients till all the globules disappear; afterwards sublime. Reduce the sublimed matter to a very fine powder, and wash it frequently with boiling Distilled Water, till the washings afford no precipitate upon the addition of Solution of Ammonia; then dry it." *U. S.*

The *London* formula is the same as the above, except that a measure of sulphuric acid is taken, equivalent to three pounds, and the testing of the washings is not directed.

"Take of Mercury *eight ounces;* Sulphuric Acid (commercial) *two fluidounces and three fluidrachms* [Imperial measure]; Pure Nitric Acid *half a fluidounce* [Imp. meas.]; Muriate of Soda *three ounces.* Mix the Acids, add four ounces of the Mercury, and dissolve it with the aid of a moderate heat. Raise the heat so as to obtain a dry salt. Triturate this with the Muriate of Soda and the rest of the Mercury till the globules entirely disappear. Heat the mixture by means of a sand-bath in a proper subliming apparatus. Reduce the sublimate to fine powder; wash the powder with boiling Distilled Water until the Water ceases to precipitate with solution of iodide of potassium, and then dry it." *Ed.*

"Take of Sulphate of Mercury *ten pounds;* Mercury of Commerce *seven pounds;* Dried Chloride of Sodium *five pounds.* Incorporate as completely as possible the Sulphate and the metallic Mercury by prolonged trituration, and, having then added the Chloride of Sodium previously reduced to a fine powder, rub all well together until a perfectly equable mixture is obtained. Heat this, through the medium of sand, in a shallow iron pot with a flat bottom, lined with clay, and covered with a lid of cast iron, until the sublimate which attaches itself to a circular plug in the centre of the lid (which admits of being removed and cleaned from time to time) neither exhibits minute globules of mercury, nor is rendered yellow by being touched with a solution of potash. The whole being now permitted to cool down to the temperature of the air, the contents of the pot are to be transferred to a small hot-hearth or oven, whose door is made tight by a clay lute, and a regulated heat is to be applied so as to cause the vaporized Calomel to pass into an adjacent chamber of considerable size, on the floor of which it will accumulate in the form of a fine white powder." *Dub.*

The object of the above processes, which all coincide in the principle on which they are conducted, is to obtain the protochloride of mercury. This chloride consists of one eq. of chlorine and one of mercury, and consequently contains precisely half as much chlorine as corrosive sublimate, combined with the same quantity of mercury. In the process of the U. S. Pharmacopœia, as in the case of corrosive sublimate, a bisulphate of the deutoxide is first formed; but, instead of being immediately sublimed with the chloride of sodium, it undergoes a preparatory trituration with the same quantity of mercury as was employed in forming it. This trituration may be conceived to take place between one eq. of the bisulphate of the deutoxide, and one of metallic mercury, which are thus converted into two eqs. of the monosulphate of the protoxide. This change will be easily understood, by adverting to the fact, that the bisulphate of the deut-

oxide consists of two eqs. of sulphuric acid, two of oxygen, and one of mercury; and, when rubbed up with one additional eq. of mercury, the whole becomes two eqs. of acid, two of oxygen, and two of mercury, evidently corresponding with two eqs. of the monosulphate of the protoxide. The two eqs. of monosulphate thus formed, being heated with two eqs. of common salt, the two eqs. of chlorine in the latter sublime in union with the two eqs. of mercury in the former, and generate two eqs. of protochloride of mercury; while the two eqs., severally, of sulphuric acid, oxygen, and sodium, unite together to form two eqs. of dry sulphate of soda, which remain as a fixed residue. It is hence apparent that the residue in this process and in that for corrosive sublimate is the same.

The calomel in mass, as sublimed, is liable to contain a little corrosive sublimate; and hence the direction of the U. S. Pharmacopœia to reduce the sublimed matter to a very fine powder, and to wash it with boiling distilled water until ammonia produces no precipitate with the washings. Ammonia occasions a white precipitate (ammoniated mercury) so long as the washings contain corrosive sublimate; and when it ceases to produce this effect, the operator may rest satisfied that the whole of the poisonous salt has been removed. The London Pharmacopœia prescribes a careful washing, but omits in the formula any directions for testing for corrosive sublimate.

The *Edinburgh* formula is peculiar in ordering a small proportion of nitric acid to assist the sulphuric acid in oxidizing the mercury, as is done also in the corrosive sublimate process. The washings are tested by iodide of potassium, which is not so delicate a test as ammonia. The *Dublin* process includes no directions for making the bisulphate of the deutoxide of mercury; because that salt, in the Dublin Pharmacopœia, is made by a separate formula, and designated by a distinct name, *sulphate of mercury*. It is, therefore, taken ready formed, mixed with the mercury and common salt in the usual way, and the mixture is submitted to a preliminary sublimation to separate metallic mercury and corrosive sublimate. The product is allowed to cool, and then transferred to a small oven, connected with a chamber of considerable size; and, heat being applied, the vaporized calomel condenses in the chamber, and falls on its floor in the powdery form. By thus using a large cool chamber, the calomel does not require to be pulverized, but is got at once in the form of powder. The Dublin College orders no washing, which is a defect; for although the preliminary sublimation separates corrosive sublimate, yet some accidental circumstance may prevent the whole of it from being removed in this step of the process, in which case the sublimed powder will be contaminated with the poisonous chloride.

Preparation on the Large Scale. The process for making calomel by means of the bisulphate of deutoxide of mercury, was originally practised at Apothecaries' Hall, London. The proportions taken and the mode of proceeding in that establishment are, according to Mr. Brande, as follows: 50 lbs. of mercury are boiled to dryness with 70 lbs. of sulphuric acid, in a cast iron vessel; and 62 lbs. of the dry salt formed are triturated with 40½ lbs of mercury till the globules disappear, and the whole is mixed with 34 lbs. of common salt. The mixture is sublimed from an earthenware retort into an earthenware receiver, and the product is from 95 to 100 lbs. of calomel in mass. This is then ground to an impalpable powder, and washed with a large quantity of distilled water.

The object of bringing calomel into a state of minute division is more perfectly accomplished by the method of Mr. Joseph Jewell, of London, improved by M. Ossian Henry. It consists in causing the calomel in vapour to come in contact with steam in a large receiver, whereby it is condensed into an impalpable powder, and perfectly washed from corrosive sublimate, in the same operation. Calomel made by this process, sometimes called Jewell's or Howard's *hydrosublimate of mercury*, is free from all suspicion of containing corrosive sublimate, is

much finer than when obtained by levigation and elutriation, and possesses more activity as a medicine. This kind of calomel is included in the French Codex under a distinct name (*mercure doux à la vapeur*). M. Soubeiran, of Paris, has perfected a process for obtaining calomel in an impalpable powder, by substituting the agency of cold air for that of steam for the purpose of condensing it; a process which he believes to be precisely the same as that pursued by the English manufacturers, and which produces a calomel equal to the best English. A description of his apparatus may be found in the *Journ. de Pharm.*, 3*e sér.*, ii. 507. For an account of the English apparatus, as described by F. C. Calvert, see *Journ. de Pharm.*, 3*e sér.*, iii. 121. Both these papers are copied into the *Am. Journ. of Pharm.*, xv. 89 and 93.

Properties. Mild chloride of mercury is a tasteless, inodorous substance, insoluble in water, alcohol, and ether, less volatile than corrosive sublimate, unalterable in the air, but blackening by long exposure to light. When in mass its form and appearance depend on the shape and temperature of the subliming vessel. In this state it is generally in the form of a white, fibrous, crystalline cake, soft and brittle, the interior surface of which is often studded with shining transparent crystals, having the shape of quadrangular prisms, and a texture somewhat horny and elastic. When the mass is scratched it yields a yellow streak, which is very characteristic. Its sp. gr. is 7·2. The officinal form of this chloride is that of powder, in which state it is always kept in the shops. The powder has a light buff or ivory colour, if obtained by the levigation of sublimed masses; but if condensed at once in the form of an impalpable powder, as is the case with Jewell's calomel, it is perfectly white. To protect it from the action of the light, it should be kept in a dark place, or in bottles painted black or covered with black paper. By the action of the alkalies or alkaline earths it immediately becomes black, in consequence of the formation of protoxide, reducible by heat to the metallic state. (See *Hydrargyri Oxidum Nigrum.*) The preparation, formerly in use and still occasionally employed, under the name of *lotio niger* or *black wash*, as a local application to syphilitic ulcers, &c., was made by adding *a drachm* of calomel to *a pint* of lime-water. By double decomposition between the calomel and lime, the black protoxide precipitates, and chloride of calcium remains in solution. The oxide, however, is not pure, but associated with undecomposed calomel, which is used in excess. Before being applied, the wash should be well shaken.

Tests of Purity and Incompatibles. Calomel, when pure, completely sublimes on the application of heat, a property which detects all fixed impurities, such as carbonate, sulphate, and phosphate of lime, sulphate of baryta, and carbonate of lead. It also strikes a black colour, free from reddish tinge, by the action of the fixed alkalies. The buff colour indicates the absence of corrosive sublimate; but whiteness by no means shows the presence of impurity. Its freedom from the corrosive chloride may be determined by washing a portion of it in warm distilled water, and then testing the water with ammonia, which will cause a white precipitate (ammoniated mercury), in case the water has taken up any of the poisonous chloride. Soluble salts of mercury may be detected by rubbing the suspected calomel with ether on a bright surface of copper, when the metal will become amalgamated, and exhibit a white stain. When this test shows impurity, the soluble salt present is probably corrosive sublimate. Calomel, containing corrosive sublimate, acts violently on the bowels; and, when the impurity has been present in considerable amount, has been known to cause death. Besides being incompatible with the alkalies and alkaline earths, calomel is also decomposed by the alkaline carbonates, soaps, hydrosulphates, and, according to some authorities, by iron, lead, and copper. It should not be given at the same time with nitromuriatic acid, for fear of generating corrosive sublimate. One of

the authors has been informed of a case, in which death, with symptoms of violent gastro-intestinal irritation, followed their simultaneous use. Agreeably to the experiments of M. Deschamps, calomel is decomposed by bitter almonds and by hydrocyanic acid. In the former case corrosive sublimate, bicyanuret of mercury, and muriate of ammonia are formed; in the latter, corrosive sublimate and bicyanuret only. Hence this writer considers it very dangerous to associate calomel with bitter almonds or hydrocyanic acid in prescription. This conclusion has been confirmed by M. Mialhe, and M. Prenleloup; and more recently it has been shown by Dr. E. Riegel, that cherry-laurel water has the power of converting calomel into corrosive sublimate. According to M. Mialhe, calomel is in part converted into corrosive sublimate and metallic mercury by muriate of ammonia, and by the chlorides of sodium and potassium, even at the temperature of the body; and hence he believes that the conversion may take place in the primæ viæ. Popular belief coincides with M. Mialhe's views in regard to the power of common salt of increasing the activity of calomel. More recently M. Mialhe has extended his observations, and now believes that all the preparations of mercury yield a certain amount of corrosive sublimate by reacting with solutions of the chlorides of potassium, sodium, and ammonium. The deutoxide and similarly constituted compounds are most prone to undergo this change. Even metallic mercury, digested with the chlorides named, is partly converted, under the influence of air, into corrosive sublimate. Dr. Gardner denies the assertion of M. Mialhe, that calomel is converted into corrosive sublimate by chlorides of the alkalifiable metals, maintaining that it is merely rendered soluble by their solutions. B.

Medical Properties and Uses. Calomel unites to the general properties of the mercurials those of a purgative and anthelmintic. It is the most valuable of the mercurial preparations, and in extent of employment is inferior to few articles of the Materia Medica. Whether the object is to bring the system under the general influence of mercury, or to produce its alterative action upon the hepatic or other secretory function, calomel, on account both of its certainty and mildness, is preferred to all other preparations, with the single exception of the blue pill, which, though less certain, is still milder, and is sometimes preferably employed. When used with the above objects, the tendency to purge which it sometimes evinces, even in very small doses, must be restrained by combining it with opium. In sialagogue or alterative doses, it is often prescribed with other medicines, which, while they give it a direction to certain organs, have their own peculiar influence increased by its co-operation. Thus it renders squill more diuretic, nitre and the antimonials more diaphoretic, and seneka more expectorant.

As a purgative, calomel owes its chief value to its tendency to the liver, the secretory function of which it powerfully stimulates. It is usually slow and somewhat uncertain in its cathartic effect, and, though itself but slightly irritating, sometimes occasions severe griping pain with bilious vomiting, attributable to the acrid character of the bile which it causes the liver to secrete. It is peculiarly useful in the commencement of bilious fevers, in hepatitis, jaundice, bilious and painters' colic, dysentery, especially that of tropical climates, and all other affections attended with congestion of the portal system, or torpidity of the hepatic vessels. The difficulty with which it is thrown from the stomach, renders it highly useful in some cases of obstinate vomiting, when other remedies are rejected. In the cases of children it is peculiarly valuable from the facility of its administration; and, in the febrile complaints to which they are subject, appears to exercise a curative influence, depending on some other cause than its mere purgative effect, and perhaps referrible to its action upon the liver. In the treatment of worms it is one of the most efficient remedies, acting probably not only as a purgative, but also as an irritant to the worms, either by its immediate in-

fluence, or that of the acrid bile which it causes to flow. The slowness and uncertainty of its action, and its liability to salivate if too long retained in the bowels, render it proper either to follow or combine it with other cathartics, in order to ensure its purgative effect. When given alone, it should be followed, if it do not operate in six or seven hours, by a dose of castor oil or sulphate of magnesia. The cathartics with which it is most frequently combined are jalap, rhubarb, aloes, scammony, colocynth, and gamboge. It is often added in small quantities to purgative combinations, with a view to its influence on the liver.

In very large doses, calomel is supposed by some to act directly as a sedative, and with this view has been given in yellow and malignant bilious fevers, violent dysentery, malignant cholera, &c. The quantities which have been administered in such affections, with asserted impunity and even advantage, are almost incredible. A common dose is one or two scruples, repeated every half hour, or hour, or less frequently, according to the circumstances of the case. We have had no experience in this mode of administering calomel.

It is sometimes used as an errhine in amaurosis, mixed with twice its weight of sugar, or other mild powder; and in the same combination is occasionally employed to remove specks and opacity of the cornea. For the latter purpose, Dupuytren recommended particularly the calomel prepared according to the plan of Mr. Jewell. Calomel is also sometimes employed externally in herpetic and other eruptions, in the shape of an ointment.

The dose as an alterative in functional derangement of the liver, is from half a grain to a grain every night, or every other night, followed in the morning, if the bowels are not opened, by a gentle saline laxative. When the stomach or bowels are very irritable, as in cholera and diarrhœa, from an eighth to a quarter of a grain may be given every hour or two, so as to amount to one or two grains in the course of the day. With a view to salivation, the dose is from half a grain to a grain three or four times a day, to be increased considerably in urgent cases. Sometimes, very minute doses, as the twelfth of a grain or less, given very frequently, so as to amount to the ordinary quantity in twenty-four hours, will operate more effectually as a sialagogue than larger doses. When large doses are given with this view, it is often necessary to combine them with opium. As a purgative, from five to fifteen grains or more may be given. Calomel has the peculiarity that its cathartic action is not increased in proportion to the dose, and enormous quantities have sometimes been given with impunity. In yellow fever, tropical dysentery, &c., from twenty grains to a drachm have been given, and repeated at short intervals, without producing hypercatharsis; but this practice is justifiable only in cases of extreme urgency, in which the constitutional action of mercury as well as purgation is indicated. Even in very small doses of not more than one, two, or three grains, calomel purges some individuals briskly. In these persons, large doses, though they do not proportionably increase the evacuation, often occasion spasmodic pain in the stomach and bowels. For children larger doses are generally required in proportion than for adults. Not less than from three to six grains should be given as a purge to a child two or three years old, and this quantity often fails to act on the bowels, unless assisted by castor oil or some other cathartic. Calomel may be given in pill made with gum Arabic and syrup, or in powder mixed with syrup or molasses.

Off. Prep. Hydrargyri Oxidum Nigrum; Pilulæ Calomelanos Compositæ; Pilulæ Calomelanos et Opii; Pilulæ Catharticæ Compositæ; Pilulæ Hydrargyri Chloridi Mitis. W.

HYDRARGYRI CYANURETUM. *U. S.* *Cyanuret of Mercury. Bicyanuret of Mercury. Prussiate of Mercury.*

"Take of Ferrocyanuret of Iron [Prussian blue] *four ounces;* Red Oxide of Mercury *three ounces,* or *a sufficient quantity;* Distilled Water *three pints.* Put

the Ferrocyanuret of Iron and three ounces of the Oxide of Mercury, previously powdered and thoroughly mixed, into a glass vessel; and pour upon them two pints of the Distilled Water. Then boil the mixture, stirring constantly; and, if at the end of half an hour the blue colour remain, add small portions of the Oxide of Mercury, continuing the ebullition until the mixture becomes of a yellowish colour; after which, filter it through paper. Wash the residue in the remainder of the Distilled Water, and filter as before. Mix the solutions, and evaporate till a pellicle appears; then set the liquor aside that crystals may form. To purify the crystals, dissolve them in distilled water, filter and evaporate the solution, and set it aside to crystallize." *U. S.*

The object of the above process is to present cyanogen and mercury to each other under favourable circumstances for combination. The compound formed consists of two eqs. of cyanogen, and one of mercury. It is, therefore, properly speaking, a bicyanuret. As Prussian blue is a compound of cyanogen and iron, the reaction which occurs is a case of double decomposition, resulting in the formation of bicyanuret of mercury, and a mixture of the protoxide and sesquioxide of iron. The reaction may be thus expressed; $2Fe_7Cy_9$ and $9HgO_2 = 9HgCy_2$ and $6FeO$ and $4Fe_2O_3$. This formula would be exact, if nothing remained but the oxides of iron; but in the residuum cyanogen appears to be present in an unknown state of combination.

Winckler prepares the bicyanuret of mercury by the following process. Mix 15 parts of ferrocyanuret of potassium in powder with 13 parts of concentrated sulphuric acid, and 100 parts of water. Distil the mixture to dryness into a receiver containing 30 parts of water. The ferrocyanuret is decomposed, bisulphate of potassa is formed in the retort, and hydrocyanic acid distils over. Of the acid thus obtained reserve a portion, and mix the remainder with 16 parts of red oxide of mercury in fine powder, and stir the mixture till the odour of hydrocyanic acid has entirely disappeared. Then decant the liquor, and add, for the purpose of saturating it, the portion of acid that had been reserved. This process yields 12 parts of bicyanuret. If the liquor were not treated with free hydrocyanic acid after having acted on the red oxide, it would probably contain some of this oxide in excess, and when evaporated would yield, instead of the bicyanuret, a peculiar salt, composed of the bicyanuret and the red oxide, which crystallizes in small acicular crystals.

Properties, &c. Cyanuret of mercury is permanent in the air, and crystallizes in anhydrous right square prisms, which are sometimes transparent, but usually white and opaque. It has a disagreeable styptic taste. It is but sparingly soluble in alcohol, but dissolves readily in cold water, and much more abundantly in hot. When acted on by muriatic acid, hydrocyanic acid is evolved, recognisable by its odour, and bichloride of mercury is left, which is wholly volatilizable by heat. When heated it yields cyanogen, and a black matter is left containing globules of mercury. It acts on the animal economy as a potent poison. In medicinal doses it excites nausea, vomiting, and not unfrequently ptyalism, but does not produce epigastric pain like corrosive sublimate. It has been occasionally used as a remedy in syphilis; and in the treatment of that disease it is preferred by some practitioners to corrosive sublimate, on account of its not giving rise to pain, and not being decomposed by alkalies and certain organic matters. The dose is from a sixteenth to an eighth of a grain. Its composition has been already given. B.

HYDRARGYRI IODIDUM. *U. S., Lond.* Hydrargyri Iodidum Viride. *Dub. Iodide of Mercury. Green Iodide of Mercury. Protiodide of Mercury.*

"Take of Mercury *an ounce;* Iodine *five drachms;* Alcohol *a sufficient quantity.* Rub the Mercury and Iodine together, adding sufficient Alcohol to form

a soft paste, and continue the trituration till the globules disappear. Then dry the Iodide in the dark, with a gentle heat, and keep it in a well stopped bottle protected from the light." *U. S.*

The *London* and *Dublin Colleges* make this iodide by the foregoing formula.

This process for forming the protiodide of mercury is a case of simple combination, the alcohol facilitating the union by dissolving the iodine. It may also be prepared by precipitation, by adding a solution of iodide of potassium to one of the nitrate of protoxide of mercury; but, as it is difficult to prepare the nitrate of the protoxide, without being mixed with some nitrate of deutoxide, the protiodide, when thus obtained, is apt to be contaminated with biniodide. A better way is to decompose calomel by iodide of potassium, in which case protiodide of mercury and chloride of potassium are formed, the latter of which may be removed by washing. The formula recommended by M. Boutigny is to mix twenty-nine drachms of calomel with twenty of pulverized iodide of potassium in a glass mortar, and to pour upon the mixture twelve ounces of boiling distilled water. After cooling, the liquid is decanted, and the precipitate washed on a filter with distilled water, and dried in the shade. (*Amer. Jour. of Pharm.*, viii. 326, from the *Bull. Gén. de Thérap.*)

Properties. Iodide of mercury is in the form of a yellowish-green powder, insoluble in water, alcohol, or solution of chloride of sodium, but soluble in ether. Its sp. gr. is 7·75. It sometimes contains biniodide, which may be separated by washing it with alcohol, as recommended by Mialhe. When exposed to the light it is partially decomposed, and becomes of a dark-olive colour. If quickly and cautiously heated, it sublimes in red crystals which afterwards become yellow. It is composed of one eq. of mercury 202, and one of iodine 126·3=328·3. Its formula is HgI.

Medical Properties and Uses. Iodide of mercury has been given in scrofula and scrofulous syphilis. The dose is a grain daily, gradually increased to three or four. It should never be given at the same time with iodide of potassium, which converts it immediately into biniodide and metallic mercury. (Mialhe, *Journ. de Pharm.*, 3e *sér.*, iv. 36.)

Off. Prep. Unguentum Hydrargyri Iodidi. B.

HYDRARGYRI IODIDUM RUBRUM. *U. S.*, *Dub.* Hydrargyri Biniodidum. *Ed.* *Red Iodide of Mercury. Biniodide of Mercury.*

"Take of Corrosive Chloride of Mercury *an ounce;* Iodide of Potassium *ten drachms;* Distilled Water *two pints.* Dissolve the Chloride of Mercury in a pint and a half, and the Iodide of Potassium in half a pint of the Distilled Water, and mix the solutions. Collect the precipitate upon a filter, and, having washed it with distilled water, dry it with a moderate heat, and keep it in a well stopped bottle." *U. S.*

The *Dublin* formula is substantially the same as that of the U. S. Pharmacopœia; the same proportion of the reacting salts being taken, and a similar mode of proceeding prescribed.

"Take of Mercury *two ounces;* Iodine *two ounces and a half;* Concentrated Solution of Muriate of Soda *a gallon* [Imp. meas.]. Triturate the Mercury and Iodine together, adding occasionally a little rectified spirit till a uniform red powder be obtained. Reduce the product to fine powder, and dissolve it in the solution of Muriate of Soda with the aid of brisk ebullition. Filter, if necessary, through calico, keeping the funnel hot. Wash and dry the crystals which form on cooling." *Ed.*

In the U. S. and Dub. processes for forming biniodide or red iodide of mercury, a double decomposition takes place between corrosive sublimate and iodide of potassium, resulting in the formation of chloride of potassium which remains in solution, and biniodide of mercury which precipitates. The precipitate is soluble in the reacting salts, and hence a loss of part of it is incurred by an

excess of either. It is best, however, to have a slight excess of the iodide of potassium, which is furnished by the proportion taken in the formulæ; as then the decomposition of the whole of the corrosive sublimate is insured, and any contamination of the biniodide by it prevented. The process of the Edinburgh College is the same in principle as that for obtaining the protiodide, described in the last article; namely, the simple combination of the ingredients by trituration with the aid of alcohol, a double proportion of iodine, of course, being taken; but after the red powder is obtained, it is treated with a boiling solution of common salt, which dissolves the biniodide to the exclusion of any contaminating protiodide; and the solution, thus obtained, on cooling, deposits the pure biniodide in crystals.

According to Dublanc, biniodide of mercury may be made economically by pouring 1000 parts of alcohol of 38° Cartier (sp. gr. 0·825) on 100 of mercury, contained in a matrass, and adding, from time to time, 10 parts of dry iodine, until 120 parts have been consumed. By agitation each portion of iodine is successively made to combine with the mercury, a result which is known to have taken place by the alcohol resuming its transparency. To complete the reaction, 4 additional parts of iodine are added, which, being more than enough to convert the whole of the mercury into biniodide, permanently colours the alcohol. The alcohol is now poured off, and the deposited biniodide washed with a little concentrated alcohol and dried. The alcohol poured off is reserved for future operations. (*Journ. de Pharm.*, March, 1849.)

Properties. Biniodide of mercury is a scarlet-red powder, of the sp. gr. 6·3, insoluble in water, but soluble in alcohol, and in solutions of iodide of potassium, chloride of sodium, and many of the mercurial salts. As obtained by the Edinburgh process, it is in splendid crimson acicular crystals. When heated it fuses readily into a yellow liquid, and sublimes in yellow rhombic scales, which become red on cooling. Biniodide of mercury is a dimorphous substance, having a different crystalline form in its red and yellow states. It forms definite compounds with the iodides of the alkalifiable metals. The compound formed with iodide of potassium has been used as a medicine. (See *Iodohydrargyrate of Potassium*, in the *Appendix.*) Biniodide of mercury consists of one eq. of mercury 202, and two of iodine 252·6=454·6. Its formula is HgI_2. It combines with the protiodide, so as to form a yellow *sesquiodide*, represented by the formula $HgI+HgI_2$, or Hg_2I_3.

Medical Properties and Uses. Biniodide of mercury is a powerful irritant poison. It has been used in similar diseases with the protiodide, namely, in scrofula and syphilis, but is much more active. The dose is a sixteenth of a grain, gradually increased to a fourth, given in pill, or dissolved in alcohol. M. Cazenave has found it the best topical application he has used in lupus. He applies it in thin layers, every six or eight days, to small portions of the ulcerated surface at a time, in the form of a caustic ointment, made of equal parts of the iodide, oil, and lard. The application produces violent pain, and gives rise to a sharp inflammation which soon terminates, leaving the ulcer in an improved condition, with a tendency to cicatrize smoothly, and on a level with the surrounding skin. (*Ann. de Thérap.*, A. D. 1852, p. 175.)

Off. Prep. Liquor Arsenici et Hydrargyri Iodidi; Unguentum Hydrargyri Iodidi Rubri. B.

HYDRARGYRI OXIDUM NIGRUM. *U. S. Black Oxide of Mercury.*

"Take of Mild Chloride of Mercury [calomel], Potassa, each, *four ounces;* Water *a pint.* Dissolve the Potassa in the Water, and, when the dregs have subsided, pour off the clear solution. To this add the Mild Chloride of Mercury, and stir them constantly together till the Black Oxide is formed. Having

poured off the supernatant liquor, wash the Black Oxide with distilled water, and dry it with a gentle heat." *U. S.*

This preparation has been abandoned by the London and Dublin Colleges in the last edition of their Pharmacopœias (1851 and 1850). The object of the U. S. process is to obtain the protoxide or black oxide of mercury, which was at one time believed to be the active constituent of those preparations in which the metal is minutely divided by trituration. The calomel is completely decomposed by the solution of potassa; its chlorine uniting with potassium to form chloride of potassium, which remains in solution, and the mercury with the oxygen of the potassa to form protoxide of mercury, which subsides. More potassa is employed than by calculation would seem to be requisite; but it has been ascertained by experiment that a considerable excess is necessary for the complete decomposition of the calomel. The use of the officinal solution of potassa is preferable, on the score of economy, to that of a solution extemporaneously prepared from the caustic alkali. In order to ensure the success of the process, the calomel, very finely levigated, should be rubbed quickly with the alkaline solution in a mortar; and the resulting oxide should be dried in the dark with a very gentle heat, as it is decomposed by the agency both of light and of an elevated temperature. For the same reason it should be preserved in an opaque bottle. This mode of preparing the black oxide of mercury was introduced into use by Mr. Donovan.

The oxide may also be prepared by decomposing a solution of the nitrate of protoxide of mercury by the solution of potassa. This nitrate may be obtained by treating twenty parts of mercury with eighteen parts of nitric acid of 25° Baumé, adding, when nitrous vapours cease to rise, ten parts of warm distilled water, boiling for a short time, decanting the clear liquor, and setting it aside to crystallize. The mother-waters by evaporation will furnish a new product of crystals of nitrate of protoxide. (Ratier, *Pharm. Franc.*) The former London Pharmacopœia prepared this oxide by decomposing calomel with lime-water; but it is extremely difficult to effect a complete decomposition in this way, and the preparation was consequently almost always mixed with calomel. The process recently abandoned by the Dublin College was the same essentially as the present one of the U. S. Pharmacopœia. The preparation, officinal in a former Dublin Pharmacopœia under the name of *Pulvis Hydrargyri Cinereus*, made by adding carbonate of ammonia to a solution of mercury in heated nitric acid, was a mixture of subnitrate of mercury and ammonia with the protoxide of mercury.

Properties, &c. As first prepared, this oxide is greenish-black; but as found in the shops it is almost always of an olive colour, owing, it is supposed, to the chemical changes which it undergoes. It is inodorous, tasteless, and insoluble in water and alkaline solutions; and consists of one eq. of mercury 202, and one of oxygen 8=210. On exposure to light or heat it is decomposed, one part assuming the metallic state, in consequence of the loss of its oxygen, which converts another part into the deutoxide. The preparation, therefore, becomes a mixture of the protoxide, the deutoxide, and metallic mercury, with which calomel is sometimes associated, in consequence of the incomplete decomposition of that originally employed in the process. By a strong heat it is completely dissipated, and metallic globules are sublimed. When pure it is soluble in acetic and nitric acids, and entirely insoluble in muriatic acid, which forms with it water and calomel. If it contain the deutoxide, this will be dissolved by muriatic acid, and may be detected in the solution by the production of a white precipitate with water of ammonia, and a yellow one with solution of potassa. Calomel, if present, may be discovered by boiling the powder with a solution of potassa, thus forming chloride of potassium, which, when the solution is saturated with nitric acid, will afford a white precipitate of chloride of silver on the addition of nitrate of silver. (*Phillips.*)

Medical Properties and Uses. The black oxide is alterative, sialagogue, and purgative. It may be employed for the same purposes with calomel, over which, however, it has not in our hands exhibited any superiority, while, from the occasional presence of the deutoxide, it must be liable to operate harshly. Dr. B. H. Coates, of this city, informs us that he uses it habitually as a mercurial, and finds it to answer an excellent purpose. The idea under which it was introduced into use, that it was the basis of the blue pill, is probably erroneous. Made into an ointment with lard according to the process of Donovan, it may be applied externally with good effect in bringing the system under the mercurial influence. (See *Unguentum Hydrargyri.*) Its dose as an alterative is one-fourth or half of a grain daily, as a sialagogue from one to three grains two or three times a day, given in the form of pill. It was employed by Mr. Abernethy for mercurial fumigation; the patient being placed, covered with under garments, in a vapour-bath, and exposed for fifteen or twenty minutes to the vapours arising from two drachms of the oxide, put upon heated iron within the bath. W.

HYDRARGYRI OXIDUM RUBRUM. *U. S.*, *Ed.* HYDRARGYRI NITRICO-OXIDUM. *Lond.* HYDRARGYRI OXYDUM RUBRUM. *Dub.* *Red Oxide of Mercury. Red Precipitate.*

"Take of Mercury *thirty-six ounces;* Nitric Acid *eighteen fluidounces;* Water *two pints;* Dissolve the Mercury, with a gentle heat, in the Acid and Water previously mixed together, and evaporate to dryness. Rub the dry mass into powder, and heat it in a very shallow vessel till red vapours cease to rise." *U. S.*

"Take of Mercury *three pounds;* Nitric Acid *eighteen fluidounces;* Distilled Water *two pints* [Imperial measure]. Mix, and apply a gentle heat till the mercury is dissolved. Boil down the solution, and rub the residue into powder. Put this into a very shallow vessel; then apply a gentle fire, and gradually increase it, till red vapour ceases to rise." *Lond.*

"Take of Mercury *eight ounces;* Diluted Nitric Acid (D. 1·280) *five fluidounces* [Imperial measure]. Dissolve half of the Mercury in the Acid with the aid of a moderate heat; and continue the heat till a dry salt is formed. Triturate the rest of the Mercury with the salt till a fine uniform powder be obtained; heat the powder in a porcelain vessel and constantly stir it, till acid fumes cease to be discharged." *Ed.*

"Take of Pure Mercury *eight ounces* [avoirdupois]; Pure Nitric Acid *three fluidounces;* Distilled Water *six* [*fluid*]*ounces.* In the Acid, diluted with the Water, digest the Mercury, using at first a very gentle heat, but, when the action has ceased, finally boiling for a few minutes; and, having decanted the solution, evaporate to dryness. Let the residuum, first reduced to powder, be transferred to a shallow cast-iron pot with a flat bottom, and loosely covered by a fire-tile lid; and in this let it be exposed to the heat of a slow fire until red vapours cease to be given off. The heat must now be withdrawn, and, when the pot has cooled, its contents should be transferred to bottles." *Dub.*

In these processes the mercury is first oxidized at the expense of a portion of the nitric acid, the remainder of which unites with the oxidized metal to form either the nitrate of the deutoxide of mercury, or a mixture of this with the nitrate of the protoxide. The resulting mass when exposed to a strong heat is decomposed, giving out red nitrous fumes, and assuming successively a yellow, orange, and brilliant purple-red colour, which becomes orange-red on cooling. These changes are owing to the gradual separation and decomposition of the nitric acid, by the oxygen of which the protoxide of mercury, if any be present, is converted into deutoxide, while nitric oxide gas escapes, and takes the form of nitrous acid vapour on contact with the air. The deutoxide of mercury is left behind; but in general not entirely free from the nitrate, which cannot be wholly decomposed by heat, without endangering the decomposition of the oxide

itself, and the volatilization of the metal. The preparation is, in common language, called *red precipitate.* The name of *red oxide of mercury*, by which it is now designated in most of the Pharmacopœias, is appropriate; as the nitrate of mercury exists in it merely as an incidental impurity; and there is no occasion to distinguish the preparation from the pure deutoxide obtained by calcining mercury, the latter not being recognised as officinal, and perhaps never employed.

In the preparation of this mercurial, various circumstances influence in some measure the nature of the product, and must be attended to, if we desire to procure the oxide with that fine bright orange-red colour, and shining scaly appearance, which are usually considered desirable. Among these circumstances is the condition of the nitrate of mercury submitted to calcination. According to Gay-Lussac, it should be employed in the form of small crystalline grains. If previously pulverized, as directed in the officinal processes, it will yield an orange-yellow powder; if it be in the state of large and dense crystals, the oxide will have a deep-orange colour. Care must also be taken that the mercury and acid be free from impurities. It is highly important that sufficient nitric acid be employed fully to saturate the mercury. M. Payssé, who paid great attention to the manufacture of red precipitate, recommended 70 parts of nitric acid from 34° to 38° Baumé, to 50 parts of mercury. This, however, is an excess of acid. We have been told by a skilful practical chemist of Philadelphia that he has found, by repeated experiment, 7 parts of nitric acid of 35° Baumé, to be sufficient fully to saturate 6 parts of mercury. Less will not answer, and more would be useless. It is not necessary that the salt should be removed from the vessel in which it is formed; and it is even asserted that the product is always more beautiful when the calcination is performed in the same vessel. A matrass may be used with a large flat bottom, so that an extended surface may be exposed, and all parts heated equally. The metal and acid having been introduced, the matrass should be placed in a sand-bath, and covered with sand up to the neck. The solution of the mercury should be favoured by a gentle heat, which should afterwards be gradually increased till red vapours make their appearance, then maintained as equably as possible till these vapours cease, and at last slightly elevated till oxygen gas begins to escape. This may be known by the increased brilliancy with which a taper will burn if placed in the mouth of the matrass, or by its rekindling if partially extinguished. Too high a temperature must be carefully avoided, as it decomposes the oxide, and volatilizes the mercury. At the close of the operation, the mouth of the vessel should be stopped, and the heat gradually diminished, the matrass being still allowed to remain in the sand-bath. These last precautions are said to be essential to the fine red colour of the preparation. It is best to operate upon a large quantity of materials, as the heat may be thus more steadily and uniformly maintained. The direction of the Edinburgh College to rub a portion of mercury with the nitrate before decomposing it, renders the process more economical; as the nitric acid which would otherwise be dissipated is thus employed in oxidizing an additional quantity of the metal.

As the process is ordinarily conducted in chemical laboratories, the nitrate of mercury is decomposed in shallow earthen vessels, several of which are placed upon a bed of sand in the chamber of an oven or furnace, provided with a flue for the escape of the vapours. Each vessel may conveniently contain ten pounds of the nitrate. There is always loss in the operation thus conducted.

In the former Dublin Pharmacopœia, under the name of *Hydrargyri Oxydum Rubrum*, a preparation was officinal, called by the elder chemists *hydrargyrum præcipitatum per se*, or *precipitate per se*, and sometimes *calcined mercury*, made by exposing the metal to a heat near its boiling point, or about 600° F., in a matrass with a broad bottom and narrow mouth. The vapours rising were con-

densed in the upper part of the vessel; and a circulation was thus kept up within it, during which the mercury slowly combined with oxygen, being converted first into a black and then into a red powder. But the process was very slow, requiring several weeks for the complete oxidation of the metal; and, as the product, which was the pure deutoxide, had no peculiar virtues to recommend it over the oxide procured in the ordinary mode, it has been very properly discarded by the Dublin College. The oxide made in this way is in minute, sparkling, crystalline scales, of a deep-red colour, becoming still deeper by heat.

The same oxide of mercury, prepared by precipitation, was recognised in the former London Pharmacopœia by the name of *Hydrargyri Binoxidum* or *binoxide of mercury*. It was made by adding solution of potassa to a solution of bichloride of mercury, and differed from the preceding only in containing some water. It was an orange-red impalpable powder, having the same properties essentially as the present officinal red oxide.

Properties, &c. Red precipitate, when well prepared, has a brilliant red colour, with a shade of orange, a shining scaly appearance, and an acrid taste. It is very slightly soluble in water, of which Dr. Barker found 1000 parts to take up only 0·62 of the oxide. Dr. Christison found 1 part of the oxide to be dissolved by about 7000 parts of boiling water, and the solution to give a black precipitate with sulphuretted hydrogen. Nitric and muriatic acids dissolve it without effervescence. It yields oxygen when heated, and at a red heat is decomposed and entirely dissipated. It is essentially the deutoxide (peroxide) of mercury, consisting of one equivalent of the metal 202, and two of oxygen 16=218; but, in its ordinary state, it always contains a minute proportion of nitric acid, probably in the state of subnitrate. According to Brande, when rubbed and washed with a solution of potassa, edulcorated with distilled water, and carefully dried, it may be regarded as nearly pure deutoxide. It is said to be sometimes adulterated with brickdust, red lead, &c.; but these may be readily detected, as the oxide of mercury is wholly dissipated if thrown upon red-hot iron. The disengagement of red vapours, when it is heated, indicates the presence of nitrate of mercury. The same or some other saline impurity would be indicated, should water, in which the oxide has been boiled, afford a precipitate with lime-water.

Medical Properties and Uses. This preparation is too harsh and irregular in its operation for internal use; but is much employed externally as a stimulant and escharotic, either in the state of powder or of ointment. In the former state it is sprinkled on the surface of chancres, and indolent, flabby, or fungous ulcers; and, mixed with 8 or 10 parts of finely powdered sugar, is sometimes blown into the eye to remove opacity of the cornea. The powder should be finely levigated. The ointment is officinal.

Off. Prep. Hydrargyri Cyanuretum; Unguentum Hydrargyri Oxidi Rubri.

W.

HYDRARGYRI PERNITRATIS LIQUOR. *Dub. Solution of Pernitrate of Mercury. Acid Nitrate of Mercury. Acid Binitrate of Deutoxide of Mercury.*

"Take of Pure Mercury *two ounces* [avoirdupois]; Pure Nitric Acid *one fluid-ounce and a half* [Imp. meas.]; Distilled Water *one ounce and a half* [avoird.]. In the Acid, first diluted with the Water, dissolve the Mercury, with the application of heat, and evaporate the solution to the bulk of two ounces and a half [Imp. meas.]." *Dub.*

In the process for making this new officinal of the Dublin Pharmacopœia of 1850, mercury is dissolved, with the assistance of heat, in an excess of nitric acid, and there is formed an acid binitrate of deutoxide of mercury, which is brought to a determinate bulk by evaporation. Thus, the proportion of nitric

acid employed is sufficient not only to deutoxidize the mercury and generate a bisalt, but to furnish an excess of acid. The binitrate of the deutoxide of mercury must be viewed as the neutral salt of that oxide; and if this salt were exclusively formed, it may be presumed that three eqs. of mercury would require eight of nitric acid; two eqs. of the acid being broken up into nitric oxide and oxygen in oxidizing the mercury, and the remaining six uniting with the three eqs. of deutoxide formed, producing three eqs. of binitrate. In the formula, however, more than ten eqs. of nitric acid are taken to three of mercury; and, consequently, sufficient acid is furnished to form an acid salt. This solution forms a dense and very caustic liquid, containing from twelve to fifteen per cent. of acid in excess.

Medical Properties. This preparation is frequently used in Europe, and has been employed to some extent in this country, as a caustic application to malignant ulcerations and cancerous affections. It has been used by Biett in lupus, by Bennet and others in ulceration of the neck of the uterus, and by Recamier in cancer. It is applied by means of a camel's hair brush to the diseased surface, which is then covered with lint, moistened with the solution. The parts touched immediately become white, the surrounding parts inflame, and in a few days a yellow scab is formed, which gradually falls off. Sometimes the application produces salivation. When it is desirable to avoid this result, the cauterized part should be washed with water immediately after the application of the caustic. B.

HYDRARGYRI SULPHAS. *Dub. Sulphate of Mercury.*

"Take of Quicksilver of Commerce *ten ounces* [avoirdupois]; Oil of Vitriol of Commerce *six fluidounces* [Imp. meas.]. Place the Quicksilver and Oil of Vitriol in a porcelain capsule, and apply heat until effervescence ceases, and nothing remains but a white and dry crystalline salt." *Dub.*

Mercury is not acted on by cold sulphuric acid; but, when boiled with an excess of this acid to dryness, it is deutoxidized at the expense of part of the acid, sulphurous acid being copiously evolved; and the deutoxide formed unites with the undecomposed portion of the sulphuric acid, so as to form the bisulphate of the deutoxide of mercury, which is the sulphate of the Dublin College.

Sulphate of mercury, as obtained by a separate formula, is peculiar to the Dublin Pharmacopœia; but it is formed as the first step of the processes of the other Pharmacopœias for preparing corrosive sublimate, calomel, and turpeth mineral. The adoption of a separate formula and distinct officinal name for this salt is certainly a convenience; as it obviates the necessity of repeating the directions for obtaining the same substance in several distinct formulæ. On account of its important uses, it requires to be made on a large scale by the manufacturing chemist; and the process is generally performed in a cast-iron vessel, which should be conveniently arranged for the escape and decomposition of the sulphurous acid fumes, which otherwise become a serious nuisance to the neighbourhood. The best way to effect this purpose is to allow them to pass off through a very lofty chimney, mixed with abundance of coal smoke.

Properties, &c. Sulphate of mercury is in the form of a white saline mass. It consists of two eqs. of acid 80 and one of deutoxide of mercury 218=298. It has no medical uses.

Off. Prep. Calomelas; Sublimatum Corrosivum. B.

HYDRARGYRI SULPHAS FLAVUS. *U.S. Yellow Sulphate of Mercury. Turpeth Mineral.*

"Take of Mercury *four ounces;* Sulphuric Acid *six ounces.* Mix them in a glass vessel, and boil by means of a sand-bath till a dry white mass remains. Rub this into powder, and throw it into boiling water. Pour off the supernatant

liquor, and wash the yellow precipitated powder repeatedly with hot water; then dry it." *U. S.*

By referring to the articles on corrosive sublimate and calomel, it will be found that the peculiar salt which is generated by boiling sulphuric acid with mercury to dryness, is directed to be made as the first step for obtaining these chlorides; and here it is perceived that in preparing turpeth mineral, the same salt is again directed to be formed. We have already stated that this salt is the bisulphate of the deutoxide of mercury. When thrown into boiling or even warm water it is instantly decomposed, and an insoluble salt is precipitated, which is the turpeth mineral. According to Berzelius, turpeth mineral is a basic sesquisulphate of the deutoxide of mercury, and the supernatant solution contains a supersulphate, consisting of six eqs. of acid and one of base. The same composition for turpeth mineral is given by Gay-Lussac; and its accuracy has been recently verified by an analysis of Sir Robert Kane, of Dublin. (See *Pharm. Journ. and Trans.* for August, 1842.) The composition above given of turpeth mineral implies the decomposition of four eqs. of the bisulphate of the deutoxide, and the manner in which the reaction takes place is shown by the following equation; $4(HgO_2,2SO_3)$=turpeth mineral, $3HgO_2,2SO_3$, and supersulphate of mercury, $HgO_2,6SO_3$.

Properties, &c. Yellow sulphate of mercury is in the form of a powder of a lemon-yellow colour, and possessing a somewhat acrid taste. It dissolves in 2000 parts of cold water, and in about 600 of boiling water. When exposed to a moderate heat, it becomes first red and afterwards brownish-red, but regains its original colour on cooling. (*Barker.*) At a red heat it is decomposed and dissipated, sulphuric acid being evolved, and metallic globules sublimed. It was originally called *turpeth* mineral, from the resemblance of its colour to that of the root of *Ipomæa Turpethum.*

Medical Properties and Uses. Turpeth mineral is alterative, and powerfully emetic and errhine. As an alterative, it has been given in leprous disorders and glandular obstructions. It has been employed with benefit as an emetic, repeated every few days, in chronic enlargement of the testicle. It operates with great promptness, and sometimes excites ptyalism. Dr. Hubbard, of Maine, considers it a valuable medicine, in cases in which the equalizing and revulsive effect of emesis is alone desired, apart from any cathartic operation, which he has never known it to produce. He recommends it highly as an emetic in croup, on the ground of its promptness and certainty, and of its not producing catharsis, or the prostration caused by antimony. The dose for a child two years old is two or three grains, repeated in fifteen minutes, if it should not operate. As an errhine, it has been used with advantage in chronic ophthalmia, and in diseases of the head; and it sometimes produces salivation when thus employed. The dose as an alterative is from a quarter to half a grain; as an emetic from two to five grains. When employed as an errhine, one grain may be mixed with five of starch or powdered liquorice root.

Turpeth mineral, in an over-dose, acts as a poison. A case of death in a boy aged sixteen, caused by swallowing a drachm, is reported by Dr. Letheby in the *London Medical Gazette*, for March, 1847. B.

HYDRARGYRI SULPHURETUM NIGRUM. *U. S. Black Sulphuret of Mercury. Ethiops Mineral.*

"Take of Mercury, Sulphur, each, *a pound.* Rub them together till all the globules disappear." *U. S.*

Mercury and sulphur have a strong affinity for each other; as is shown by the fact, that, when they are triturated together in quantities, the mixture grows hot, cakes, and exhales a sulphureous odour. During the trituration, the mixture

should be sprinkled from time to time with a little water or alcohol, to prevent the dust from rising, which exposes the operator to serious inconvenience. When rubbed together in equal weights, as directed in the formula, they are supposed to unite chemically; but the proportion of sulphur is much greater than is necessary to form a definite compound. Only two sulphurets of mercury have been admitted by the generality of chemists, the protosulphuret, and the bisulphuret or cinnabar; but the quantity of sulphur directed in the process is much more than sufficient to form even the latter. Thus, it still remains an unsettled point, what is the exact nature of the officinal black sulphuret, or *ethiops mineral.* Mr. Brande, from his experiments, considers it to be the bisulphuret mixed with sulphur. Thus he found that, when boiled repeatedly in a solution of potassa, sulphur was dissolved, and a black insoluble powder was left, which sublimed without decomposition, and yielded a substance having all the characters of cinnabar.

Ethiops mineral is sometimes obtained by melting sulphur in a crucible, and adding to it an equal weight of mercury; but, when thus prepared, the sulphur is apt to become acidified, and the preparation to acquire an activity which does not belong to it when obtained by trituration. According to C. Vogler, a better method than that by trituration for obtaining ethiops mineral, is to agitate for two hours four ounces of mercury with an ounce of finely powdered flowers of sulphur in a strong stoppered bottle, capable of holding from twelve to sixteen ounces, and then to add another ounce of sulphur at intervals, continuing the agitation until no mercury can be distinguished with the naked eye. Finally, two ounces more of sulphur are added, and the mixture shaken, until the metal cannot be detected with a lens. The advantages of this method over that by trituration are that it consumes less time, is more easy of execution, and less injurious to health. (*Journ. de Pharm.* for September 1848.)

Properties, &c. Black sulphuret of mercury is a heavy, tasteless, insoluble, black powder. When exposed to heat, it becomes of a dark-violet colour, emits the excess of sulphur in sulphurous acid fumes, and sublimes in brilliant red needles without residue. If charcoal be present, it will remain behind. When well prepared, no globules of mercury are discernible in it when viewed with a magnifier; and, if rubbed on a gold ring, it should not communicate a white stain. Ivory black is detected in it by throwing a small portion on a red-hot iron, when a white matter (phosphate of lime) will be left behind. Adulteration by sulphuret of antimony is shown, if muriatic acid, boiled on a portion of the powder, acquires the property of causing a precipitate of oxychloride of antimony when added to water. According to the views of Mr. Brande, ethiops mineral consists of one eq. of bisulphuret of mercury, mixed with about ten and a half eqs. of sulphur in excess.

Medical Properties. Ethiops mineral is supposed to be alterative, and as such is sometimes prescribed in glandular affections and cutaneous diseases. It has been given in scrofulous swellings, occurring in children; and from the mildness of its operation is considered well suited to such cases. The dose generally given is from five to thirty grains, repeated several times a day; but it has often been administered in much larger doses, without producing any obvious impression on the system. The late Dr. Duncan stated that he had given it in doses of several drachms, for a considerable length of time, with scarcely any effect. Ethiops mineral is very little used as a medicine. The London and Dublin Colleges, in the recent editions of their Pharmacopœias, have omitted it. B.

HYDRARGYRI SULPHURETUM RUBRUM. *U. S.* Hydrargyri Bisulphuretum. *Lond.* Cinnabaris. *Ed.* *Red Sulphuret of Mercury. Bisulphuret of Mercury. Cinnabar.*

"Take of Mercury *forty ounces;* Sulphur *eight ounces.* Mix the Mercury with the melted Sulphur over the fire; and, as soon as the mass begins to swell,

remove the vessel from the fire, and cover it with considerable force, to prevent combustion; then rub the mass into powder, and sublime." *U. S.*

The *London* and *Edinburgh Colleges* take *two pounds* of mercury and *five ounces* of sulphur, and treat them as in the U. S. process.

Mercury and sulphur, when heated together, unite with great energy, and a product is obtained, which by sublimation becomes the red or bisulphuret of mercury. In order to render the combination more prompt, the sulphur is first melted; and the addition of the mercury should be made gradually, while the mixture is constantly stirred. Dr. Barker recommends the addition of the metal by straining it upon the melted sulphur through a linen cloth, whereby it falls in the form of a shower, in a minutely divided state. When the temperature has arrived at a certain point, the combination takes place suddenly with a slight explosion, attended by the inflammation of the sulphur, which must be extinguished by covering the vessel. A black mass will thus be formed, containing generally an excess of sulphur, which, before the sublimation is performed, should be got rid of by gently heating the matter, reduced to powder, on a sand-bath. The sublimation is best performed, on a small scale, in a loosely stopped glass matrass, which should be placed in a crucible containing sand, and, thus arranged, exposed to a red heat. The equivalent quantities for forming this sulphuret, are 32 of sulphur, and 202 of mercury.

Preparation on the Large Scale. Cinnabar is seldom or never prepared on a small scale, being made in large quantities for the purposes of the arts. In Holland, where it is principally manufactured, the sulphur is melted in a cast iron vessel, and the mercury is added in a divided state, by causing it to pass through chamois leather. As soon as the combination has taken place, the iron vessel is surmounted by another, into which the cinnabar is sublimed. In proportion as the quantity of the materials employed in one operation is greater, will the product have a finer tint. It is also important in the manufacture to use the materials pure, and to drive off any uncombined sulphur which may exist in the mass, before submitting it to sublimation.

Properties, &c. Red sulphuret of mercury is in the form of heavy, brilliant, crystalline masses, of a deep-red colour and fibrous texture. It is inodorous and tasteless, and insoluble in water and alcohol. It is not acted on by nitric, muriatic, or cold sulphuric acid, or by solutions of the caustic alkalies; but it is soluble in nitromuriatic acid, on account of the free chlorine which the mixed acid contains. When heated with potassa, it yields globules of mercury. In the open air it is decomposed by heat, the sulphur becoming sulphurous acid, and the mercury being volatilized. In close vessels at a red heat it sublimes without decomposition, and condenses in a mass composed of a multitude of small needles. When duly levigated, it furnishes a powder of a brilliant red colour, and in this state constitutes the paint called *vermilion.* It occurs native, and forms the principal ore of mercury, and that from which the metal is exclusively extracted. It should not be purchased in powder; as, in that state, it is sometimes adulterated with red lead, dragon's blood, or chalk. If red lead be present, acetic acid, digested with it, will yield a yellow precipitate (iodide of lead) with iodide of potassium. Dragon's blood may be detected by alcohol, which will take up the colouring matter of this vegetable product, if present; and, if chalk be mixed with it, effervescence will be excited on the addition of an acid. This sulphuret is composed of one eq. of mercury 202, and two of sulphur 32=234.

Medical Properties and Uses. Cinnabar was formerly considered to be alterative and anthelmintic, but is at present seldom given internally. It is sometimes employed in the way of fumigation, as a rapid sialagogue, in venereal ulcers of the nose and throat, in cases in which it is an object of importance to bring the system under the influence of mercury in the shortest possible time. The

dose for internal exhibition is from ten grains to half a drachm, in the form of electuary or bolus. When used by fumigation, half a drachm may be thrown on a red-hot iron, and the fumes inhaled as they arise. These consist of sulphurous acid gas and mercurial vapour, the former of which must prove highly irritating to the patient's lungs. A better substance for mercurial fumigation is the black oxide of mercury. B.

HYDRARGYRUM AMMONIATUM. *U. S.* HYDRARGYRI AMMONIO-CHLORIDUM. *Lond., Dub.* HYDRARGYRI PRECIPITATUM ALBUM. *Ed. Ammoniated Mercury. White Precipitate.*

"Take of Corrosive Chloride of Mercury *six ounces;* Distilled Water *a gallon;* Solution of Ammonia *eight fluidounces.* Dissolve the Corrosive Chloride of Mercury in the Water, with the aid of heat, and to the solution, when cold, add the Solution of Ammonia, frequently stirring. Wash the precipitate till the washings become tasteless, and dry it." *U. S.*

The *London* and *Edinburgh* processes are essentially the same as the above.

"Take of Corrosive Sublimate *one ounce* [avoirdupois]; Solution of Ammonia *nine fluidrachms* [Imp. meas.]; Distilled Water *one pint* [Imp. meas.]. Dissolve the Corrosive Sublimate in the Water, with the aid of a gentle heat, pour the Ammonia into the solution, and, having stirred the mixture well, collect the precipitate on a filter, and wash it with warm distilled water, until the liquid which passes through ceases to give a precipitate when dropped into an acid solution of nitrate of silver. Lastly, dry the product at a temperature not exceeding 212°." *Dub.*

All the Pharmacopœias now agree in obtaining white precipitate by precipitating a solution of corrosive sublimate by ammonia. When ammonia, in slight excess, is added to a cold solution of corrosive sublimate, muriate of ammonia is formed in solution, and the white precipitate of the Pharmacopœias is thrown down. The precipitate is washed, according to the U. S. formula, until the washings become tasteless, and not until the powder is tasteless as directed by the London College; because the powder itself is sapid. The matter washed away is muriate of ammonia and the excess of ammonia employed; and hence the washings, agreeably to the directions of the Dublin formula, are tested with an acid solution of nitrate of silver. According to Sir Robert Kane, white precipitate has a composition corresponding to one eq. of protochloride of mercury, united with one eq. of a compound represented by one eq. of ammonia, *minus* one eq. of hydrogen. To this compound, represented by NH_2, he has given the name of *amidogen*, the *amide* of some chemists. The reaction may be thus explained. Two eqs. of ammonia are decomposed into one eq. of ammonium (NH_4) and one of amide (NH_2); and one eq. of corrosive sublimate is resolved into one eq. of chlorine and one of calomel. The chlorine unites with the ammonium and remains in solution as chloride of ammonium (muriate of ammonia), and the calomel precipitates with the amide as white precipitate. In symbols the reaction is thus denoted; $2NH_3$ and $HgCl_2 = NH_4Cl$ and $HgCl,NH_2$. For an explanation of what is meant by *ammonium*, see *page* 81. The analysis of Kane agrees virtually with those of Guibourt and Hennell; for Guibourt's results, minus the elements of one eq. of water, and Hennell's, minus the elements of two eqs. of the same liquid, give exactly the constituents found by Kane.

Properties, &c. Ammoniated mercury is in powder or pulverulent masses, perfectly white, insoluble in water and alcohol, decomposed by boiling water, and having a taste, at first earthy and afterwards metallic. It dissolves without effervescence in muriatic acid. When heated with a solution of caustic potassa, it yields ammonia and becomes yellow. Exposed to a strong heat it is entirely dissipated, and resolved into nitrogen, ammonia, and protochloride of mercury or calomel. Adulteration with white lead, chalk, or sulphate of lime may be

detected by exposing a sample to a strong red heat, when these impurities will remain. Should starch be mixed with it, a charry residuum will be obtained on the application of heat. Lead may also be found by digesting the white precipitate with acetic acid, and testing the acetic solution with iodide of potassium, which, if lead be present, will give a yellow precipitate. The absence of protoxide of mercury is shown by its not being blackened when rubbed with lime-water. Ammoniated mercury is used only as an external application, in the form of ointment.

Off. Prep. Unguentum Hydrargyri Ammoniati; Unguentum Sulphuris Compositum. B.

HYDRARGYRUM CUM CRETÂ. *U. S., Lond., Ed., Dub. Mercury with Chalk.*

"Take of Mercury *three ounces;* Prepared Chalk *five ounces.* Rub them together till all the globules disappear." *U. S., Lond., Ed.*

The *Dublin College* rubs *an ounce* of mercury with *two ounces* of prepared chalk, in a porcelain mortar until the globules cease to be visible, and the mixture acquires a uniform gray colour.

When mercury is triturated with certain dry and pulverulent substances, such as chalk or magnesia, it gradually loses its fluidity and metallic lustre, and assumes the form of a blackish or dark-gray powder. A similar change takes place when it is rubbed with viscid or greasy substances, such as honey or lard. The globules disappear, so as in some instances not to be visible even through a good lens; and the mercury is said to be extinguished. It was formerly thought that the metal was oxidized in the process. At present, the change is generally attributed to the mechanical division of the metal, which in this state is supposed to be capable of acting on the system. There is good reason, however, to believe that in this, as in all the analogous preparations of mercury, in which the metal is extinguished by trituration, a very small portion is converted into protoxide, while by far the greater part remains in the metallic state.

Mercury with chalk is a grayish powder, in which globules of mercury can generally be seen with the aid of a microscope; as the metal can scarcely be completely extinguished with chalk alone by any length of trituration. Mr. Jacob Bell found that, by powerfully pressing it, a considerable quantity of metal was separated in the form of globules. Mr. Phillips states that the extinguishment of the mercury is greatly accelerated by the addition of a little water. Mr. Stewart, of Baltimore, proposed the following process, by which he stated that the preparation might be completed in a short time, so that no globules should be visible with a powerful lens. Three ounces of mercury and six ounces of resin are to be rubbed together for three hours; five ounces of chalk are to be added, and the trituration continued for an hour; the mixture is then to be heated with alcohol so as to dissolve the resin; and the remaining powder is to be dried on bibulous paper, and well rubbed in a mortar. (*Am. Journ. of Pharm.*, xv. 162.) But Professor Procter has shown that the preparation thus made contains deutoxide of mercury, and is, therefore, injuriously harsh in its operation. (*Am. Journ. of Pharm.*, xxii. 113.) It is said that the precipitated black oxide is sometimes added with a view to save time in the trituration. But this must be considered as an adulteration, until it can be shown that the same oxide exists, in the same proportion, in the preparation made according to the officinal directions. Dr. Edward Jenner Coxe, of New Orleans, has found that the extinguishment of the mercury may be effected much more speedily than in the ordinary manner, by putting the ingredients into a quart bottle, to be well corked, and kept in constant agitation till the object is attained. This mode of proceeding was suggested to him by Mr. W. Hewson, of Augusta, Ga. (*Am. Journ. of Pharm.*, xxii. 317.) The mercury contained in this preparation is

volatilized by heat. The remaining chalk is dissolved by dilute acetic acid, and the solution is not coloured by sulphuretted hydrogen. The presence of any probable metallic impurity may be detected in this way.

Medical Properties and Uses. Mercury with chalk is a very mild mercurial, similar in its properties to the blue pill, but much weaker. It is sometimes used as an alterative, particularly in the complaints of children attended with deficient biliary secretion, indicated by white or clay-coloured stools. The chalk is antacid, and, though in small quantity, may sometimes be a useful accompaniment of the mercury in diarrhœa. Eight grains of the preparation, according to the U. S., London, and Edinburgh Pharmacopœias, contain three grains of mercury. The dose is from five grains to half a drachm twice a day. Two or three grains is the dose for a child. It should not be given in pill with substances which become hard on keeping; as the contraction of the mass presses together the particles of mercury, which, in time, appear in globules in the interior of the pill. W.

HYDRARGYRUM CUM MAGNESIÂ. *Dub. Mercury with Magnesia.*

The *Dublin College* prepares this with *an ounce* of pure mercury and *two ounces* of carbonate of magnesia in the same manner as directed for the preparation of mercury with chalk. (See *Hydrargyrum cum Cretâ.*)

This preparation has the same virtues with the preceding, but may be preferably used in the complaints of children attended with constipation. W.

INFUSA.

Infusions.

These are aqueous solutions obtained by treating with water, without the aid of ebullition, vegetable products which are only partly soluble in that liquid. The water employed may be hot or cold, according to the objects to be accomplished. Infusions are generally prepared by pouring boiling water upon the vegetable substance, and macerating in a lightly closed vessel till the liquid cools. The soluble principles are thus extracted more rapidly, and, as a general rule, in a larger proportion than at a lower temperature. Some substances, moreover, are dissolved in this manner, which are nearly or quite insoluble in cold water. A prolonged application of heat is in some instances desirable; and this may be effected by placing the vessel near the fire. Cold water is preferred, when the active principle is highly volatile, when it is injured by heat, or when any substance of difficult solubility at a low temperature exists in the vegetable, which it is desirable to avoid in the infusion. A longer continuance of the maceration is necessary in this case; and, in warm weather, there is sometimes danger that spontaneous decomposition may commence before the process is completed. When a strong infusion is required, the *process of percolation* may be advantageously resorted to. (See *pages* 782 and 789.) The water employed should be free from saline impurities, which frequently produce precipitates, and render the infusion turbid. Fresh river, rain, or distilled water is usually preferable to that of pumps or springs.

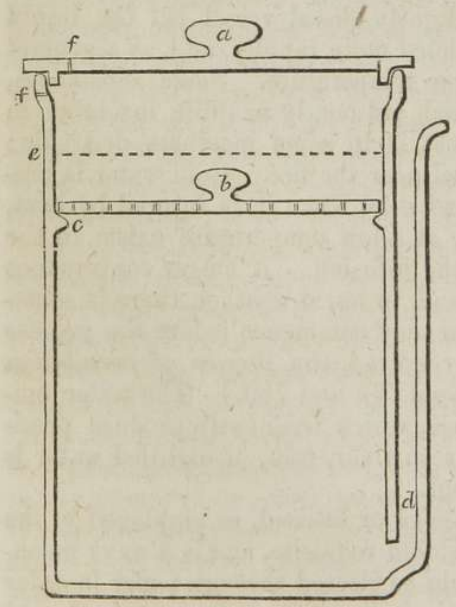
The substance to be acted on should be sliced or bruised, or employed in the state of powder; but this last condition is seldom requisite, and is always inconvenient, as it requires that the infusion should be filtered through paper in order completely to separate the undissolved portion. In other cases, it is sufficient to strain through fine linen or muslin. When, however, percolation or displacement is resorted to, the substance should be more or less finely powdered. Infusions are usually prepared in glazed earthenware or porcelain vessels fitted

with covers. Mr. Brande suggests the use of clean metallic vessels, which, when finely polished, retain the heat for a greater length of time; but they are also more liable to chemical alteration, and may sometimes injuriously affect the preparation. Vessels of block-tin are generally well adapted for the purpose.*

As infusions do not keep well, especially in warm weather, they should be made extemporaneously and in small quantities. In this country they are usually prepared in families, and the propriety of their introduction into the Pharmacopœia has been doubted; but it is desirable to have certain fixed standards for the convenience of the medical practitioner; and it is sometimes convenient to direct infusions from the apothecary, for whose guidance officinal formulæ are necessary. Physicians would, indeed, find their advantage in more frequently directing them from the shops, instead of leaving their preparation to the carelessness or want of skill of the attendants upon the sick. For a mode of preserving infusions, the reader is referred to the introductory observations, page 785. By making very concentrated infusions, as suggested by Mr. Donovan, with a mixture of three parts of water and one of alcohol, they may be kept for a long time, and when used can be diluted with water to the proper strength. Thus, if made four times as strong as the officinal infusion, they may be diluted with three measures of water. The proportion of alcohol would thus be very small; but it would still frequently be medically injurious; and infusions should never be prepared in this way unless with the cognizance of the prescriber.

Mr. Battley, of London, has introduced a new set of preparations, which he calls *inspissated infusions*, the advantages of which are that the virtues are extracted by cold water, are not injured by heat used in the evaporation, are in a concentrated state, and are not injured by time. To prepare them he macerates the material, coarsely powdered, bruised, or finely sliced, in twice its weight of cold distilled water, pressing the solid matter into the liquid repeatedly by a rammer or the hand; then allows the liquid to drain out, or expresses it in the

* *Alsop's infusion jar* affords a very neat and effectual method of making the hot infusions. It consists of an earthenware mug, represented in the marginal figure, with a spout (*d*) proceeding from the bottom, and placed closely to the side of the vessel to prevent fracture; a perforated plate or diaphragm (*b*), supported on a ledge (*c*), at about one-quarter or one-third of the height of the vessel from the top; and a lid (*a*), which may be fastened on by a string through holes (*ff*). The material to be submitted to infusion is placed on the perforated plate, and the hot water poured in so as cover it, the vessel having been previously warmed so as not to chill the liquid. As the water becomes impregnated, it acquires an increased specific gravity, and sinks to the bottom, its place being supplied by the unsaturated portion; and this circulation goes on until the whole of the soluble matter is extracted. In order to maintain a due warmth, the vessel may be placed upon a stove or an iron plate near the fire. The advantage of the process is that the material is subjected to the solvent power of the least impregnated portion of the menstruum. Such jars may now be had in Philadelphia. In order that the vessel may be adapted for the preparation of different quantities of infusions, it will be proper to have ledges arranged within at different heights, so that the diaphragm may be supported at any desirable point. The surface of the liquid (*e*) should of course always be above the medicinal substance placed upon the diaphragm. (See *Am. Journ. of Pharm.*, viii. 89.)



case of highly absorbent substances; and repeats the process, with an amount of water equal to that which has been separated, until the strength is exhausted. Four or six hours maceration is usually sufficient. The infusion is then to be concentrated by evaporation at a temperature not exceeding 160° to the sp. gr. 1·200, and as much alcohol is to be added as will make its sp. gr. 1·100. These preparations are very analogous to the *fluid extracts* already treated of. As a general rule it would probably be preferable to prepare the infusion by the process of percolation. The inspissated infusions must be diluted when administered. The presence of alcohol, though in small quantity, would in some instances be a serious objection. (*Pharm. Journ. and Trans.*, x. 129.)

As we have already treated of the chemical relations and medical properties of the substances used in infusion, it would be useless repetition to enlarge upon these points in the following details. We shall touch upon them only in cases of peculiar interest, or where changes requiring particular notice may grow out of the nature of the process. W.

INFUSUM ANGUSTURÆ. *U. S.* INFUSUM CUSPARIÆ. *Lond., Ed. Infusion of Angustura Bark.*

"Take of Angustura Bark, bruised, *half an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* directs *five drachms* to *a pint* [Imperial measure] of boiling distilled water; the *Edinburgh, five drachms* to *a pint* [Imp. meas.] of boiling water; and both proceed as above.

The dose of the infusion is two fluidounces, repeated every two, three, or four hours. W.

INFUSUM ANTHEMIDIS. *U. S., Lond., Ed., Dub. Infusion of Chamomile.*

"Take of Chamomile *half an ounce;* Boiling Water *a pint.* Macerate for ten minutes in a covered vessel, and strain." *U. S.*

The *London College* orders *five drachms* of the flowers to *a pint* [Imperial measure] of boiling distilled water, and proceeds as above; the *Edinburgh, five drachms* to *a pint* [Imp. meas.] of boiling water, and infuses for twenty minutes; the *Dublin, half an ounce* [avoirdupois] of the flowers and *twelve* [*fluid*]*ounces* of boiling water, and infuses for fifteen minutes.

The infusion of chamomile has the odour and taste of the flowers. It affords precipitates with gelatin, yellow Peruvian bark, sulphate of iron, tincture of chloride of iron, nitrate of silver, corrosive chloride of mercury, and the acetates of lead. (*London Dispensatory.*) As a tonic it is given cold, in the dose of two fluidounces several times a day. To assist the operation of emetic medicines it should be administered in the tepid state, and in large draughts. The infusion prepared by maceration in cold water is more grateful to the palate and stomach than that made with boiling water, but is less efficient as an emetic. W.

INFUSUM ARMORACIÆ. *U. S.* INFUSUM ARMORACIÆ COMPOSITUM. *Lond. Infusion of Horse-radish.*

"Take of Horse-radish [fresh root], sliced, Mustard [seed], bruised, each, *an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* macerates *an ounce* of the root, and *an ounce* of the seeds in *a pint* [Imp. meas.] of boiling distilled water, in a covered vessel, for two hours, and strains; then adds *a fluidounce* of compound spirit of horse-radish.

This infusion is rendered turbid by the deposition of vegetable albumen, and in warm weather speedily runs into the putrefactive fermentation. It affords precipitates with the infusions of galls and Peruvian bark, with the alkaline carbonates, nitrate of silver, and corrosive chloride of mercury. (*London Dis-*

pensatory.) It has the stimulant properties of its two active ingredients, and is occasionally used in paralytic, scorbutic, and dropsical affections, attended with general debility. The dose is two fluidounces three or four times a day. W.

INFUSUM AURANTII COMPOSITUM. *Lond., Dub.* INFUSUM AURANTII. *Ed. Compound Infusion of Orange Peel.*

"Take of dried Orange Peel *half an ounce;* Lemon Peel *two drachms;* Cloves, bruised, *a drachm;* boiling Distilled Water *a pint* [Imperial measure]. Macerate for a quarter of an hour in a covered vessel, and strain." *Lond.*

The *Edinburgh* process differs from the above only in the use of boiling water not distilled, and in straining through linen or calico. The *Dublin College* takes *three drachms* [Dub. weight] of dried bitter orange peel, *half a drachm* [Dub. weight] of bruised cloves, and *half a pint* [Imp. meas.] of boiling water; and infuses for half an hour.

This infusion is given as a grateful stomachic, in the dose of two or three fluidounces. W.

INFUSUM BUCHU. *U. S., Lond., Dub.* INFUSUM BUCKU. *Ed. Infusion of Buchu.*

"Take of Buchu *an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* takes *an ounce* of buchu and *a pint* [Imperial measure] of boiling distilled water, and macerates for four hours; the *Edinburgh*, the same quantities, and infuses for two hours; the *Dublin*, *half an ounce* (avoird.) of buchu and *half a pint* [Imp. meas.] of boiling water, and infuses for an hour.

This is the *Infusum Diosmæ* of former Pharmacopœias. It has the odour, taste, and medical virtues of the leaves, and affords a convenient method of administering the medicine. The dose is one or two fluidounces. W.

INFUSUM CAPSICI. *U. S. Infusion of Cayenne Pepper.*

"Take of Cayenne Pepper, in coarse powder, *half an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

This infusion is used chiefly as a gargle. It may, however, be given internally in the dose of half a fluidounce. W.

INFUSUM CARYOPHYLLI. *U. S., Lond., Ed., Dub. Infusion of Cloves.*

"Take of Cloves, bruised, *two drachms;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* takes *three drachms* of cloves, and *a pint* [Imperial measure] of boiling distilled water; the *Edinburgh*, *three drachms* of cloves and *a pint* [Imp. meas.] of boiling water; and both proceed as above. The *Dublin College* takes *two drachms* [Dub. weight] of cloves, and *nine* [*fluid*]*ounces* of boiling water, and infuses for an hour.

The infusion of cloves affords precipitates with lime-water, and with the soluble salts of iron, zinc, lead, silver, and antimony. (*Phillips.*) The dose is about two fluidounces. W.

INFUSUM CASCARILLÆ. *U. S., Lond., Ed., Dub. Infusion of Cascarilla.*

"Take of Cascarilla, bruised, *an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* directs *an ounce and a half* of bruised cascarilla, and *a pint* [Imperial measure] of boiling distilled water; the *Edinburgh*, the same quantities of the bark and of boiling water; and both proceed as above. The *Dublin College* takes *an ounce* [avoirdupois] of the bark, and *half a pint* [Imp. meas.] of boiling water, and infuses for an hour.

This infusion affords precipitates with lime-water, infusion of galls, nitrate of silver, acetate and subacetate of lead, sulphate of zinc, and sulphate of iron. (*London Dispensatory.*) The medium dose is two fluidounces. W.

INFUSUM CATECHU COMPOSITUM. *U. S., Lond., Dub.* INFUSUM CATECHU. *Ed. Compound Infusion of Catechu.*

"Take of Catechu, in powder, *half an ounce;* Cinnamon, bruised, *a drachm;* Boiling Water *a pint.* Macerate for an hour in a covered vessel, and strain." *U. S.*

"Take of Catechu, in powder, *six drachms;* Cinnamon, bruised, *a drachm;* boiling Distilled Water *a pint* [Imperial measure]. Macerate for an hour in a covered vessel, and strain." *Lond.*

"Take of Catechu, in powder, *six drachms;* Cinnamon, in powder, *one drachm;* Syrup *three fluidounces;* boiling Water *seventeen fluidounces.* Infuse the Catechu and Cinnamon with the Water for two hours, strain through linen or calico, and add the Syrup." *Ed.*

"Take of Catechu, in coarse powder, *three drachms* [Dub. weight]; Cinnamon bark, bruised, *half a drachm* [Dub. weight]; boiling Water *nine* [*fluid*]*ounces.* Infuse for one hour in a covered vessel, and strain." *Dub.*

This is an elegant mode of administering catechu. The dose is from one to three fluidounces, repeated three or four times a day, or more frequently. W.

INFUSUM CHIRETTÆ. *Ed., Dub. Infusion of Chiretta.*

"Take of Chiretta *four drachms;* boiling Water *one pint* [Imperial measure]. Infuse for two hours, and strain through linen or calico." *Ed.*

"Take of Chiretta, bruised, *two drachms* [Dub. weight]; boiling Water *nine* [*fluid*]*ounces and a half.* Infuse for one hour in a covered vessel, and strain." *Dub.*

The dose of this simple bitter is from one to three fluidounces. W.

INFUSUM CINCHONÆ COMPOSITUM. *U. S. Compound Infusion of Peruvian Bark.*

"Take of Red Bark, in powder *an ounce;* Aromatic Sulphuric Acid *a fluidrachm;* Water *a pint.* Macerate for twelve hours, occasionally shaking, and strain.

"The Infusion may also be prepared from the same quantity of Red Bark, in coarse powder, by the process of displacement, in the manner directed for Infusion of Yellow Bark, *a fluidrachm* of Aromatic Sulphuric Acid being added to the Water with which the Bark is moistened." *U. S.*

This is an elegant and very efficient preparation. Water extracts from bark the kinates of quinia and cinchonia, but leaves behind the compounds which these principles form with the cinchonic red. The ordinary infusion, therefore, is rather feeble. But the addition of the acid ensures the solution of all or nearly all the active matter. We have been long in the habit of using this infusion, and have had reason to be satisfied with its efficacy. The second process more speedily and perhaps thoroughly exhausts the bark; but in this case a glass or porcelain percolator should be used. This preparation may also be made very advantageously with the yellow or Calisaya bark. It would be best that the bark should be macerated with the acidulated water some time before being introduced into the instrument. The medium dose of the infusion is two fluidounces, equivalent to a drachm of the bark. W.

INFUSUM CINCHONÆ FLAVÆ. *U. S.* INFUSUM CINCHONÆ. *Lond., Ed. Infusion of Yellow Bark.*

"Take of Yellow Bark, bruised, *an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain.

"This infusion may also be prepared from the same quantity of Yellow Bark, in coarse powder, in the following manner. Having moistened the Bark thoroughly with Water, introduce it into a percolator, press it slightly, and pour Water upon its surface so as to keep it covered. So long as the liquid passes turbid, return it into the apparatus; then allow the filtration to continue until a pint of clear infusion is obtained." *U. S.*

"Take of Yellow Bark, bruised, *an ounce;* boiling Distilled Water *a pint* [Imp. meas.]. Macerate for two hours in a covered vessel, and strain." *Lond.*

"Take of any species of Cinchona, according to prescription, *one ounce* in powder; boiling Water *one pint* [Imp. measure]. Infuse for four hours in a covered vessel, and then strain through linen or calico." *Ed.*

Though the infusion with boiling water is more quickly prepared than the cold infusion, and therefore better adapted to cases of emergency, yet the latter is a more elegant preparation, not turbid like the former, and at least equally efficient. We, therefore, prefer the second process of the U. S. Pharmacopœia, provided it be skilfully conducted. Perhaps it would be better that the bark should be in moderately fine than in coarse powder.

The infusion of cinchona affords precipitates with the alkalies, alkaline carbonates, and alkaline earths; the soluble salts of iron, zinc, and silver; corrosive chloride of mercury, arsenious acid, and tartar emetic; gelatinous solutions; and various vegetable infusions and decoctions, as those of galls, chamomile, columbo, cascarilla, horse-radish, cloves, catechu, orange-peel, foxglove, senna, rhubarb, valerian, and simaruba. In some instances the precipitate occurs immediately, in others not for several hours. (*London Dispensatory.*) Few, however, of these substances diminish the efficacy of the infusion, as they do not affect the active principles. The alkalies, alkaline earths, and vegetable astringents are really incompatible. The same is said to be the case with tartaric and oxalic acids, and the soluble tartrates and oxalates. For an elaborate account of the chemical reactions of the infusions of different varieties of Peruvian bark see the *Am. Journ. of Pharm.*, ix. 128.

The infusion of cinchona may be advantageously administered in cases which require tonic treatment, but do not call for the full powers of the bark. The medium dose is two fluidounces, to be repeated three or four times a day, or more frequently in acute diseases. W.

INFUSUM CINCHONÆ PALLIDÆ. *Lond.* INFUSUM CINCHONÆ. *Dub., Ed. Infusion of Pale Bark.*

The *London College* prepares this in the manner directed for infusion of yellow bark. (See *Infusum Cinchonæ Flavæ.*] The *Edinburgh College* has only one infusion of bark, which it names *Infusum Cinchonæ*, and prepares from any one of the varieties in the manner directed for infusion of yellow bark. The *Dublin College* directs only this infusion of bark, which it prepares by infusing *an ounce* [avoirdupois] of pale bark, in coarse powder, in *half a pint* [Imperial measure] of boiling water for an hour, in a covered vessel, and then filtering through paper.

It is rather singular that the Dublin College should have selected the feeblest bark exclusively for this preparation. The remarks made in reference to the preparation of the infusion of yellow bark are applicable to this. W.

INFUSUM CINCHONÆ RUBRÆ. *U.S.* INFUSUM CINCHONÆ. *Ed. Infusion of Red Bark.*

"Take of Red bark, bruised, *an ounce;* Boiling Water *a pint.* Prepare the Infusion in the manner directed for Infusion of Yellow Bark." *U. S.* (See *Infusum Cinchonæ Flavæ.*)

The *Edinburgh* directions are also the same as those for infusion of yellow

bark, as it recognises no distinction between the three varieties in the preparation of the infusion.

The remarks made in relation to infusion of yellow bark are equally applicable to this. W.

INFUSUM CINCHONÆ SPISSATUM. *Lond. Inspissated Infusion of Peruvian Bark.*

"Take of Yellow Bark, coarsely powdered, *three pounds;* Distilled Water *six pints* [Imperial measure]; Rectified Spirit *a sufficient quantity.* Macerate the Bark in the manner directed in the preparation of Extract of Peruvian Bark [see *Extractum Cinchonæ, Lond.*], and strain. Mix the infusions, evaporate by means of a water-bath to one-fourth, and set apart that the dregs may subside. Pour off the clear liquor, and filter the rest. Then mix, and again evaporate till the sp. gr. of the liquor becomes 1·200. Into this, when cold, slowly drop the Spirit, so that three fluidrachms may be added for every fluidounce. Lastly, set the liquor aside for twenty days, that it may become entirely clear." *Lond.*

INFUSUM CINCHONÆ PALLIDÆ SPISSATUM. *Lond. Inspissated Infusion of Pale Bark.*

"Prepare this in the manner directed for Inspissated Infusion of Peruvian Bark." *Lond.* (See *Infusum Cinchonæ Spissatum.*)

These two inspissated infusions are made according to Mr. Battley's method, described under the general observations upon infusions (see *page* 1051). They are no doubt efficacious preparations of Peruvian bark; and the proportion of alcohol is scarcely sufficient to interfere with their use in most cases in which the bark or its preparations are prescribed. They might without violence be placed among the fluid extracts. We have had some of the "Infusum Cinchonæ Spissatum" prepared, and found that each ounce of the bark yielded very nearly two fluidrachms of the preparation, the dose of which, therefore, equivalent to a drachm of the bark would be fifteen minims, supposing the bark to be exhausted; but, as this is not the case, twenty minims may be considered as a medium dose. The preparation is a very dark, yet clear, and intensely bitter liquid. W.

INFUSUM COLOMBÆ. *U. S.* INFUSUM CALUMBÆ. *Lond., Ed., Dub. Infusion of Columbo.*

"Take of Columbo, bruised, *half an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* directs *five drachms* of Columbo to *a pint* [Imperial measure] of boiling distilled water, and proceeds as above.

"Take of Calumba, in coarse powder, *half an ounce;* cold Water about *a pint* [Imperial measure]. Triturate the Calumba with a little of the Water, so as to moisten it thoroughly; put it into a percolator, and transmit cold Water till sixteen fluidounces of infusion be obtained." *Ed.*

"Take of Calumba Root, in coarse powder, *three drachms* [Dub. weight]; cold Water *nine* [*fluid*]*ounces.* Macerate for two hours and strain." *Dub.*

The infusion of columbo is apt to spoil very quickly, especially in warm weather. It has been generally supposed that the cold infusion would keep better than the hot, because it contains no starch. Mr. Thomas Greenish, however, upon comparing specimens of the two infusions, found that the spontaneous change began sooner in the cold than the hot, though the former was clearer. Columbo contains starch and albumen. Cold water extracts the latter without the former; hot water the former with comparatively little of the latter, which is partially coagulated by the heat. Both starch and albumen are liable to spontaneous change; but the former is much the more permanent of the two. Hence it is, according to Mr. Greenish, that the hot infusion keeps best. Indeed, he ascribes the change which takes place in the starch of the hot infusion chiefly to the agency of a

little albumen, which has escaped coagulation. According to these views, the best plan of preparing infusion of columbo is to exhaust the root with cold water, by which the starch is left behind, and then to heat the infusion to the boiling point in order to coagulate the albumen. (*Am. Journ. of Pharm.*, xviii. 141, from *Pharm. Journ.*) Upon comparing specimens of the cold and hot infusion, we have not found the results of Mr. Greenish fully confirmed. The cold infusion appeared to keep better than the hot. Nevertheless, the plan of preparing the infusion above proposed is probably the best. The infusion of columbo is not disturbed by salts of iron, and may be conveniently administered in connexion with them. The dose is two fluidounces three or four times a day. W.

INFUSUM DIGITALIS. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Infusion of Foxglove.*

"Take of Foxglove [dried leaves] *a drachm;* Boiling Water *half a pint;* Tincture of Cinnamon *a fluidounce.* Macerate the Foxglove with the Water for two hours in a covered vessel, and strain; then add the Tincture of Cinnamon." *U. S.*

The *London College* takes *a drachm* of the dried leaves, *a fluidounce* of spirit of cinnamon, and *a pint* [Imperial measure] of boiling distilled water; macerates the leaves in the water for four hours; and, having strained the liquor, adds the spirit. The *Ed. College* takes *two drachms* of the leaves, *two fluidounces* of spirit of cinnamon, and *eighteen fluidounces* of boiling water; and, having macerated the leaves in the water for four hours, strains through linen or calico, and adds the spirit. The *Dub. College* takes *a drachm* [54·68 grains] of the dried leaves, and *nine* [*fluid*]*ounces* of boiling water, infuses for an hour, and strains.

The U. S. infusion is essentially the same with that employed by Withering. It affords precipitates with the sulphate of iron, acetate of lead, and infusion of Peruvian bark. (*London Dispensatory.*) The dose is usually stated at half a fluidounce, repeated twice a day under ordinary circumstances, every eight hours in urgent cases, until the system is affected. The proportion of digitalis is not half as great in the London preparation, and the dose, of course, is proportionably larger. It will not, however, escape the close observer, that the stated dose of digitalis in infusion is much larger than in substance, for which there does not appear to be a good reason. It might be safer to give only half the quantity, and increase if necessary. W.

INFUSUM ERGOTÆ. *Dub.* *Infusion of Ergot.*

"Take of Ergot of Rye, in coarse powder, *two drachms* [Dublin weight]; Boiling Water *nine* [*fluid*]*ounces.* Infuse for one hour in a covered vessel and strain." *Dub.*

The dose of this infusion is two fluidounces for a woman in labour. W.

INFUSUM EUPATORII. *U. S.* *Infusion of Thoroughwort.*

"Take of Thoroughwort [the dried herb] *an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

As a tonic, this infusion should be taken cold in the dose of two fluidounces three or four times a day, or more frequently; as an emetic and diaphoretic, in large tepid draughts. W.

INFUSUM GENTIANÆ COMPOSITUM. *U. S.*, *Lond.*, *Dub.* INFUSUM GENTIANÆ. *Ed.* *Compound Infusion of Gentian.*

"Take of Gentian, bruised, *half an ounce;* Orange peel [dried peel of the Seville orange], bruised, Coriander, bruised, each, *a drachm;* Diluted Alcohol *four fluidounces;* Water [cold] *twelve fluidounces.* First pour on the Diluted Alcohol, and, three hours afterwards, the Water; then macerate for twelve hours, and strain." *U. S.*

The above was copied from the *Edinburgh* formula, which differs only in having *four fluidounces* [Imperial measure] of proof spirit and *sixteen fluidounces* [Imp. meas.] of cold water.

The *London College* takes of sliced gentian and dried orange peel, each, *two drachms*, of [fresh] lemon peel *four drachms*, of boiling distilled water *a pint* [Imperial measure]; the *Dublin* takes of gentian and dried orange peel, each, *two drachms* [Dub. weight], and of boiling water *half a pint* [Imp. meas.]; both macerate for an hour in a covered vessel, and strain.

The U. S. and Edinburgh infusion differs materially from the London. The former has much more gentian in proportion to the solvent than the latter, and is therefore a much stronger bitter; while, by the use of cold instead of boiling water, less of the inert mucilaginous matter is extracted, and the addition of alcohol gives the preparation the character rather of a weak tincture than an infusion. The use of the diluted alcohol is to assist in dissolving the bitter principle, and at the same time to contribute towards the preservation of the infusion, which, without this addition, is very apt to spoil. The Dublin preparation is rather weaker than that of the U. S. Pharmacopœia, and is simply an infusion.

The dose of the U. S. infusion is a fluidounce, that of the preparation of the London College two or three fluidounces, to be repeated three or four times a day.

Off. Prep. Mistura Gentianæ Composita. W.

INFUSUM HUMULI. *U. S.* Infusum Lupuli. *Lond.* *Infusion of Hops.*

"Take of Hops *half an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

"Take of Hops *six drachms;* boiling Distilled Water *a pint* [Imperial measure]. Macerate for four hours in a covered vessel, and strain." *Lond.*

The dose of this infusion is one or two fluidounces. W.

INFUSUM JUNIPERI. *Dub.* *Infusion of Juniper.*

"Take of Juniper Berries, bruised, *one ounce* [avoirdupois]; Boiling Water *half a pint* [Imperial measure]. Infuse for one hour, in a covered vessel, and strain." *Dub.*

It will be found more convenient to prepare this infusion, as is generally done in this country, in the proportion of *an ounce* of the fruit, to *a pint* of boiling water. The whole quantity made may be taken in twenty-four hours, in doses of two or three fluidounces. W.

INFUSUM KRAMERIÆ. *U. S.*, *Lond.*, *Dub.* *Infusion of Rhatany.*

"Take of Rhatany, bruised, *an ounce;* Boiling Water *a pint.* Macerate for four hours in a covered vessel, and strain.

"This Infusion may also be prepared from the same quantity of Rhatany, in coarse powder, by the process of displacement, in the manner directed for the Infusion of Yellow Bark." *U. S.* (See *Infusum Cinchonæ Flavæ.*)

The *London College* takes *an ounce* of the root, and *a pint* [Imperial measure] of boiling distilled water, and macerates for four hours; the *Dublin* takes *half an ounce* [avoirdupois] to *nine* [*fluid*]*ounces*, and digests for an hour.

The infusion of rhatany would probably be more efficient, if prepared by the mode of percolation, with cold water, from the root in a state of moderately fine powder, as directed for infusion of Peruvian bark. The dose of the infusion is one or two fluidounces. W.

INFUSUM LINI COMPOSITUM. *U. S., Lond.* INFUSUM LINI. *Ed. Compound Infusion of Flaxseed.*

"Take of Flaxseed *half an ounce;* Liquorice Root, bruised, *two drachms;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* directs *six drachms* of flaxseed, *two drachms* of sliced fresh liquorice root, and *a pint* [Imperial measure] of boiling distilled water, and macerates for four hours; the *Edinburgh* directs the same except boiling water for boiling distilled water, and digests near the fire for four hours.

This is a useful demulcent drink in inflammatory affections of the mucous membrane of the lungs and urinary passages. It may be taken *ad libitum.* W.

INFUSUM MATICO. *Dub. Infusion of Matico.*

"Take of Matico Leaves, cut small, *half an ounce* [avoirdupois]; Boiling Water *half a pint* [Imperial measure]. Infuse for one hour in a covered vessel, and strain." *Dub.*

The dose of this infusion is two fluidounces. W.

INFUSUM MENTHÆ VIRIDIS. *Dub. Infusion of Spearmint.*

"Take of Spearmint, dried, and cut small, *three drachms* [Dublin weight]; Boiling Water *half a pint* [Imperial measure]. Infuse for fifteen minutes, in a covered vessel, and strain." *Dub.*

This is common mint tea, and may be taken *ad libitum.* W.

INFUSUM PAREIRÆ. *Ed., Dub. Infusion of Pareira Brava.*

"Take of Pareira *six drachms;* Boiling Water *a pint* [Imperial measure]. Infuse for two hours, in a covered vessel, and then strain through linen or calico." *Ed.*

"Take of Pareira Root, bruised and torn into shreds, *half an ounce* [avoirdupois]; Boiling Water *nine* [*fluid*]*ounces.* Digest for one hour, in a covered vessel, and strain." *Dub.*

The infusion of Pareira brava is highly esteemed by some English practitioners as a remedy in irritation and chronic inflammation of the urinary passages, and has been found useful in catarrh of the bladder. The dose is one or two fluidounces. Brodie employed a *decoction* of the root, which he prepared by boiling half an ounce in three pints of water down to a pint, and gave in the quantity of from eight to twelve fluidounces daily. The London College has substituted the decoction for the infusion. W.

INFUSUM PRUNI VIRGINIANÆ. *U. S. Infusion of Wild-cherry Bark.*

"Take of Wild-cherry Bark, bruised, *half an ounce;* Water [cold] *a pint.* Macerate for twenty-four hours, and strain.

"This Infusion may also be prepared from the same quantity of Wild-cherry Bark, in coarse powder, by the process of displacement, in the manner directed for Infusion of Yellow Bark." *U. S.* (See *Infusum Cinchonæ Flavæ.*)

This is a peculiarly suitable object for officinal direction, as, in consequence of the volatile nature of one of its active ingredients, and for another reason before stated (see *page* 598), it is better prepared with cold water than in the ordinary mode. The infusion of wild-cherry bark is one of the preparations to which the process of percolation or displacement is well adapted. In this way the virtues of the bark can be more rapidly and thoroughly exhausted than by maceration alone. When properly made, it is beautifully transparent, has the colour of madeira wine, and the agreeable bitterness and peculiar flavour of the bark. The dose is two or three fluidounces three or four times a day, or more frequently when a strong impression is required. W.

INFUSUM QUASSIÆ. *U. S., Lond., Ed., Dub. Infusion of Quassia.*

"Take of Quassia, rasped, *two drachms;* Water [cold] *a pint.* Macerate for twelve hours, and strain." *U. S.*

The *London College* takes *two scruples* of quassia, sliced, and *a pint* [Imperial measure] of boiling distilled water; the *Edinburgh, a drachm* of quassia in chips, and *a pint* [Imp. meas.] of boiling water; both macerate for two hours. The *Dublin College* takes *a drachm* [54·68 grains] of the wood, and *eight* [*fluid*] *ounces and a half* of boiling water, and infuses for an hour.

The proportion of quassia directed in the London and Edinburgh Pharmacopœias is much too small. The London infusion contains the strength of only two grains of quassia in a fluidounce, and the Edinburgh three grains; while the dose of quassia in substance is from twenty grains to a drachm, and of the extract not less than five grains. We, therefore, prefer the proportions directed by our national Pharmacopœia Boiling water may be employed when it is desirable to obtain the preparation quickly; but cold water affords a clearer infusion. The dose is two fluidounces three or four times a day. W.

INFUSUM RHEI. *U. S., Lond., Ed., Dub. Infusion of Rhubarb.*

"Take of Rhubarb, bruised, *a drachm;* Boiling Water *half a pint.* Digest for two hours in a covered vessel, and strain." *U. S.*

"Take of Rhubarb, sliced, *three drachms;* boiling Distilled Water *a pint* [Imperial measure]. Macerate for two hours, in a covered vessel, and strain." *Lond.*

"Take of Rhubarb, bruised into coarse powder, *one ounce;* Spirit of Cinnamon *two fluidounces;* boiling Water *eighteen fluidounces.* Infuse the Rhubarb for twelve hours in the Water, in a covered vessel, add the Spirit, and strain through linen or calico." *Ed.*

"Take of Rhubarb, sliced, *three drachms* [Dublin weight]; boiling Distilled Water *a pint* [Imp. meas.]. Macerate for two hours, in a covered vessel, and strain." *Dub.*

In order that the rhubarb may be exhausted, it should be digested with the water near the fire, at a temperature somewhat less than that of boiling water. It is customary to add some aromatic, such as cardamom, fennel-seed, or nutmeg, which improves the taste of the infusion, and renders it more acceptable to the stomach. One drachm of either of these spices may be digested in connexion with the rhubarb.

This infusion may be given as a gentle laxative, in the dose of one or two fluidounces, every three or four hours, till it operates. It is occasionally used as a vehicle of tonic, antacid, or more active cathartic medicines. The stronger acids and most metallic solutions are incompatible with it. W.

INFUSUM ROSÆ COMPOSITUM. *U. S., Lond.* INFUSUM ROSÆ. *Ed.* INFUSUM ROSÆ ACIDUM. *Dub. Compound Infusion of Roses.*

"Take of Red Roses [dried petals] *half an ounce;* Boiling Water *two pints and a half;* Diluted Sulphuric Acid *three fluidrachms;* Sugar [refined] *an ounce and a half.* Pour the Water upon the Roses in a glass vessel; then add the Acid, and macerate for half an hour; lastly, strain the liquor, and add the Sugar." *U. S.*

The *London College* takes *three drachms* of dried red roses, *a fluidrachm and a half* of diluted sulphuric acid, *six drachms* of sugar, and *a pint* [Imperial measure] of boiling distilled water, and proceeds as above, except that it macerates for two hours instead of half an hour. The *Edinburgh* process corresponds with the London, except that boiling water is used instead of boiling distilled water, the maceration continues only for an hour, and the acid is added after the

maceration instead of before it. The *Dublin College* takes *two drachms* [Dub. weight] of the dried roses, *a fluidrachm* of the diluted acid, and *half a pint* [Imp. meas.] of boiling water; infuses the petals for an hour in the water, strains, and adds the acid.

The red roses serve little other purpose than to impart a fine red colour and a slight astringent flavour to the preparation, which owes its medicinal virtues almost exclusively to the sulphuric acid. It is refrigerant and astringent, and affords a useful and not unpleasant drink in hemorrhages and colliquative sweats. It is much used by British practitioners as a vehicle for saline medicines, particularly sulphate of magnesia, the taste of which it serves to cover. It is also employed as a gargle, usually in connexion with acids, nitre, alum, or tincture of Cayenne pepper. The dose is from two to four fluidounces. W.

INFUSUM SARSAPARILLÆ. *U. S. Infusion of Sarsaparilla.*

"Take of Sarsaparilla, bruised, *an ounce;* Boiling Water *a pint.* Digest for two hours in a covered vessel, and strain.

"This infusion may also be prepared from the same quantity of Sarsaparilla, in coarse powder, by the process of displacement, in the manner directed for Infusion of Peruvian Bark." *U. S.* (See *Infusum Cinchonæ Flavæ.*)

From the experiments of Soubeiran it appears that, by maceration in cold water for twenty-four hours, the active principle of sarsaparilla is extracted as effectually as by infusion in boiling water and digestion for two hours, and that in either case the infusion is stronger than the decoction; but the aqueous preparation which he found to possess most of the sensible properties of the root, was made by infusing the spirituous extract in water. In all his experiments, M. Soubeiran employed the same proportions of the root and of water. (*Journ. de Pharm.*, xvi. 43.) These observations correspond with those long since made by Hancock, and subsequently confirmed by Mr. T. J. Husband, of this city, so far as relates to the greater solvent power of spirit than of water over sarsaparilla. (*Am. Journ. of Pharm.*, xv. 6.) Water does not appear competent completely to exhaust sarsaparilla of its active principle, unless employed in very large proportion. Still the watery preparations made from the root are certainly not without efficacy; and the inference from the experiments of Soubeiran is, that it is of little consequence whether the infusion be made with hot or cold water, supposing time to be allowed in the latter case. It is probable that percolation, as directed by the U. S. Pharmacopœia in the second formula above given, will be found the most efficacious plan. The sarsaparilla should in this case be reduced to powder. From two to four fluidounces of the infusion may be taken three times a day. W.

INFUSUM SASSAFRAS MEDULLÆ. *U. S. Infusion of Sassafras Pith.*

"Take of Sassafras Pith *a drachm;* Water [cold] *a pint.* Macerate for three hours, and strain." *U. S.*

This infusion is much used as an application to the eye in inflammation of the conjunctiva. It may be used as a drink in inflammatory and febrile diseases, particularly inflammations of the mucous passages, *ad libitum.* W.

INFUSUM SENEGÆ. *Ed.* INFUSUM POLYGALÆ. *Dub. Infusion of Seneka.*

"Take of Senega *ten drachms;* boiling Water *one pint* [Imperial measure]. Infuse for four hours in a covered vessel, and strain." *Ed.*

The *Dublin College* digests *half an ounce* [avoirdupois] of the root in *nine* [*fluid*]*ounces* of boiling water, for *an hour*, and strains.

The efficacy of the officinal decoction of seneka has been proved by so long an experience, that we should be cautious in allowing it to be superseded by the

infusion on hypothetical grounds alone. The dose of the preparation is from *one to three fluidounces.* W.

INFUSUM SENNÆ. *U. S., Ed.* INFUSUM SENNÆ COMPOSITUM. *Lond., Dub. Infusion of Senna.*

"Take of Senna *an ounce;* Coriander, bruised, *a drachm;* Boiling Water *a pint.* Macerate for an hour in a covered vessel, and strain." *U. S.*

The *London College* orders *fifteen drachms* of senna, *four scruples* of bruised ginger, and *a pint* [Imperial measure] of boiling distilled water; the *Edinburgh, an ounce and a half* of senna, *four scruples* of ginger, and *a pint* [Imp. meas.] of boiling water; and the *Dublin, half an ounce* [avoirdupois] of senna, *half a drachm* [Dub. weight] of ginger, and *half a pint* [Imp. meas.] of boiling water. All macerate as above directed.

We decidedly prefer the formula of the U. S. Pharmacopœia. The proportions of senna directed by the London and Edinburgh Colleges are unnecessarily large; and coriander is a better addition than ginger to an infusion very often given in inflammatory affections. This infusion deposits, on exposure to the air, a yellowish precipitate, which is said to aggravate its griping tendency; it should, therefore, not be made in large quantities. It is customary to connect with it manna and some one of the saline cathartics, which increase its efficacy and render it less painful in its operation. The following is a good formula for the preparation of senna tea. Take of senna *half an ounce;* sulphate of magnesia, manna, each, *an ounce;* fennel-seed *a drachm;* boiling water *half a pint.* Macerate in a covered vessel till the liquid cools. One-third may be given for a dose, and repeated every four or five hours till it operates. Such a combination as this is called *the black draught* by English writers. The dose of the infusion of the U. S. Pharmacopœia is about four fluidounces.

Off. Prep. Mistura Gentianæ Composita. W.

INFUSUM SENNÆ COMPOSITUM. *Ed. Compound Infusion of Senna.*

"Take of Senna *one drachm;* Tamarinds *one ounce;* Coriander, bruised, *one drachm;* Muscovado [sugar] *half an ounce;* boiling Water *eight fluidounces.* Infuse for four hours, with occasional stirring, in a covered vessel not glazed with lead, and then strain through linen or calico.

"This infusion may be likewise made with twice or thrice the prescribed quantity of senna." *Ed.*

In this infusion, the unpleasant taste of the senna is covered by the acidity of the tamarinds and sweetness of the sugar. It is aperient and refrigerant, and is well adapted to febrile complaints when a laxative operation is desired. The dose is from two to four fluidounces. W.

INFUSUM SERPENTARIÆ. *U. S., Lond., Ed. Infusion of Virginia Snakeroot.*

"Take of Virginia Snakeroot *half an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The *London College* employs *half an ounce* of the root with *a pint* [Imperial measure] of boiling distilled water, and macerates for four hours. The *Edinburgh* process differs from the London only in the use of boiling water instead of boiling distilled water.

This is the ordinary form in which serpentaria is employed. The dose is one or two fluidounces, repeated every two hours in low forms of fever, but less frequently in chronic affections. W.

INFUSUM SIMARUBÆ. *Ed., Dub. Infusion of Simaruba.*

"Take of Simaruba, bruised, *three drachms;* boiling Water *a pint* [Imperial

measure]. Infuse for two hours in a covered vessel, and then strain through linen or calico." *Ed.*

The *Dublin College* infuses *two drachms* [Dublin weight] of the bark with *nine* [*fluid*]*ounces* of boiling water, for an hour, in a covered vessel, and strains.

This preparation is little used in the United States. The dose is two fluidounces. W.

INFUSUM SPIGELIÆ. *U. S.* *Infusion of Pinkroot.*

"Take of Pinkroot *half an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The dose of this infusion, for a child two or three years old, is from four fluidrachms to a fluidounce; for an adult, from four to eight fluidounces, repeated morning and evening. A quantity of senna equal to that of the spigelia is usually added, in order to insure a cathartic effect. W.

INFUSUM TABACI. *U. S.* ENEMA TABACI. *Lond., Ed., Dub.* *Infusion of Tobacco.*

"Take of Tobacco *a drachm;* Boiling Water *a pint.* Macerate for an hour in a covered vessel, and strain." *U. S.*

The *London College* takes *a scruple* of tobacco, and *half a pint* [Imperial measure] of boiling distilled water, macerates for an hour, and strains. The *Edinburgh College* takes from *fifteen* to *thirty grains* of tobacco, and *eight fluidounces* of boiling water, infuses for half an hour, and strains. The *Dublin College* takes *a scruple* [18·22 grains], and *eight* [*fluid*]*ounces* of boiling water, infuses for an hour, and strains.

This is used only in the form of enema in strangulated hernia, obstinate colic, and retention of urine from spasm of the urethra. Only half of the pint of the U. S. infusion should be employed at once; and, if this should not produce relaxation in half an hour, the remainder may be injected. Fatal consequences have resulted from too free a use of tobacco in this way. W.

INFUSUM TARAXACI. *U. S.* *Infusion of Dandelion.*

"Take of Dandelion, bruised, *two ounces;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

This has been substituted in the U. S. Pharmacopœia for the decoction. The dose is a wineglassful two or three times a day, or oftener. W.

INFUSUM ULMI. *U. S.* *Infusion of Slippery Elm Bark.*

"Take of Slippery Elm Bark, sliced and bruised, *an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

This infusion may be used *ad libitum* as a demulcent and nutritious drink in catarrhal and nephritic diseases, and in inflammatory affections of the intestinal mucous membrane. W.

INFUSUM VALERIANÆ. *U. S., Lond., Dub.* *Infusion of Valerian.*

"Take of Valerian *half an ounce;* Boiling Water *a pint.* Macerate for an hour in a covered vessel, and strain." *U. S.*

The *London College* takes *half an ounce* of Valerian, and *a pint* [Imperial measure] of boiling distilled water, macerates for half an hour in a covered vessel, and strains. The *Dublin College* takes *two drachms* [Dub. weight] of valerian, and *nine* [*fluid*]*ounces* of boiling water, digests for an hour, and strains.

The dose of this infusion is two fluidounces, repeated three or four times a day, or more frequently. W.

INFUSUM ZINGIBERIS. *U. S.* *Infusion of Ginger.*

"Take of Ginger, bruised, *half an ounce;* Boiling Water *a pint.* Macerate for two hours in a covered vessel, and strain." *U. S.*

The dose of this infusion is two fluidounces. W.

IODINIUM.

Preparations of Iodine.

IODINIUM PURUM. *Dub. Pure Iodine.*

"Take of Iodine of Commerce *any convenient quantity.* Introduce it into a deep porcelain capsule of a circular shape, and, having covered this as accurately as possible with a glass matrass filled with cold water, apply to the capsule a water heat for the space of twenty minutes, and then, withdrawing the heat, permit the capsule to cool. Should the sublimate attached to the bottom of the matrass include acicular prisms of a white colour and pungent odour, let it be scraped off with a glass rod, and rejected. The matrass being now returned to its previous position, a gentle and steady heat (that of a gas-lamp answers well) is to be applied, so as to sublime the entire of the iodine. Upon now lifting off the matrass, the purified product will be found attached to its bottom. When separated, it should be immediately enclosed in a bottle furnished with an accurately ground stopper." *Dub.*

The Edinburgh College does not recognise purified iodine under a separate name, but gives the following directions for its purification.

"Iodine, as obtained in commerce, being almost always adulterated with variable proportions of water, and being consequently unfit for making pharmaceutical preparations of fixed and uniform strength, it must be dried by being placed in a shallow basin of earthenware in a small confined space of air with ten or twelve times its weight of fresh-burnt lime, till it scarcely adheres to the inside of a dry bottle." *Ed.*

In the Dublin process for the purification of iodine, a short preliminary sublimation by the heat of a water-bath is ordered, in which the bottom of a glass matrass filled with cold water is the refrigerator. The object of this is to separate any iodide of cyanogen that may happen to be present. This impurity is sometimes present in considerable amount. Klobach obtained from eighty pounds of commercial iodine, twelve ounces of this iodide, which is in the proportion of nearly one per cent. (*Chem. Gaz.*, April 15, 1850.) If the matrass, upon its removal, should have attached to its bottom white acicular crystals, these will consist of the iodide referred to, and must be rejected. The matrass having been replaced, heat is again applied until the whole of the iodine has sublimed, and attached itself to the cool bottom of the matrass. The Edinburgh process for purifying iodine is merely intended to separate water by the drying influence of quicklime. Water has sometimes been found to the extent of fifteen or twenty per cent. Its amount may be estimated by the method of M. Bolley, which consists in rubbing together, until the smell of iodine disappears, thirty grains of iodine with about two hundred and forty grains of mercury, in a weighed small porcelain dish, using a weighed small agate pestle. When complete combination has been effected, the whole is placed in a water-bath to dissipate the water. The loss of weight gives the amount of water in the iodine. (*Chem. Gaz.*, Mar. 15, 1853, p. 118.) The presence of water is not otherwise injurious than as it renders all the preparations of iodine weaker than they should be.

The U. S. and London Pharmacopœias give no directions for purifying iodine; but the iodine recognised is the pure substance, and not the commercial iodine, unless this should happen to be pure. The properties and tests of pure iodine have been given under the head of *Iodinium* in the first part of this work.

Off. Prep. Arsenici et Hydrargyri Hydriodatis Liquor; Ferri Iodidum; Hydrargyri Iodidum Viride; Potassii Iodidi Liquor Compositus; Potassii Iodidum; Sulphur Iodatum; Syrupus Ferri Iodidi; Tinctura Iodinii Composita; Unguentum Iodinii Compositum. B.

LIQUOR IODINII COMPOSITUS. *U. S.* IODINEI LIQUOR COMPOSITUS. *Ed.* *Compound Solution of Iodine.*

"Take of Iodine *six drachms;* Iodide of Potassium *an ounce and a half;* Distilled Water *a pint.* Dissolve the Iodine and Iodide of Potassium in the Water." *U. S.*

"Take of Iodine *two drachms;* Iodide of Potassium *an ounce;* Distilled Water *sixteen fluidounces* [Imp. meas.]. Dissolve the Iodide and Iodine in the Water with gentle heat and agitation." *Ed.*

In these solutions iodine is dissolved in water with the assistance of iodide of potassium. Iodine dissolves sparingly in water, but freely in a solution of that salt. In using iodide of potassium to render iodine more soluble in water, the iodide is generally taken in a quantity twice the weight of the iodine; and this is the proportion adopted in the U. S. formula. The *U. S.* solution corresponds in strength with Lugol's *concentrated* solution of iodine with iodide of potassium, and is intended to facilitate the administration of the combination in drops. The *Edinburgh* preparation is a weaker form of the same concentrated solution of iodine, in which the iodide of potassium is taken in a quantity four times the weight of the iodine, instead of twice its weight, the usual proportion adopted. On the assumption that 16 Imperial fluidounces are equal to the wine pint, and they are only 5 fluidrachms less, it will be found, on comparing the formulæ, that the Edinburgh solution is one-third as strong in iodine, and two-thirds as strong in iodide of potassium as that of the U. S. Pharmacopœia. The medicinal properties of these solutions depend mainly on the free iodine contained in them, by which their dose must be regulated, and not by the iodide of potassium. The dose of the U. S. solution is six drops, containing about a quarter of a grain of iodine, three times a day, given in four tablespoonfuls of sweetened water, and gradually increased. For children the dose to begin with is two drops. (See *page* 411.) The Edinburgh solution may be given in doses about three times as large. B.

LINIMENTA.

Liniments.

These are preparations intended for external use, of such a consistence as to render them conveniently applicable to the skin by gentle friction with the hand. They are usually thicker than water, but thinner than the ointments, and are always liquid at the temperature of the body. W.

LINIMENTUM ÆRUGINIS. *Lond.* *Liniment of Verdigris.*

"Take of Verdigris [Subacetate of Copper], in powder, *an ounce;* Vinegar *seven fluidounces;* Honey *fourteen ounces.* Dissolve the Verdigris in the Vinegar, and strain through linen; then gradually add the Honey, and boil down to the proper consistence." *Lond.*

It sometimes happens during the boiling of the acetic solution of the verdigris, that a red deposit rapidly forms, consisting of the red or suboxide of copper; and that, at the end of the process, little or none of the metallic salt remains in the preparation. This happens especially when granular honey is employed. (Harley, *Pharm. Journ. and Trans.*, xi. 357.) The change is owing to the decomposition of the oxide of copper by the grape sugar of the honey, converting it into the suboxide. The inference is that, in making the preparation, so as to fulfil the intentions of the original prescription, fresh liquid honey should be employed, which contains comparatively little glucose.

This is an external stimulant and escharotic, and was formerly called *Mel Ægyptiacum.* It is employed, either undiluted, or mixed with some mild oint-

ment, to destroy fungous granulations, or to repress their growth. In the latter state, it is a useful stimulant to flabby, indolent, and ill-conditioned ulcers, and, largely diluted with water, has been used as a gargle in venereal ulcerations of the mouth and throat. It is sometimes also applied undiluted to such ulcers in the fauces, by means of a camel's-hair brush. W.

LINIMENTUM AMMONIÆ. *U. S., Lond., Ed., Dub. Liniment of Ammonia. Volatile Liniment.*

"Take of Solution of Ammonia *a fluidounce;* Olive Oil *two fluidounces.* Mix them." *U. S.*

The *London* and *Edinburgh* processes agree with the above. The *Dublin College* directs *one fluidounce* of its solution of ammonia, and *three fluidounces* of olive oil.

The U. S., London, and Edinburgh Pharmacopœias agree at present in the strength of this liniment. In the preparation, the ammonia unites with the oil to form a soap, which is partly dissolved, partly suspended in the water, producing a white, opaque emulsion. The liniment is an excellent rubefacient, frequently employed in inflammatory affections of the throat, catarrhal and other pectoral complaints of children, and in rheumatic pains. It is applied by rubbing it gently upon the skin, or placing a piece of flannel saturated with it over the affected part. Should it occasion too much inflammation, it must be diluted with oil. W.

LINIMENTUM AMMONIÆ COMPOSITUM. *Ed. Compound Liniment of Ammonia.*

"Take of Stronger Aqua Ammoniæ (D. 0·880) [Stronger Solution of Ammonia] *five fluidounces;* Tincture of Camphor *two fluidounces;* Spirit of Rosemary *one fluidounce.* Mix them well together. This liniment may be also made weaker for some purposes with *three fluidounces* of Tincture of Camphor and *two* of Spirit of Rosemary." *Ed.*

This liniment is a very close imitation of Dr. Granville's *counter-irritant lotion.* Like that, it is of two strengths; the stronger containing five-eighths of its bulk of the ammoniacal solution, the weaker only five-tenths. They are nothing more than dilutions in different degrees of the officinal *Liquor Ammoniæ Fortior*, which is itself too powerful for convenient use. The tincture of camphor and spirit of rosemary can scarcely exercise, in this case, any peculiar therapeutical influence. These preparations are employed as prompt and powerful rubefacients, vesicatories, or escharotics, in various neuralgic, gouty, rheumatic, spasmodic, and inflammatory affections, in which strong and speedy counter-irritation is indicated. When mere rubefaction is desired, the weaker lotion may be used; and even for blistering or cauterizing, unless a very prompt effect is necessary. In the latter case the stronger lotion should be resorted to. They are applied by means of linen folded several times, or a thick piece of flannel saturated with the liniment. A convenient mode is to fill the wooden cover of a large pill or ointment box, an inch or two in diameter, with patent lint, saturate this with the liquid, and press it upon the part. The ammonia is thus prevented from escaping, and a definite boundary given to the inflammation. The application will generally produce rubefaction in from one to six or eight minutes, vesication in from three to ten minutes, and a caustic effect in a somewhat longer period. W.

LINIMENTUM AMMONIÆ SESQUICARBONATIS. *Lond. Liniment of Sesquicarbonate of Ammonia.*

"Take of Solution of Sesquicarbonate of Ammonia *a fluidounce;* Olive Oil *three fluidounces.* Shake them together until they are mixed." *Lond.*

In this, as in the liniment of ammonia, a liquid soap is formed; but the union between the oil and alkali is less perfect, and after a short time the soapy matter separates from the water. The preparation is therefore less elegant; and the end which it was intended to answer, of affording a milder rubefacient, may be obtained by diluting the liniment of ammonia with olive oil. W.

LINIMENTUM CALCIS. *U. S., Lond., Ed., Dub. Lime Liniment.*

"Take of Lime-water, Flaxseed Oil, each, *two fluidounces.* Mix them." *U. S.*

The *London College* directs *ten fluidounces*, each, of lime-water and olive oil; the *Dublin*, *two fluidounces*, each, of the same ingredients; the *Edinburgh*, *equal measures* of lime-water and flaxseed oil.

The lime forms a soap with the oil, of which there is a great excess, that separates upon standing. Olive oil, as directed by the London and Dublin Colleges, is often substituted for that of flaxseed; but possesses no other advantage than that of having a less unpleasant odour. This is a very useful liniment in recent burns and scalds. It is sometimes called *Carron oil*, from having been much employed at the iron works of that name in Scotland. It is recommended to be applied upon carded cotton. W.

LINIMENTUM CAMPHORÆ. *U. S., Lond., Ed., Dub. Camphor Liniment.*

"Take of Camphor *half an ounce;* Olive Oil *two fluidounces.* Dissolve the Camphor in the Oil." *U. S.*

The *London* and *Edinburgh Colleges* direct *an ounce* of camphor, and *four fluidounces* of olive oil; the *Dublin College*, *an avoirdupois ounce* of the former and *four fluidounces* of the latter.

This is employed as an anodyne embrocation in sprains, bruises, rheumatic or gouty affections of the joints, and other local pains. It is also supposed to have a discutient effect when rubbed upon glandular swellings.

Mr. Wm. B. Price, of Burlington, N. J., proposes a modification of this liniment, founded on the solvent power of chloroform over camphor, whereby the preparation is made stronger with camphor, and acquires also additional anodyne influence from the chloroform. The proposed liniment consists of *an ounce and a half* of camphor, *two fluidrachms* of chloroform, and *two fluidounces* of olive oil. It is useful in rheumatic and neuralgic pains. (*N. J. Med. Rep.*, ii. 217.)

Off. Prep. Linimentum Hydrargyri Compositum. W.

LINIMENTUM CAMPHORÆ COMPOSITUM. *Lond., Dub. Compound Camphor Liniment.*

"Take of Camphor *two ounces and a half;* Oil of Lavender *a fluidrachm;* Rectified Spirit *seventeen fluidounces;* Stronger Solution of Ammonia *three fluidounces.* Dissolve the Camphor and Oil in the Spirit; then add the Ammonia, and agitate together till they are mixed." *Lond.*

The *Dublin College* takes *five ounces* [avoirdupois] of camphor; *two fluidrachms* of oil of lavender, *a pint and a half* [Imp. meas.] of rectified spirit, and *half a pint* [Imp. meas.] of stronger solution of ammonia, and proceeds as above.

This preparation deserves a place rather among the spirits or tinctures than the liniments. It is used as a rubefacient and at the same time anodyne embrocation in local pains, particularly of a rheumatic character. W.

LINIMENTUM CANTHARIDIS. *U. S., Dub. Liniment of Spanish Flies.*

"Take of Spanish Flies, in powder, *an ounce;* Oil of Turpentine *half a pint.* Digest for three hours, in a close vessel, by means of a water-bath, and strain." *U. S.*

"Take of Spanish Flies, in fine powder, *three ounces* [avoirdupois]; Olive Oil *twelve fluidounces.* Digest the Flies in the Oil for three hours, in a steam or

water bath, and strain through flannel; express the residuum and strain the oil thus obtained; finally mix both products." *Dub.*

Oil of turpentine dissolves, especially with the aid of heat, the active principle of cantharides, and, when impregnated with it, acquires in addition to its own rubefacient properties those of a powerful epispastic. The U. S. liniment was introduced into notice by the late Dr. Joseph Hartshorne, of Philadelphia, who employed it with advantage as an external stimulant in the prostrate states of typhus fever. Caution, however, is necessary in its use, both to graduate its strength to the circumstances of the case, and not to apply it very extensively, lest it may produce troublesome, if not dangerous vesication. If too powerful, it may be diluted with olive or linseed oil. The Dublin preparation, in which olive oil is the solvent, exercises only the properties of the flies.

Off. Prep. Unguentum Cantharidis. W.

LINIMENTUM CROTONIS. *Dub. Croton Oil Liniment.*

"Take of Croton Oil *one fluidounce;* Oil of Turpentine *seven fluidounces.* Mix them with agitation." *Dub.*

This is a rubefacient and pustulating preparation, operating speedily in the former capacity through the oil of turpentine, and more slowly in the latter through the croton oil. From ten to thirty minims or more may be rubbed upon a limited surface, and repeated twice a day or oftener till an eruption is produced. W.

LINIMENTUM HYDRARGYRI. *Lond.* LINIMENTUM HYDRARGYRI COMPOSITUM. *Dub. Mercurial Liniment.*

"Take of Mercurial Ointment, Lard, each, *four ounces;* Camphor *an ounce;* Rectified Spirit *a fluidrachm;* Solution of Ammonia *four fluidounces.* Rub the Camphor first with the Spirit, then with the Lard and Ointment; lastly, add gradually the Solution of Ammonia, and mix the whole." *Lond.*

"Take of Ointment of Mercury *one ounce* [avoirdupois]; Camphor Liniment, Solution of Ammonia, of each, *one fluidounce.* Melt the Ointment in the Liniment, with a gentle heat, then add the Ammonia, and mix them with agitation." *Dub.*

This is a stimulating liniment, employed for the discussion of chronic glandular enlargements, swellings of the joints, and venereal tumours, and to promote the absorption of collections of fluid. It is said to be more apt to salivate than mercurial ointment. One drachm of it may be rubbed upon the affected part night and morning. W.

LINIMENTUM OPII. *Lond., Ed., Dub. Liniment of Opium. Anodyne Liniment.*

"Take of Castile Soap *six ounces;* Opium *an ounce and a half;* Camphor *three ounces;* Oil of Rosemary *six fluidrachms;* Rectified Spirit *two pints* [Imperial measure]. Macerate the Soap and Opium in the Spirit for three days; filter, add the Oil and Camphor, and agitate briskly." *Ed.*

The *Lond.* and *Dub. Colleges* mix their liniment of soap (*Tinctura Saponis Camphorata, U. S.*) with tincture of opium; the former, in the proportion of *six* measures of the liniment to *two* of the tincture, the latter, in equal measures.

This is commonly called *anodyne liniment*, and is employed as an anodyne and gently rubefacient embrocation in sprains, bruises, and rheumatic and gouty pains. It differs from *camphorated tincture of soap* only in containing opium, and is most conveniently prepared by extemporaneously mixing that tincture with laudanum, as directed by the London and Dublin Colleges. W.

LINIMENTUM SAPONIS CAMPHORATUM. *U. S. Camphorated Soap Liniment. Opodeldoc.*

"Take of Common Soap, sliced, *three ounces;* Camphor *an ounce;* Oil of Rosemary, Oil of Origanum, each, *a fluidrachm;* Alcohol *a pint.* Digest the

Soap with the Alcohol, by means of a sand-bath, till it is dissolved; then add the Camphor and Oils, and when they are dissolved, pour the liquor into broad-mouthed bottles. This liniment has, when cold, the consistence of a soft ointment." *U. S.*

This preparation differs from the common soap liniment (*Tinctura Saponis Camphorata, U. S.*) chiefly in being prepared with common white soap, made with animal fat, instead of Castile soap, which is made with olive oil. The former is peculiarly adapted to the purposes of this formula, in consequence of assuming, when its alcoholic solution cools, the consistence characteristic of the liniment. It is customary, after the solution of the soap has been effected, to pour the liquor into small wide-mouthed glass bottles, containing about four fluidounces, in which it concretes into a soft, translucent, uniform, yellowish-white mass. This liniment melts with the heat of the body, and therefore becomes liquid when rubbed on the skin. It is much used, under the name of *opodeldoc*, as an anodyne application in sprains, bruises, and rheumatic pains. W.

LINIMENTUM SIMPLEX. *Ed. Simple Liniment.*

"Take of Olive Oil *four parts;* White Wax *one part.* Dissolve the Wax in the Oil with a gentle heat, and agitate well as the fused mass cools and concretes." *Ed.*

This may be used for keeping the skin soft and smooth in cold weather.

Off. Prep. Unguentum Zinci. W.

LINIMENTUM TEREBINTHINÆ. *U. S., Lond., Dub.* LINIMENTUM TEREBINTHINATUM. *Ed. Liniment of Turpentine.*

"Take of Oil of Turpentine *half a pint;* Resin Cerate *a pound.* Add the Oil of Turpentine to the Cerate previously melted, and mix them." *U. S.*

"Take of Soft Soap *two ounces;* Camphor *an ounce;* Oil of Turpentine *sixteen fluidounces.* Shake them together until they are mixed." *Lond.*

"Take of Resinous Ointment *four ounces;* Oil of Turpentine *five fluidounces;* Camphor *half an ounce.* Melt the ointment, and gradually mix with it the Camphor and Oil, till a uniform liniment be obtained." *Ed.*

"Take of Oil of Turpentine *five fluidounces*; Ointment of Resin *eight ounces* [avoirdupois]. Melt the Ointment, then add the Oil of Turpentine gradually, and stir the mixture until a uniform liniment is obtained." *Dub.*

This preparation, made according to the U. S. and Dublin formulæ, is the liniment originally proposed by Dr. Kentish, and subsequently so highly lauded as a remedy in burns and scalds. It should be applied as soon after the occurrence of the accident as possible, and should be discontinued when the peculiar inflammation excited by the fire is removed. The best mode of application is to cover the burned or scalded surface with pledgets of patent lint saturated with the liniment. It should not be allowed to come in contact with the sound parts. This liniment may also be successfully applied in other cases of cutaneous inflammation requiring stimulation, as in certain conditions of erysipelas. The liniment of the London College is a stimulating mixture, applicable wherever a powerful rubefacient impression is desired. W.

MAGNESIA.

Preparations of Magnesia.

MAGNESIA. *U. S., Lond., Ed., Dub. Magnesia.*

"Take of Carbonate of Magnesia *any quantity.* Put it into an earthen vessel, and expose it to a red heat for two hours, or till the carbonic acid is wholly expelled." *U. S.*

"Take of Carbonate of Magnesia *a pound*. Burn it for two hours in a strong fire." *Lond.*

"Take *any convenient quantity* of Carbonate of Magnesia, expose it in a crucible to a full red heat for two hours, or till the powder, when suspended in water, presents no effervescence on the addition of muriatic acid. Preserve the product in well closed bottles." *Ed.*

"Take of Carbonate of Magnesia *any convenient quantity*. Introduce it into a clay crucible closed loosely by a lid, and let this be exposed to a low red heat as long as a little of the magnesia, taken from the central part of the crucible, when cooled, and dropped into dilute sulphuric acid, continues to give rise to effervescence. Let the product be preserved in well-closed bottles." *Dub.*

By exposure to a red heat, the water and carbonic acid of the carbonate of magnesia are expelled, and the earth is obtained pure. According to Dr. Black, the carbonate loses seven-twelfths of its weight by calcination. Brande says that the loss varies from 50 to 60 per cent., of which from 15 to 20 per cent. is water. About the close of the process the earth exhibits a luminous or phosphorescent appearance, which is said to be a good criterion of its freedom from carbonic acid. (*Duncan.*) A more certain indication, however, is the absence of effervescence when muriatic acid is added to a little of the magnesia, previously mixed with water. It is an error to suppose that a very intense heat is requisite in the calcination. The temperature of ignition is sufficient for the expulsion of the water and carbonic acid, and any increase serves only to render the magnesia harder, denser, less readily soluble in acids, and consequently less useful as a medicine. In order to ensure a pure product, care should be taken that the carbonate employed be free from lime. It should be rubbed to powder before being introduced into the pot or crucible; and, as in consequence of its levity it occupies a very large space, the plan has been proposed of moistening and compressing it in order to reduce its bulk. The magnesia may thus be obtained of greater density; but this is an equivocal recommendation; and the French pharmaceutical writers direct that the vessels employed should be sufficiently large to contain a considerable quantity of the carbonate, without the necessity of resorting to compression. The officinal direction, to keep the magnesia, after it has been prepared, in well stopped glass vessels, is founded on the fact that it absorbs carbonic acid and water from the air; but, as the absorption of the acid goes on very slowly, and that of water does not injure the preparation, the caution is often neglected in the shops. The great bulk of the earth renders its introduction into small bottles inconvenient. A four ounce bottle holds only about an ounce of the purest and finest magnesia. But its specific gravity is greatly increased by trituration; and four times the quantity may be thus got into the same space. (*Journ. of the Phil. Col. of Pharm.*, iii. 198.) The density of *Henry's Magnesia*, which is at least four times that of the earth prepared in the ordinary way, has been ascribed to this cause. It has also been attributed to the influence of intense heat employed in the calcination. The conjecture has even been advanced, that this magnesia, which has enjoyed so great a popularity in England and this country, is prepared by precipitating a solution of sulphate of magnesia by caustic potassa; as the earth afforded by this plan is comparatively dense. It is asserted that the magnesia, prepared from the carbonate procured by precipitating the sulphate of magnesia with carbonate of soda, is softer to the touch, and bears a closer resemblance to Henry's than that prepared from the ordinary carbonate. The fact is explained by the presence in common magnesia of a little sulphate of potassa, from which it is difficult entirely to free it in consequence of the sparing solubility of this salt, and of a portion of silica which originally existed in the carbonate of potassa employed to decompose the sulphate of magnesia, and of which the carbonate of soda is destitute. According to Mr. Richard Phillips, jun., if equivalent quantities of

crystallized sulphate of magnesia and crystallized carbonate of soda be boiled together in water, the mixture evaporated to dryness, the residual salts calcined, and the sulphate of soda dissolved out by water, the magnesia obtained will be dense. (*Am. Journ. of Pharm.*, xvi. 118, from the *Pharm. Journ.*) It is said that if the heat be kept low during calcination the resulting magnesia is light, if high, it is dense. By packing the carbonate closely in the crucible, or by moistening and then compressing it strongly in a cloth, before calcination, a heavy magnesia is obtained. The advantages of Henry's magnesia, independently of the convenience of its less bulk, are its greater softness, and more ready miscibility with water. Preparations similar to Henry's are made by T. J. Husband and by Charles Ellis, of Philadelphia, and sold under the names respectively of *Husband's* and of *Ellis's Magnesia.**

Properties, &c. Magnesia is a very light, white, inodorous powder, of a feeble alkaline taste. Its sp. gr. is commonly stated at 2·3. It was deemed infusible, till melted by means of the compound blowpipe of Dr. Hare. Water sprinkled upon it is absorbed to the extent of about 18 per cent., but with scarcely any increase of temperature. It is almost insoluble, requiring, according to Dr. Fyfe, 5142 parts of water at 60°, and 36,000 parts of boiling water for solution. Water thus impregnated has no effect on vegetable colours; but magnesia itself produces a brown stain by contact with moistened turmeric paper. Magnesia is a metallic oxide, consisting of one equivalent of magnesium 12, and one of oxygen 8=20. *Magnesium* is a white, very brilliant metal, resembling silver, malleable, fusible at a low temperature, and convertible into magnesia by the combined action of air and moisture. There is a hydrate of magnesia consisting of one equiv. of the earth and one of water. Magnesia forms with nitric and muriatic acids, salts which are soluble in alcohol, and very deliquescent. It is precipitated from its saline solutions by the pure alkalies in the state of a hydrate, and by the carbonates of potassa and soda as a carbonate; but it is not precipitated by the alkaline bicarbonates, nor by common carbonate of ammonia.

Magnesia is liable to contain, as impurities, carbonate of magnesia, lime, alumina, silica, and small quantities of the soluble salts employed or produced in the preparation of the carbonate from which it is procured. The presence of carbonate of magnesia is indicated by effervescence when the earth is dissolved

* The three kinds of heavy magnesia sold in our market have been examined by Prof. Procter, with the following results. All are heavier than common magnesia, more readily miscible with water, smoother upon the tongue, and of a less quickly developed taste; but they differ in these respects, Henry's standing first, Husband's second, and Ellis's last. But the two latter are much more readily acted on by acids than Henry's, differing in this respect little from each other. Both, moreover, though less readily miscible with water than Henry's, are longer retained in suspension, and Ellis's exceeds Husband's in this quality. In reference, therefore, to mere facility of administration and to taste, it appears that the imported magnesia has the advantage; but for forming liquid mixtures, and for rapidity of antacid action, the American are preferable. Husband's was found to contain 7 per cent. of combined water; the two others lost at a red heat only seven-tenths of one per cent. (See *Am. Journ. of Pharm.*, xxii. 383.)

Dr. Pereira found light magnesia, under the microscope, to exhibit the same forms observed in the light carbonate, namely, an amorphous portion of a flocculent or granular consistence, and another consisting of fragments of prismatic crystals; while the *heavy magnesia* was homogeneous, exhibiting no traces of crystals, and composed of minute granules more or less cohering into small soft balls or masses. (*Pharm. Journ. and Trans.*, viii. 235.)—*Note to the ninth edition.*

After this sheet had been prepared for the press, we received the number of the *Am. Journ. of Pharm.* for May, 1854, in which is an interesting experimental essay by Mr. T. H. Barr, on the preparation of heavy magnesia. The author, after trying various methods, obtained the best results either by precipitating a hot concentrated solution of sulphate of magnesia with a like solution of carbonate of soda, or by decomposing chloride of magnesium by heat. For more precise information the reader is referred to the paper itself, vol. xxvi. p. 193.—*Note to the tenth edition.*

in muriatic acid. Lime, which is a very frequent impurity, and imparts to the magnesia a more strongly alkaline and more disagreeable taste, is detected by oxalate of ammonia or bicarbonate of potassa. Neither of these salts disturbs a neutral solution of pure magnesia in a dilute acid; but if lime be present, both produce precipitates, the former of oxalate, the latter of carbonate of lime. As magnesia is completely dissolved by muriatic acid, silica and other impurities insoluble in that acid would be left behind. Alumina is indicated by the production of a precipitate, when ammonia is added in excess to a solution of fifty grains of magnesia in a fluidounce of muriatic acid. (*Christison's Dispensatory.*) If the magnesia contain a soluble sulphate or carbonate, from insufficient washing of the carbonate of magnesia, from which it was prepared, chloride of barium will reveal it by producing a precipitate with water digested on the magnesia.

Medical Properties and Uses. Magnesia is antacid and laxative; and is much employed, under the name of *calcined magnesia*, in dyspepsia, sick headache, gout, and other complaints attended with sour stomach and constipation. It is also a favourite remedy in the complaints of children, in which acidity of the primæ viæ is often a prominent symptom. Its antacid properties render it very useful in gravel attended with an excessive secretion of uric acid. Its advantages over carbonate of magnesia are that it may be given in a smaller dose, and does not occasion flatulence. The dose as a laxative is from thirty grains to a drachm; as an antacid merely, or antilithic, from ten to thirty grains twice a day. When it meets with no acid, it is apt to linger in the stomach or bowels, and may in that case be followed by lemonade. It should be administered in water or milk, and should be thoroughly triturated so as to render the mixture uniform. If mixed with less than 14 or 15 times its weight of water, and allowed to stand for a day or two, magnesia is apt to form with the liquid a more or less concrete mass, owing to the production of a hydrate of the earth, and the solidification of a portion of the water. This change does not take place, or at least takes place much less readily, when magnesia already saturated with moisture is employed instead of that freshly calcined. It has been conjectured that anhydrous magnesia might prove injurious in the stomach by solidifying its liquid contents; and the earth which has become saturated with moisture by exposure to a damp air is preferably recommended. (*Journ. de Pharm.*, 3*e sér.* iv. 360, and v. 475.) Freshly precipitated hydrate of magnesia will serve as an antidote to arsenious acid, though less efficient than hydrated sesquioxide of iron. Magnesia is used in the process for preparing veratria.

Off. Prep. Pilulæ Copaibæ; Pulvis Rhei Compositus; Trochisci Magnesiæ.

W.

LIQUOR MAGNESIÆ CITRATIS. *U.S.* *Solution of Citrate of Magnesia.*

"Take of Carbonate of Magnesia *five drachms;* Citric Acid *seven drachms and a half;* Syrup of Citric Acid *two fluidounces:* Water *a sufficient quantity.* Dissolve the Citric Acid in four fluidounces of Water, and add to the solution four drachms of the Carbonate of Magnesia, previously rubbed with three fluidounces of Water. When the reaction has ceased, filter the solution into a strong glass bottle, of the capacity of twelve fluidounces, into which the Syrup of Citric Acid has been previously introduced. Rub the remaining Carbonate of Magnesia with two fluidounces of Water, and pour the mixture into the bottle, which is then to be tightly corked, and secured with twine. Lastly, shake the mixture occasionally until it becomes transparent." *U. S.*

This new officinal of the U. S. Pharmacopœia of 1850 is founded on a preparation proposed by M. Rogé Delabarre, and improved by M. Rabourdin, of Paris. It is an aqueous solution of citrate of magnesia, containing an excess of citric acid, impregnated with carbonic acid, and sweetened with syrup. The ex-

cess of citric acid taken, together with the citric acid in the syrup, amounts to about 14½ grains. Four-fifths of the carbonate of magnesia are dissolved in the citric acid, forming an acid citrate of magnesia, the acidity of which is increased by being filtered upon the syrup of citric acid, contained in the bottle. The filtration serves to separate any gritty impurities which may happen to be contained in the carbonate. The reserved fifth of the carbonate is now rubbed up with water, and added to the bottle, which is then tightly closed with a cork, secured by twine. This last addition of carbonate of magnesia generates a fresh portion of the citrate, with evolution of carbonic acid, which is prevented from escaping from the bottle by its immediate and firm closure. The magnesia, thus added, is not sufficient to neutralize the whole of the free citric acid; so that the preparation, when finished, is still an acid citrate of magnesia. If the portion of carbonate of magnesia used in completing the preparation should be impure, and not all soluble in the citric acid, it will give rise to a sediment in the solution. Any similar insoluble portion, depending upon impurity in the carbonate first dissolved, is removed by the filtration ordered. The dispensing apothecary will be able to judge of the quality of his carbonate of magnesia by the solution of it in the citric acid in the beginning of the process; for, if good, it will entirely dissolve, and filtration will not remove anything The total bulk of the liquid ingredients is eleven fluidounces; but the solution of the solids will increase the total volume to near twelve fluidounces, the capacity of the bottle directed.

Properties, &c. This solution is a transparent liquid, having an agreeable taste, like that of lemonade. Overlooking the slight excess of acid which it contains, the salt present in it may be considered to be the neutral or tribasic citrate, consisting of one eq. of citric acid and three of magnesia. In the recent solution this salt is wholly soluble, but in that which has been kept for some days it undergoes a molecular change, and precipitates as a white granular powder, rendering the solution unfit for medicinal use. This precipitate has been analyzed by Prof. Procter, who finds it to consist of one eq. of citric acid, three of magnesia, and fourteen of water. (*Am. Journ. of Pharm.*, July, 1851.) Various modes have been suggested of obviating the liability of this solution to precipitate upon being kept. Some have used a considerable excess of acid; and a solution made in this way will keep for a longer time. Although it is true that the officinal solution will form a deposit on being kept, yet it must be recollected that it was never intended to be kept. It is strictly an extemporaneous solution, to be made at the time it is ordered. The revisers of the U. S. Pharmacopœia so considered it, and, therefore, ordered a quantity to be made in the formula, equal to a full dose. The formula calls for filtration; and the solution of the second portion of carbonate of magnesia added requires at least half an hour to effect it. To avoid the loss of time thus occasioned, some pharmaceutists use magnesia instead of the carbonate, thus forming a solution which rarely requires filtering, and complete the preparation by adding forty grains of bicarbonate of potassa, instead of the reserved carbonate of magnesia, with the effect of forming a clear solution at once, and of introducing into it a small portion of citrate of potassa. These varations from the formula are not admissible when the U. S. solution is prescribed under its officinal name, or is clearly indicated as the preparation wanted.

Dorvault makes a solid citrate of magnesia which is perfectly and readily soluble, by melting on a sand-bath *one hundred parts* of crystallized citric acid in its water of crystallization, and thoroughly incorporating with it *twenty-nine parts* of calcined magnesia. A pasty mixture is thus formed, which soon hardens, and may be pulverized for use. Citrate of magnesia, thus prepared, is soluble in twice its weight of water. When in saturated solution it soon precipitates as a nearly insoluble hydrate; but when dissolved in eight or ten times its weight of water, it forms a permanent solution. See the report on the solid citrate, made

by E. Parrish and A. Smith, to the Phil. Coll. of Pharmacy (*Am. Journ. of Pharm.*, April, 1852, p. 113), and M. E. Robiquet's paper on lemonades of citrate of magnesia (*Journ. de Pharm.*, April, 1852, p. 295).

Medical Properties. This solution is a cooling cathartic, and operates mildly. It has come into extensive use in Philadelphia, and perhaps other cities in the Union, on account of the facility with which it may be taken. The dose as a full purge is the whole quantity directed in the formula, or twelve fluidounces; as a laxative, half that quantity or less. In relation to this solution, see a paper by Prof. Procter, in the *Am. Journ. of Pharm.* for July, 1851. B.

MELLITA.

Preparations of Honey.

Honey is used in pharmacy chiefly as the vehicle of more active medicines. It is said to have this advantage over syrup, that its preparations are less apt to become candied; but, as it contains principles which disagree with the stomach in many persons, and as its variable consistence prevents the same exact precision in regard to proportion as is attainable with a solution of pure sugar, it is at present little employed. The preparations in which honey and vinegar are combined are called *Oxymels.*

Medicated honeys are of a proper consistence, if, when a small quantity, allowed to cool upon a plate, is divided by the edge of a spoon, the portions do not readily coalesce. A more accurate criterion, however, is their specific gravity, which should be 1·319 (35° B.) at ordinary temperatures, and 1·261 (30° B.) at the boiling point of water. The specific gravity is most readily determined by means of the saccharometer. W.

MEL DESPUMATUM. *U. S.* Mel Depuratum. *Dub. Clarified Honey.*

"Take of Honey *any quantity.* Melt it by means of a water-bath, and then remove the scum." *U. S.*

The *Dublin College* prepares it by melting in a water-bath, and straining while hot through flannel.

Honey, by the heat of the water-bath, becomes so fluid that the wax and other lighter impurities which it contains rise to the surface, and may be skimmed off; while the heavier substances which may have been accidentally or fraudulently added, such as sand or other earth, sink to the bottom.

The following method of clarifying honey has been practised in France. Take of white honey 3000 parts; water 750 parts; carbonate of lime, powdered and washed, 96 parts. Mix them in a suitable vessel, and boil for three minutes, stirring constantly. Then add 96 parts of animal charcoal previously washed, heated to redness, powdered, and sifted, and boil for a few minutes. Lastly, add the whites of two eggs beat up with 500 parts of water, and bring the liquid to the boiling point. Withdraw the vessel from the fire, and, after the mixture has cooled for fifteen minutes, strain it through flannel, and repeat the straining till the liquid passes perfectly clear. Should it not have the proper consistence, it should be concentrated sufficiently by a quick boiling. The use of the carbonate of lime is to saturate any acid in the honey, which might favour the formation of glucose, and thus increase the tendency to granulation. The French Codex simply directs six pounds of white honey to be heated with three pounds of water, skimmed, concentrated to 30° B. while boiling hot, and then strained through flannel.

The following method of clarifying honey is recommended by André von Hirschberg. Boil twenty-five pounds of honey, to which half the quantity of

water has been added, with a pulp obtained by stirring three sheets of white blotting-paper with water, over a slow fire till the pulp is reduced to minute fibres. When the mixture cools, put it into a woollen filtering-bag, previously moistened, and allow the honey to pass. It comes away perfectly clear. The paper pulp may then be washed, and the dark wine-coloured liquid which passes, evaporated by a water-bath to the proper consistence. (*Pharm. Journ. and Trans.*, ix. 543, from *Arch. der Pharm.*)

Honey clarified with carbonate of lime and animal charcoal, as in the first process described, is as clear and colourless as syrup made with sugar, but still retains a peculiar flavour. It is less disposed to ferment than crude honey, and is said not to be so liable to produce griping pain when swallowed.

Off. Prep. Confectio Aromatica; Confectio Opii; Confectio Piperis Nigri; Confectio Rosæ; Confectio Scammonii; Confectio Sulphuris; Confectio Terebinthinæ; Mel Boracis; Mel Rosæ; Oxymel; Oxymel Scillæ; Pilulæ Ferri Carbonatis; Tinctura Opii Camphorata. W.

MEL BORACIS. *Lond., Ed., Dub. Honey of Borax.*

"Take of Borax, in powder, *a drachm;* Honey [Clarified Honey, *Dub.*] *an ounce.* Mix them." *Lond., Ed., Dub.*

This preparation might well be left to extemporaneous prescription. It is used in the thrush of infants, and aphthous ulcerations of the mouth. W.

MEL ROSÆ. *U. S., Lond., Ed. Honey of Roses.*

"Take of Red Roses, in coarse powder, *two ounces;* Clarified Honey *twenty fluidounces;* Boiling Water *twelve fluidounces.* Macerate the Roses in eight fluidounces of boiling Water for four hours, in a glass or earthen vessel; then, with strong pressure, remove as much as possible of the infusion, and set it aside. Macerate the residue in four fluidounces of the boiling Water for half an hour, and again express. Reserving four fluidounces of the first infusion, mix the remainder with the infusion last obtained, add the Honey, and by means of a water-bath evaporate to a pint. Lastly, add the reserved infusion, and strain." *U. S.*

The *London College* macerates *four ounces* of dried red roses in *sixteen fluidounces* of boiling distilled water for two hours; then gently expresses with the hand, and strains. The residue it macerates for a little while in *eight fluidounces* of boiling water, and pours off the liquor. To this it adds the half of the former infusion, and places the other half aside. Lastly, it adds the mixed liquors to the honey, and evaporates by a water-bath, so that upon the admixture of the liquor set aside, the proper consistence may be obtained. The *Edinburgh College*, operating upon the same quantity of roses and honey, infuses the petals for six hours in *two pints and a half* [Imperial measure] of boiling water, strains with expression, allows the impurities to subside, decants the clear liquor, adds the honey, and evaporates in the vapour-bath to the consistence of syrup, removing the scum which forms.

The object in reserving a portion of the first infusion, as in the U. S. and London processes, is to avoid the evaporation of the volatile oil in the concentration of the infusion, and thus to preserve the flavour as well as the astringency of the roses in the preparation. The honey of roses forms a pleasant addition to the gargles employed in inflammation and ulceration of the mouth and throat. W.

OXYMEL. *Lond., Dub. Oxymel.*

"Take of Acetic Acid *seven fluidounces;* Distilled Water *eight fluidounces;* Honey *five pounds.* Add the Acid to the Water, and mix them with the Honey previously heated." *Lond.*

"Take of Clarified Honey *one pound* [avoirdupois]; Acetic Acid of Commerce (sp. gr. 1·044) *three ounces* [avoird]. Mix the Acid with the Honey previously heated." *Dub.*

This mixture of honey and vinegar forms a pleasant addition to gargles, and is sometimes used as a vehicle of expectorant medicines, and to impart flavour to drinks in febrile complaints. W.

OXYMEL SCILLÆ. *U. S., Lond. Oxymel of Squill.*

"Take of Vinegar of Squill *two pints;* Clarified Honey *a pint and a half.* Mix them, and evaporate by means of a water-bath to the proper consistence. The specific gravity of the Oxymel of Squill should be 1·32." *U. S*

The *London College* takes *five pounds* of honey and *two pints and a half* [Imperial measure] of vinegar of squill, evaporates the vinegar with a slow fire to twelve fluidounces, and mixes it with the honey previously heated.

This preparation has the virtues of squill, but is in no respect superior to the syrup. Prepared according to the directions of the London College, it would be very liable to be injured by heat. It is chiefly used as an expectorant in chronic catarrh, humoral asthma, hooping-cough, and generally in those states of the pulmonary organs in which the bronchial tubes are loaded with a viscid mucus of difficult expectoration. The dose is from one to two fluidrachms. In large doses it is emetic, and as such may sometimes be given with advantage in infantile croup and catarrh. W.

MISTURÆ.

Mixtures.

This term should be restricted, in the language of pharmacy, to those preparations in which insoluble substances, whether solid or liquid, are suspended in watery fluids, by the intervention of gum Arabic, sugar, the yolk of eggs, or other viscid matter. When the suspended substance is of an oleaginous nature, the mixture is sometimes called an *emulsion.* The object of these preparations is usually to facilitate the administration, to conceal the taste, or to obviate the nauseating effects of unpleasant medicines; and their perfection depends upon the intimacy with which the ingredients are blended. Some skill and care are requisite for the production of a uniform and perfect mixture. As a general rule, the body to be suspended should be thoroughly mixed by trituration with the substance intended to act as the intermedium, before the watery vehicle is added. In the case of the liquid balsams and oils, if gum Arabic be employed as the intermedium, it should be previously brought to the state of mucilage of the consistence directed in the U. S. Pharmacopœia. The white of eggs has been frequently ordered by physicians as the suspending substance; but it is inferior for this purpose to the yolk, or to gum Arabic. When the white is used it should be well beaten, and incorporated with the oleaginous or balsamic substances before the water is added.* Mixtures are generally the objects of extemporaneous prescription; but a few have been deemed of sufficient importance to merit a place in the Pharmacopœias. They should be prepared only when wanted for use. W.

MISTURA ACACIÆ. *Ed. Gum Arabic Mixture.*

"Take of Mucilage [of gum Arabic] *three fluidounces;* Sweet Almonds *one*

* For some good practical observations upon the preparation of mixtures, the reader is referred to a communication published in the *Journal of the Philadelphia College of Pharmacy*, vol. iv. p. 11, by W. Hodgson, Jun. The proportion of gum and water necessary to make a good emulsion with the fixed oils varies with the oil. Thus, while castor oil requires only two drachms of the gum and three drachms of water to the ounce, most other fixed oils require half their weight of gum, and a weight of water equal to half that of the oil and gum united. These quantities being well rubbed together, any desirable amount of water may afterwards be gradually added, and will readily incorporate with the other ingredients. (Overbeck, *Pharm. Cent. Blatt*, A. D. 1851, p. 95.)

ounce and two drachms; Pure Sugar *five drachms;* Water *two pints* [Imperial measure]. Steep the Almonds in hot water and peel them; beat them to a smooth pulp in an earthenware or marble mortar, first with the Sugar, and then with the Mucilage; add the water gradually, stirring constantly, then strain through linen or calico." *Ed.*

This mixture is used as a demulcent in the dose of one or two fluidounces, or as a vehicle for various medicines in inflammatory affections of the bronchial, alimentary, and urinary mucous membranes. W.

MISTURA ALTHÆÆ. *Ed. Marsh Mallow Mixture.*

"Take of Althæa-root, dried, *four ounces;* Raisins, freed of the seeds, *two ounces;* boiling Water *five pints* [Imperial measure]. Boil down to three pints; strain through linen or calico, and when the sediment has subsided, pour off the clear liquor for use." *Ed.*

This should have been placed by the Edinburgh Pharmacopœia among the decoctions. It is essentially a mucilage flavoured with raisins, and may be used advantageously as a drink, in all cases in which demulcents are indicated. W.

MISTURA AMMONIACI. *U. S., Lond., Dub. Ammoniac Mixture.*

"Take of Ammoniac *two drachms;* Water *half a pint.* Rub the Ammoniac with the Water gradually added, until they are thoroughly mixed." *U. S.*

The *London College* takes *five drachms* of prepared ammoniac, and *a pint* [Imperial measure] of water; the *Dublin, two drachms* [Dublin weight] of ammoniac and *eight fluidounces* of water; both proceed as above, the Dublin directing that the mixture should be strained through muslin.

In this mixture the insoluble part of the ammoniac is suspended by means of the gum, imparting a milky appearance to the preparation, which, from this circumstance, was formerly called *lac ammoniaci* or *milk of ammoniac.* The greater portion of the resin subsides upon standing. The mixture is slightly curdled by acids. The dose is from one to two tablespoonfuls. W.

MISTURA AMYGDALÆ. *U. S., Lond., Dub.* MISTURA AMYGDALARUM. *Ed. Almond Mixture. Almond Emulsion.*

"Take of Sweet Almonds *half an ounce;* Gum Arabic, in powder, *half a drachm;* Sugar *two drachms;* Distilled Water *eight fluidounces.* Macerate the Almonds in water, and, having removed their external coat, beat them with the Gum Arabic and Sugar, in a marble mortar, till they are thoroughly mixed; then rub the mixture with the Distilled Water gradually added, and strain." *U. S.*

"Take of Almond Confection *two ounces and a half;* Distilled Water *a pint* [Imperial measure]. To the Confection, while rubbing it, gradually add the Water till they are mixed; then strain through linen." *Lond.*

"Take of Conserve of Almonds *two ounces;* Water *two pints* [Imp. measure]. Add the Water gradually to the Confection, triturating constantly; and then strain through linen or calico. Or,

"Take of Sweet Almonds *one ounce and two drachms;* Pure Sugar *five drachms;* Mucilage *half a fluidounce;* Water *two pints* [Imp. measure]. Steep the Almonds in hot water and peel them; and proceed as for the Mistura Acaciæ." *Ed.*

"Take of Sweet Almonds *five drachms* [Dub. weight]; Refined Sugar *two drachms* [Dub. weight]; Gum Arabic, in powder, *one drachm* [Dub. weight]; Distilled Water *eight* [*fluid*]*ounces.* Steep the Almonds in hot water for five minutes, and, having removed their external coat, beat them with the Sugar and Gum, in a mortar, into a coarse powder; add the Water gradually, and triturate so as to form a uniform mixture. Finally, strain through muslin." *Dub.*

Of the above modes of preparing the almond emulsion, we prefer those in which the mixture is made directly from the almonds, and not from the confection. This very speedily spoils if kept; and it would be a very unnecessary

complication of the process to prepare it each time that the emulsion might be wanted. The London and first Edinburgh processes are, therefore, objectionable. In the second process of the Edinburgh College, mucilage is employed instead of powdered gum Arabic, but the latter is preferable, as less likely to have undergone change. The preparations, however, of the different Pharmacopœias are essentially the same. The gum Arabic in these formulæ is introduced not so much for its demulcent properties as to assist in the suspension of the insoluble ingredients of the almonds. In the Mistura Acaciæ, described at page 1075, it is the prominent ingredient. The same formula will answer for the preparation of an *emulsion of bitter almonds*, which may be preferred to the present when a slight influence of hydrocyanic acid is desired.

The oleaginous matter of the almonds is suspended in the water by means of their albumen, gum, and sugar, forming a milky emulsion. When the almonds themselves are employed, as in the U. S. process, care should be taken to reduce them to the consistence of a paste previously to the addition of the water; and with each successive portion of fluid a uniform mixture should be formed before another portion is added. Common water, when not very impure, may be properly substituted for the distilled. Great care should be taken to select the almonds perfectly free from rancidity. The mixture is not permanent. Upon standing, the oil rises like thick cream to the surface, and the separation is effected more quickly by heat, alcohol, and the acids, which coagulate the albumen. It has a close analogy to milk in chemical relations as well as in appearance. The preparation, in warm weather, soon becomes sour, and unfit for use.

The almond mixture has a bland taste, and may be used as an agreeable, nutritive demulcent in catarrhal and dysenteric affections, and irritation of the urinary passages. To be of service it must be freely employed. From two to eight fluidounces may be taken at once. It is occasionally employed as the vehicle of less agreeable medicines; but should not be used in connexion with any considerable quantity of tinctures, acidulous salts, or other substances containing an excess of acid. W.

MISTURA ASSAFŒTIDÆ. *U. S. Assafetida Mixture.*

"Take of Assafetida *two drachms;* Water *half a pint.* Rub the Assafetida with the Water gradually added, until they are thoroughly mixed." *U. S.*

This mixture, from its whiteness and opacity, is frequently called *lac assafœtidæ*, or *milk of assafetida.* It is, as a general rule, the best form for the administration of this antispasmodic, being less stimulant than the tincture, and more prompt in its action than the pill. Its excessively disagreeable smell and taste are, however, objections, which induce a frequent preference of the last-mentioned preparation. It is very often employed as an enema. The dose is from one to two tablespoonfuls frequently repeated. From two to four fluidounces may be given by the rectum.* W.

MISTURA CAMPHORÆ CUM MAGNESIÂ. *Ed. Mixture of Camphor with Magnesia.*

"Take of Camphor *ten grains;* Carbonate of Magnesia *twenty-five grains;* Water *six fluidounces.* Triturate the Camphor and Carbonate of Magnesia together, adding the Water gradually." *Ed.*

* *Syrup of Assafetida.* Such a preparation has been proposed by Mr. Richard Petty. He has found the following formula to answer the purpose best. Take of assafetida ℥j, boiling water Oj, sugar ℔ij. Rub the assafetida with a part of the water so as to make a uniform paste, then gradually add the remainder of the water, strain, and add the sugar, heating moderately till it is dissolved. This has a less disagreeable taste than the mixture, and keeps much better, remaining several months without change, while the latter is often altered in a short time. The dose is the same as that of the mixture. (*Am. Journ. of Pharm.*, xxiv. 319.)—*Note to the tenth edition.*

This differs from the *Aqua Camphoræ* of the U. S. Pharmacopœia, in which, though the camphor is dissolved by the intervention of carbonate of magnesia, the latter is afterwards separated by filtration. In the above mixture the carbonate of magnesia is retained; and an anodyne, antacid, and laxative draught is formed, which, though it may sometimes be given with advantage, hardly deserves a place among the officinal preparations.

Camphor, with a view to its full effects upon the system, is frequently given in the form of liquid mixture, being suspended in water by various intermedia, as gum Arabic, the yolk of eggs, &c. The addition of resinous substances, as myrrh for example, softens the camphor, and enables it to be more readily retained in suspension. Chloroform, by its solvent power over camphor, answers this purpose admirably. (See *Camphora*, p. 164.) Before mixing camphor with the suspending substance, it should be powdered with the aid of a few drops of alcohol. A good plan also is to rub it first with half its weight of olive oil, then with sugar and gum Arabic, and lastly, with water gradually added. W.

MISTURA CREASOTI. *Ed.* *Creasote Mixture.*

"Take of Creasote and Acetic Acid, of each, *sixteen minims;* Compound Spirit of Juniper and Syrup, of each, *one fluidounce;* Water *fourteen fluidounces.* Mix the Creasote with the Acid, then gradually the Water, and lastly the Syrup and Spirit." *Ed.*

The dose of this mixture is a fluidounce, containing a minim of creasote.

MISTURA CRETÆ. *U. S., Lond., Ed., Dub.* *Chalk Mixture.*

"Take of Prepared Chalk *half an ounce;* Sugar [refined], Gum Arabic, in powder, each, *two drachms;* Cinnamon Water, Water, each, *four fluidounces.* Rub them together till they are thoroughly mixed." *U. S.*

The *London College* orders *half an ounce* of prepared chalk, *three drachms* of sugar, *a fluidounce and a half* of mixture (mucilage) of gum Arabic, and *eighteen fluidounces* of cinnamon water. The *Edinburgh College* takes *ten drachms* of prepared chalk, *five drachms* of pure sugar, *three fluidounces* of mucilage of gum Arabic, *two ounces* (fluidounces) of spirit of cinnamon, and *two Imperial pints* of water; rubs the chalk, mucilage, and sugar together, and then adds gradually the water and spirit of cinnamon. The *Dublin College* rubs *two drachms* [Dub. weight] of prepared chalk with *seven fluidounces* of cinnamon water, then adds *half a fluidounce,* each, of mucilage of gum Arabic and simple syrup, and mixes.

This mixture is a convenient form for administering chalk, and is much employed in looseness of the bowels accompanied with acidity. Laudanum and kino or catechu are very often added to increase its astringency. The dose is a tablespoonful frequently repeated. W.

MISTURA FERRI AROMATICA. *Dub.* *Aromatic Mixture of Iron.*

"Take of Peruvian Bark (crown or pale), in powder, *one ounce;* Calumba Root, in coarse powder, *three drachms;* Cloves, bruised, *two drachms;* Filings of Iron, separated by a magnet, *half an ounce.* Digest for three days in a covered vessel, with occasional agitation, with as much Peppermint Water as will give *twelve* [*fluid*]*ounces* of a filtered product, and then add, of Compound Tincture of Cardamom *three* [*fluid*] *ounces;* Tincture of Orange Peel *three* [*fluid*] *drachms.* This mixture should be kept in a well stopped bottle." *Dub.* The weights used here are the avoirdupois, with the Dublin divisions.

This is an aromatic infusion of Peruvian bark and columbo, and has not the slightest claim to the title given it in the Pharmacopœia; as it contains but a very small proportion of iron, and that in a state of solution, not of mixture. In consequence of the action of some of the vegetable principles upon the filings,

enough of the metal is taken up to impart a greenish-black colour to the liquor; but the quantity is not appreciable, as the filings seem to be scarcely diminished by the process. The preparation may be given as a tonic in the dose of one or two fluidounces. W.

MISTURA FERRI COMPOSITA. *U. S., Lond., Ed., Dub. Compound Mixture of Iron.*

"Take of Myrrh *a drachm;* Carbonate of Potassa *twenty-five grains;* Sulphate of Iron, in powder, *a scruple;* Spirit of Lavender *half a fluidounce;* Sugar [refined] *a drachm;* Rose Water *seven fluidounces and a half.* Rub the Myrrh with the Rose Water gradually added; then mix with these the Spirit of Lavender, Sugar, and Carbonate of Potassa, and, lastly, the Sulphate of Iron. Pour the mixture immediately into a glass bottle, which is to be well stopped." *U. S.*

"Take of Myrrh, in powder, *two drachms;* Carbonate of Potassa *a drachm;* Rose Water *eighteen fluidounces* [Imperial measure]; Sulphate of Iron, in powder, *two scruples and a half;* Spirit of Nutmeg *a fluidounce;* Sugar *two drachms.* Rub the Myrrh with the Spirit and Carbonate; and to these, while rubbing, add first the Rose Water with the Sugar, and then the Sulphate. Put the Mixture immediately into a glass vessel, and stop it." *Lond.*

The *Edinburgh* process differs from the London only in using the myrrh bruised, and the sulphate of iron in coarse powder. The *Dublin College* takes *a drachm* of myrrh, *half a drachm* of pure carbonate of potassa, *a fluidrachm* of essence of nutmeg, *eight fluidounces* of rose water, *a drachm* of refined sugar, and *half a drachm* of sulphate of iron, *using the Dublin weights;* rubs the myrrh, carbonate, and essence with seven fluidounces of the rose water; then adds the sulphate dissolved in the remaining fluidounce of rose water, and puts the mixture into a bottle, to be tightly corked.

This is very nearly the same with the celebrated tonic or antihectic myrrh mixture of Dr. Griffith. The sulphate of iron is decomposed by the carbonate of potassa, with the production of sulphate of potassa and carbonate of protoxide of iron; while the excess of the alkaline carbonate forms a saponaceous compound with the myrrh. The mixture is at first of a greenish colour, which it loses upon exposure to the air, in consequence of the conversion of the protoxide of iron of the carbonate into the red or sesquioxide. It may, however, be kept for some time without change, if the vessel in which it is contained be well closed; but the best plan is to prepare it only when it is wanted for use. The sugar contained in it probably contributes somewhat to retard the further oxidation of the protoxide of iron, and if considerably increased in amount would act still more efficiently. The finest pieces of myrrh in lump should be selected, and rubbed down for the occasion with a little of the rose water; as the powdered myrrh of the shops is often impure, and does not make a good mixture.

This mixture is a good tonic in debility of the digestive organs, especially when attended with derangement of the menstrual function. Hence it is used with advantage in chlorosis and hysterical affections. It has been also much employed in the hectic fever of phthisis and chronic catarrh. It is contraindicated by the existence of inflammation of the gastric mucous membrane. The dose is one or two fluidounces two or three times a day. W.

MISTURA GENTIANÆ COMPOSITA. *Lond. Compound Mixture of Gentian.*

"Take of Compound Infusion of Gentian *twelve fluidounces;* Compound Infusion of Senna *six fluidounces;* Compound Tincture of Cardamom *two fluidounces.* Mix them." *Lond.*

A tonic and cathartic preparation adapted to dyspepsia and constipation. The dose is one or two fluidounces. W.

MISTURA GLYCYRRHIZÆ COMPOSITA. *U. S. Compound Mixture of Liquorice. Brown Mixture.*

"Take of Liquorice [extract], in powder, Gum Arabic, in powder, Sugar, each, *half an ounce;* Camphorated Tincture of Opium *two fluidounces;* Antimonial Wine *a fluidounce;* Spirit of Nitric Ether *half a fluidounce;* Water *twelve fluidounces.* Rub the Liquorice, Gum Arabic, and Sugar with the Water gradually poured upon them; then add the other ingredients, and mix." *U. S.*

This is an exceedingly popular cough mixture, which was made officinal in the U. S. Pharmacopœia of 1850. The spirit of nitric ether is probably useful by somewhat retarding decomposition. The preparation is applicable to the advanced stages of catarrhal affections, after expectoration has become established. The dose is a tablespoonful for an adult; a teaspoonful for a child two years old. It should be well shaken when administered. W.

MISTURA GUAIACI. *Lond., Ed. Guaiac Mixture.*

"Take of Guaiac, in powder, *three drachms;* Sugar *half an ounce;* Gum Arabic, in powder, *two drachms;* Cinnamon Water *a pint* [Imperial measure]. Rub the Sugar with the Guaiac and Gum Arabic, and to these, while rubbing, add gradually the Cinnamon Water." *Lond.*

The *Edinburgh* process differs only in using *half a fluidounce* of mucilage, instead of the powdered gum, and *half a fluidounce* less of cinnamon water.

For the changes of colour which the guaiac in this mixture undergoes, and produces in other substances, see *Guaiaci Resina*, p. 377. From one to three tablespoonfuls may be given for a dose, and repeated two or three times a day, or more frequently. W.

MISTURA SCAMMONII. *Ed. Scammony Mixture.*

"Take of Resin of Scammony *seven grains;* unskimmed Milk *three fluidounces.* Triturate the Resin with a little of the Milk, and gradually with the rest of it till a uniform emulsion is formed." *Ed.*

This Edinburgh officinal is an imitation of a mixture recommended by Planche. The resin of scammony mixes admirably with the vehicle, and forms an emulsion scarcely distinguishable in appearance or taste from rich milk. Of course, it should be prepared only when wanted for immediate use. The whole is to be taken for a dose. W.

MISTURA SPIRITÛS VINI GALLICI. *Lond. Brandy Mixture.*

"Take of Brandy, Cinnamon Water, each *four fluidounces;* the yolks of *two* Eggs; Sugar [refined] *half an ounce;* Oil of Cinnamon *two minims.* Mix them." *Lond.*

A stimulant and nutritive draught, applicable to the sinking stage of low forms of fever, but scarcely entitled to a place in the Pharmacopœia. W.

MORPHIA.

Preparations of Morphia.

MORPHIA. *U. S., Dub. Morphia.*

"Take of Opium, sliced, *a pound;* Solution of Ammonia *six fluidounces;* Distilled Water, Alcohol, Animal Charcoal, each, *a sufficient quantity.* Macerate the Opium with four pints of Distilled Water for twenty-four hours, and, having worked it with the hand, digest for twenty-four hours, and strain. In like manner, macerate the residue twice successively with the same quantity of Distilled Water, and strain. Mix the infusions, evaporate to six pints, and filter; then add first five pints of Alcohol, and afterwards three fluidounces of the Solution

of Ammonia, previously mixed with half a pint of Alcohol. After twenty-four hours, pour in the remainder of the Solution of Ammonia, mixed, as before, with half a pint of Alcohol; and set the liquor aside for twenty-four hours, that crystals may form. To purify these, boil them with two pints of Alcohol till they are dissolved, filter the solution, while hot, through Animal Charcoal, and set it aside to crystallize." *U. S.*

"Take of Turkey Opium, cut into thin slices, *one pound* [avoirdupois]; Distilled Water *six pints* [Imperial measure]; Chloride of Calcium *six drachms* [Dub. weight]; Prepared Animal Charcoal *as much as is sufficient.* Macerate the Opium for twenty-four hours with a quart [two pints, Imp. meas.] of the Water, and decant. Macerate the residuum for twelve hours with a second quart of the Water, decant, and repeat this process with the rest of the water, subjecting the insoluble residuum to strong expression. Let the decanted solutions and expressed liquor be evaporated by a steam or water heat to the bulk of one pint, and then passed through a calico filter. Pour in now the chloride of calcium, first dissolved in four [fluid]ounces of distilled water, and then proceed with the evaporation until the solution is so far concentrated, that upon cooling nearly the whole of it becomes solid. Let this solid matter be enveloped in a couple of folds of strong calico, and subjected to powerful pressure, the dark liquid which exudes being reserved for subsequent use. The squeezed cake is now to be acted on with about half a pint of boiling water, and the whole being thrown upon a paper filter, the precipitate must be well washed. The filtered solution having been evaporated as before, cooled and solidified, the residue is to be again subjected to expression. If the product be not quite white, this process should be repeated a third time, the liquid forced out during expression being always preserved. Let the squeezed cake be dissolved in six [fluid]ounces of boiling water, and, if necessary, cleared by filtration through Prepared Animal Charcoal, the portion of it soaked by the filter being carefully washed out of it; and to the solution thus obtained let Water of Ammonia be added, in slight excess, and let the crystalline precipitate which forms when the liquor has cooled be collected on a paper filter, and washed with cold distilled water until the washings cease to give a precipitate upon being dropped into an acid solution of nitrate of silver. Lastly, let the filter be transferred to a porous brick, in order that the Morphia it contains may become dry.

"The liquids separated by expression from the Muriate of Morphia, in the preceding process, having been diluted with water, so as to occupy the bulk of four [fluid]ounces, and then supersaturated slightly with Ammonia, let the precipitate which forms be collected, after the lapse of six hours, on a filter, and washed with a little cold water. This, if redissolved in dilute muriatic acid, boiled with a little animal charcoal, and filtered, will, upon cooling, afford a crystalline deposit, from which, when pressed, dissolved in water, and supersaturated with ammonia, an additional quantity of morphia will be procured." *Dub.*

These processes will be better understood by a previous acquaintance with the properties and chemical relations of the substance in question.

Morphia crystallizes from alcohol in the form of small, colourless, shining crystals. It is inodorous and bitter. Exposed to a moderate heat, it loses its water of crystallization and the crystalline form, becoming white and opaque. At a higher temperature it melts, forming a yellowish liquid, which becomes white and crystalline upon cooling. Heated in the open air it burns with a bright flame, and at a red heat is wholly dissipated. It is insoluble or nearly so in cold water, soluble in rather less than 100 parts of water at 212°, slightly soluble in cold alcohol, and freely so in boiling alcohol, which deposits it upon cooling. It is dissolved also by the fixed and volatile oils, but very slightly if at all by ether. Its solution restores the blue colour of litmus paper reddened

by acids, and turns the yellow of turmeric to brown. With the acids it forms salts, which are generally soluble, and are decomposed by the alkalies. The solutions of potassa and soda are also capable of dissolving morphia, which is precipitated slowly on exposure to the air, in consequence of the absorption of carbonic acid. Solution of ammonia has to a certain extent the same solvent power; and hence the necessity, in precipitating morphia by this alkali, not to employ it in great excess. Morphia and its salts, by the contact of nitric acid, assume a blood-red colour, which ultimately changes to yellow. When added to a solution of iodic acid, or an acidulous iodate, they redden the liquid and set iodine free. (*Serullas.*) They assume a fine blue colour with the sesquichloride of iron, and the salts of the sesquioxide; at least this is true of morphia, its acetate, and oxalate; and the same effect will be produced by the other salts, if previously decomposed by an alkali. Water, acids, and alkalies, added in large quantity to the blue compound formed, destroy its colour. According to Pelletier, however, there occasionally exists in opium a principle called by him pseudomorphia, which becomes red under the action of nitric acid, and changes the salts of sesquioxide of iron blue, and yet is destitute of poisonous properties; so that the occurrence of these phenomena, in any medico-legal case, cannot be considered as certain evidence of the presence of morphia. (See *Am. Journ. of Pharm.*, viii. 77.) The terchloride of gold precipitates morphia first yellow, then bluish, and lastly violet. (*Larocque* and *Thibierge.*) Morphia is precipitated from its solutions by potassa or soda, and redissolved by an excess of the alkali. Infusions of galls and other vegetable substances containing tannic acid precipitate morphia in the state of a tannate, which is soluble in acetic acid; but, according to Dublanc, the alkali is not precipitated by pure gallic acid. If ammonia be added to a mixture of the solutions of chlorine and morphia, a dark-brown colour is produced, which is destroyed by a further addition of chlorine. The proportion of the ingredients of morphia is somewhat differently given by different writers. According to the most recent authorities, anhydrous morphia consists of one eq. of nitrogen 14, thirty-five of carbon 210, twenty of hydrogen 20, and six of oxygen 48=292, to which in the crystals are added two eqs. of water 18, or about 5·8 per cent.

Various processes for preparing morphia have been employed. In most of them the morphia is extracted from opium by maceration with water either pure or acidulated, is then precipitated by ammonia, and afterwards purified by the agency of alcohol, or by repeated solution in a dilute acid and precipitation.

Sertürner, the discoverer of morphia, made an infusion of opium in distilled water, precipitated the morphia by ammonia in excess, dissolved the precipitate in dilute sulphuric acid, precipitated anew by ammonia, and purified by solution in boiling alcohol, and crystallization.

The process of the French Codex is a modification of that of Sertürner. It is as follows. "Take of opium 1000 parts, solution of ammonia a sufficient quantity. Exhaust the opium, by means of cold water, of all its parts soluble in that menstruum. For that purpose, it is sufficient to treat the opium, four times consecutively, with ten parts of water to one of the drug, provided care be taken to macerate the opium for some hours, and to work it with the hands. Filter the liquors, and evaporate them to a quarter of their volume. Then add sufficient ammonia to render the liquor very sensibly alkaline. Boil for some minutes, always maintaining a slight excess of ammonia. Upon cooling, the morphia, impure and much coloured, will be precipitated in granular crystals, which are to be washed with cold water. Reduce this coloured morphia to powder, macerate it for twelve hours in alcohol of 24° Cartier (sp. gr. about 0·900); then decant the alcoholic liquid; dissolve the residuary morphia, already in great measure deprived of colour by the cold alcohol, in boiling alcohol of 33°

Cartier (sp. gr. about 0·850); add to the solution a little animal charcoal, and filter. Upon cooling, the morphia crystallizes in colourless needles. In this state the morphia always retains some narcotina, to free it from which, boil it with sulphuric ether in a matrass with a long neck surmounted by a refrigerator."

The process of the U. S. Pharmacopœia is an improvement upon the above, and is essentially the same with that of Dr. Edward Staples, published in the *Journal of the Philadelphia College of Pharmacy* (i. 15). Without repeating a description of the process, we shall make such remarks upon its several steps, as appear to us likely to be of practical advantage. The employment of water as the solvent is justified by the almost universal practice. It is true that dilute acetic acid has sometimes been employed, and Vogel states that the product thus obtained is much greater than when water alone is used. But when the opium is properly comminuted, either by being reduced to a coarse powder when dry, or by being finely sliced, in its ordinary state, water alone will be found sufficiently to extract the morphia, by a protracted maceration or digestion in successive portions of water, assisted by kneading, as directed in the Pharmacopœia. The acids have this disadvantage, that they dissolve more of the narcotina than pure water, and thus render the ultimate product more impure; for the narcotina which is originally taken up continues associated with the morphia in all the subsequent steps of the process. It has been proposed to expose the opium to fermentation with water and yeast, in order to facilitate the extraction of the morphia. By this plan M. Blondeau succeeded in procuring more of the alkaline principle than he could obtain by the ordinary mode; and his results were confirmed by the experiments of MM. Robiquet and Guibourt. According to these latter chemists, no alcohol is produced during the fermentation, which appears to act merely by disengaging the morphia from the combinations in which it naturally exists, and which tend to counteract the solvent power of the menstruum. Alcohol was proposed as the solvent by M. Guillermond, but is liable to the objection that it dissolves also the resin, a portion of which is afterwards precipitated with the morphia and embarrasses the process. Much of the resin, however, may be separated by distilling most of the alcohol from the tincture, and then adding water. The resin is precipitated, and the liquor may now be treated in the same manner as the aqueous infusion.* On the whole, however, the officinal mode of extraction will probably be found most satisfactory; and Mohr states that opium thus exhausted yields no more morphia even to muriatic acid; but he recommends that each maceration should be followed by strong expression. The infusion of opium having been prepared, the next object is to decompose the meconate or other salt of morphia contained in it. For this purpose solution of ammonia is added, which seizes the acid, and precipitates the organic alkali; but much colouring matter is thrown down along with the latter, occasioning some trouble to separate it, unless measures are taken to obviate this effect. The object is gained by mixing the infusion with alcohol, previously to the addition of the ammonia, and by employing the

* By a modification of the process of Guillermond, MM. Desmedt have succeeded in extracting all the morphia from opium, perfectly free from narcotina. Of crude opium 60 parts were treated with 240 of alcohol at 71° centigrade (160° F.), and expressed when cold; the residue was then treated in the same manner with 160 parts of alcohol; the liquor was introduced into a bottle well stopped; next day a copious crystallization of narcotina appeared, without the least morphia; the liquid was decanted, and, on the addition of 4 parts of ammonia, furnished a considerable quantity of morphia, free from narcotina. To the mother liquor a little distilled water was added, and the mixture was kept at the temperature of 24° C. In two days an additional quantity of the crystals of morphia was obtained equally free from narcotina. The opium was completely exhausted, and the 60 parts employed furnished 5 parts of morphia. (*Annuaire de Thérap.*, 1852, p. 31.)—*Note to the tenth edition.*

solution of ammonia itself in connexion with alcohol, as directed in the Pharmacopœia. This is the peculiarity and chief merit of the process of Dr. Staples. By the presence of the alcohol in all parts of the liquor, the colouring matter is dissolved as soon as it is separated by the ammonia, and the morphia is thus precipitated in a much purer state. The advantage of adding the ammonia in separate portions is, that the morphia, being thus more slowly disengaged, can be more completely deprived of its impurities by the alcohol of the mixture, than if the whole were liberated at once. It is necessary to be careful that the ammonia be not in great excess; as it has the property, under these circumstances, of dissolving the morphia in some degree, and will therefore lessen the product, while waste is incurred by its own unnecessary consumption. Very little more should be added than is sufficient to saturate the acid present. The solution of ammonia of the shops is often much below the officinal standard, and this should always be attended to in the process. Alcohol is mixed with the ammonia before it is added, in order that every particle of the separated morphia may come in contact with the particles of this fluid, and thus have the opportunity of being deprived of colouring matter. The crystals of morphia obtained by this first operation have a light-yellowish colour, and are much purer than when no alcohol is added to the infusion before the precipitation by ammonia. According to Dr. Staples, opium yields from 10 to 12½ per cent. of these crystals. Their purification by solution in boiling alcohol, is the concluding step of the operation. The liquid, on cooling, deposits the morphia in a crystalline state and nearly free from colour. As cold alcohol retains a portion of the morphia in solution, it should not be employed too largely. Alcohol somewhat reduced by water, is preferable to the highly rectified spirit; as it is less capable of holding the morphia in solution when cold. It is sufficiently strong for the purpose at 25° Baumé (sp. gr. 0·9032). The impure morphia remaining in the alcohol may be obtained by distilling off the latter, and when sufficiently accumulated may be purified by a separate operation. The crystals of morphia may also be purified by solution in dilute sulphuric acid, digestion with animal charcoal deprived of earthy matter, filtration, and precipitation by ammonia. If alcohol be added to the solution previously to the ammonia, the digestion with animal charcoal may be dispensed with, as the alcohol retains the colouring matter. Morphia procured in this way always contains narcotina, from which it may be freed by ether, as directed in the French Codex process, or in some of the modes hereafter to be indicated.

Magnesia was employed by Robiquet instead of ammonia. But his process was soon abandoned; as it was found to occupy more time, to require a greater consumption of alcohol, and to be attended with a greater loss of morphia in consequence of the previous washing, than the processes in which ammonia was employed as the precipitant. For an account of it the reader is referred to former editions of this work.

A process for extracting morphia without the employment of alcohol was devised by MM. Henry, jun., and Plisson. The opium was exhausted by water acidulated with muriatic acid; the resulting solution was sufficiently concentrated, then filtered, and decomposed by ammonia; the precipitate was washed and treated with muriatic acid to saturation; and the muriatic solution was boiled with animal charcoal, filtered, and evaporated to the point of crystallization. The crystals of muriate of morphia thus obtained were pressed, purified by repeated solution and crystallization, and finally decomposed by ammonia. (*Journ. de Chim. Méd.*, Mars, 1828.)

Somewhat similar to this is the process of Gregory, of Edinburgh, by which muriate of morphia is obtained by double decomposition between chloride of calcium and the meconate of morphia of the opium, and the muriate thus ob-

tained is decomposed by ammonia. This process was adopted by the Edinburgh College for the preparation of muriate of morphia; and is imitated by the Dublin College in the elaborate process above given. It will be sufficiently explained under *Muriate of Morphia.*

Mohr has proposed a process founded on the solubility of morphia in water mixed with lime, which he recommends as the shortest and easiest method of procuring the alkali, without the use of alcohol, and without the possibility of contamination from narcotina. Opium is three or four times successively macerated with three parts of water, and each time strongly expressed. The liquors are then added to a boiling-hot milk of lime, containing a quantity of lime equal to about a sixth or a quarter of the opium used; and the mixture is boiled for a few minutes. It is then strained through linen, and the residue washed with boiling water and expressed.* The whole of the narcotina is left behind, as not a trace of it can be discovered in the filtered liquor. The liquor thus obtained is evaporated till reduced to double the weight of the opium, then quickly filtered through paper, and heated to ebullition. Muriate of ammonia is now added to it in the proportion of 1 part to 16 of the opium used; and the morphia is abundantly precipitated. The use of animal charcoal is unnecessary in the process, as the lime acts even more powerfully as a decolorizing agent. The crystallized morphia obtained is somewhat coloured, but may be rendered pure by solution in dilute muriatic acid, boiling with milk of lime, filtration, and precipitation by muriate of ammonia. (*Annal. der Pharm.*, xxxv. 119, and *Am. Journ. of Pharm.*, xiii. 60.)

Various other processes, or modifications of those above described, have been proposed; but, for the preparation of small quantities of morphia by the apothecary, none are probably better adapted than that of the U. S. Pharmacopœia, unless indeed the plan of Mohr, should be found to equal the representations in its favour.

It has been already stated that morphia, obtained in the ordinary manner, contains a considerable proportion of narcotina. It is highly probable that this ingredient exercises no influence, either beneficial or injurious, upon the operation of the morphia; but, as the contrary has been supposed, various methods have been employed for separating it. The simplest and easiest is to submit the mixture to the action of ether, which dissolves the narcotina and leaves the morphia. The agency of acetic acid may also be resorted to. Distilled vinegar, or diluted acetic acid of the same strength, will dissolve the morphia and leave the narcotina, and the former may be recovered from the acetic solution by saturating the acid with ammonia. Another mode is to dissolve the mixed bases in strong acetic acid (of 7° Baume, or sp. gr. 1·0511, for example), and expose the solution to heat. The narcotina is deposited, and the morphia, remaining in solution, may be precipitated by diluting the liquid and adding ammonia. (*Journ. de Pharm.*, xvii. 640.) Wittstock advises one of the following modes. Dissolve the impure morphia in dilute muriatic acid, evaporate to the point of crystallization, and strongly express the crystals, which consist solely of the muriate of morphia, the narcotina being retained in the mother waters:—or saturate the muriatic solution with common salt, which will render the liquor milky, and cause the narcotina to separate after some days; then precipitate the morphia by ammonia:—or pour into the diluted muriatic solution a weak ley of caustic potassa, which, if in slight excess, will dissolve the morphia at the moment of its separation, while the narcotina is precipitated; then immediately filter the liquor, and separate the morphia by neutralizing the alkali. If the potassa is in great excess a small portion of the narcotina is redissolved. (*Berzelius Traité de Chimie.*) Mohr recommends to dissolve the morphia in dilute muriatic acid, and to boil the solution with lime, which throws down the nar-

cotina and holds the morphia dissolved. The liquid being filtered yields the morphia upon the addition of muriate of ammonia. (*Annal. der Pharm.*, xxv. 123.)

The proportion of pure morphia which Turkey opium is capable of affording, varies from nine per cent. or less, to fourteen per cent., according to the quality of the drug; but much less than the least quantity mentioned is often obtained, in consequence of the incomplete exhaustion of the opium, the loss in the process for preparing it, or inferiority in the quality of the drug.

Medical Properties. There can be no doubt that morphia is the chief, if not the exclusive narcotic principle of opium, from which, however, it differs somewhat in its mode of action. Whether the difference arises from the peculiar state of combination in which morphia exists in opium, or from other narcotic principles being associated with it, has not been determined; but the former would seem to be the probable cause, from the circumstance that, long before the discovery of this alkali, preparations of opium were habitually used, in which the properties of the medicine were somewhat similarly modified by the agency of vinegar, lemon-juice, or other vegetable acid. In consequence of its insolubility in water, morphia in its pure state is less certain in its effects than some of its saline compounds; as the mode and degree of its action must, in some measure, depend on the presence or absence of acid in the stomach, and perhaps on the peculiar character of the acid. Its salts are therefore always preferred. The acetate, sulphate, and muriate have been employed. Between these there is a great similarity of action, and what may be said of one, in regard to its therapeutical effects, will equally apply to the others. They have the anodyne, soporific, and diaphoretic properties of opium, but are less stimulant, less disposed to constipate the bowels, and less apt to leave behind them headache, nausea, or other unpleasant effect. They are usually also more acceptable to an irritated stomach, and may be retained, when opium or its tincture would be rejected. They are applicable to all cases where the object is to relieve pain, quiet restlessness, promote sleep, or allay nervous irritation in any shape; but are less efficient than opium in the suppression of morbid discharges, and as stimulants in low forms of disease. We have found them especially useful in the mania arising from intemperance. A great advantage which they possess is the convenience of their external application to blistered surfaces, and the certainty of their effects when thus applied. In cases which do not admit of the internal use of opium or its preparations, the acetate or sulphate of morphia, sprinkled, in triple the ordinary dose, upon a blistered surface denuded of the cuticle, will be found to exercise upon the system all the influence it is capable of exerting when taken into the stomach. Applied in this manner, these salts are peculiarly useful in relieving violent neuralgic pains, and controlling obstinate sickness of the stomach. When intended to act on the system through the medium of the skin, they should be applied preferably to the epigastrium; when to act locally, as near the affected part as possible. When given in doses nearly, but not quite sufficient to produce sleep, they sometimes give rise to a very troublesome condition of the brain, amounting almost to delirium; but this always subsides spontaneously, or vanishes immediately upon the increase of the dose. A liniment of morphia for internal use may be made by dissolving the morphia in a little chloroform, and adding the solution to olive or almond oil. The mixture is homogeneous. The chloroform acts merely as a menstruum, being in too small a quantity to produce its own effects on the system. (*Journ. de Pharm.*, 3*e sér.* xxiv. 358.)

In over-doses, morphia and its salts produce the effects of narcotic poisons, though not perhaps equally with a quantity of opium, equivalent in anodyne effect. The toxicological treatment is precisely the same as in the case of lauda-

num. (See *Opium.*) Strong coffee has been employed with great apparent advantage as an antidote.

As the proportion of acid necessary to neutralize morphia is very small, the dose of the alkali is the same as that of its salts. One-sixth of a grain may be considered about equivalent to a grain of opium of the medium strength.

Off. Prep. Morphiæ Acetas; Morphiæ Murias; Morphiæ Sulphas. W.

MORPHIÆ ACETAS. *U.S., Lond., Ed., Dub. Acetate of Morphia.*

"Take of Morphia, in powder, freed from narcotina by boiling with Ether, *an ounce;* Distilled Water *half a pint;* Acetic Acid *a sufficient quantity.* Mix the Morphia with the Water; then carefully drop in the Acid, constantly stirring, until the Morphia is saturated and dissolved. Evaporate the solution, by means of a water-bath, to the consistence of syrup. Lastly, dry the Acetate with a gentle heat, and rub it into powder." *U. S.*

The *London College* places this salt in the catalogue of Materia Medica.

"Take of Muriate of Morphia *any convenient quantity.* Dissolve it in *fourteen times its weight* of warm Water, and when the solution is cool, add Aqua Ammoniæ gradually and with constant agitation until there is a permanent but faint odour of ammonia in the fluid. Collect the precipitate on a calico filter, wash it moderately with cold water, and dissolve it by means of a slight excess of Pyroligneous Acid [acetic acid, sp. gr. 1·034] *in twelve parts* of warm Water for *every part* of Muriate of Morphia that was used. Concentrate the solution over the vapour-bath and set it aside to crystallize. Drain and squeeze the crystals, and dry them with a gentle heat. More Acetate of Morphia may be obtained on concentrating the mother liquor." *Ed.*

"Take of Morphia, in fine powder, *one ounce* [avoirdupois]; Rectified Spirit *eight fluidounces;* Acetic Acid of Commerce (sp. gr. 1·044) *four fluidrachms and a half,* or *as much as is sufficient.* Pour the Spirit on the Morphia, and, applying heat, gradually add the Acetic Acid until a neutral or slightly acid solution is obtained. Let this be evaporated to the consistence of syrup, by a steam or water heat, and then set by for a few days, until it solidifies." *Dub.*

In all these processes, morphia is saturated with acetic acid; in the U. S. and Dublin it is taken already prepared; in the Edinburgh, it is procured by the decomposition of the muriate by means of ammonia. Acetic acid is employed in preference to vinegar for saturating the morphia; because it can leave no impurity in the resulting salt. In the U. S. process, the solution of the morphia in the water is an indication that it is saturated. A small excess of acid is attended with no inconvenience, as it is subsequently driven off by the heat. Care is required not to employ too much heat in the evaporation; as the acetate is easily decomposed, a portion of the acetic acid escaping, and leaving an equivalent portion of uncombined morphia. With attention to arrest the evaporation at a certain point, the acetate may be obtained in the state of crystals; but the crystallization is attended with some difficulty, and evaporation to dryness is almost universally preferred. Some recommend to dissolve the morphia in boiling alcohol, instead of suspending it in water, previously to the addition of the acetic acid. A less heat is thus required in the evaporation, and impurities in the morphia may often be detected, as they are apt to be insoluble in alcohol. To ascertain, in this case, whether the morphia is saturated, it is necessary to employ litmus paper, the blue colour of which should not be restored, if previously reddened by an acid. Alcohol is employed as the solvent in the Dublin process. If the morphia used in preparing the acetate contain narcotina, it will be best to employ as the solvent distilled vinegar, or diluted acetic acid of the same strength, and to favour its solvent power by heat. Under these circum-

stances it dissolves only the morphia, leaving the narcotina nearly or quite untouched. (Hodgson, *Journ. of the Phil. Col. of Pharm.*, v. 35.)

Acetate of morphia crystallizes in the form of slender needles united in fasciculi. It is readily dissolved by water, and less easily by alcohol. As ordinarily obtained, however, by evaporation to dryness, it is not entirely soluble in water, a portion of it being uncombined morphia. To render it soluble, all that is necessary is to add a little distilled vinegar. The U. S. Pharmacopœia gives the following tests of its character. "From its solution potassa throws down a precipitate which is dissolved by an excess of the alkali. It is affected by heat, nitric acid, and sesquichloride of iron, in the same manner as morphia. When sulphuric acid is added to the salt, acetous vapours are evolved." In addition to these tests, the *London College* refers to the property, possessed by this and other salts, when treated first with chlorine, and then with ammonia, of presenting a brown colour, which disappears on the further addition of chlorine. The *Edinburgh College* gives the following mode of testing its purity: "One hundred measures of a solution of ten grains in half a fluidounce of water and five minims of acetic acid, heated near to 212°, and decomposed by a faint excess of ammonia, yield by agitation a precipitate which in 24 hours occupies 15·5 measures of the liquid."

From an eighth to a quarter of a grain may be given for a dose, and repeated, if necessary, in order to obtain the anodyne and soporific effects of the medicine. One-sixth of a grain is about equivalent to a grain of opium. It may be given in pill or solution. It is frequently employed externally, sprinkled on blistered surfaces, to obtain its effects upon the system.

Off. Prep. Liquor Morphiæ Acetatis. W.

LIQUOR MORPHIÆ ACETATIS. *Lond., Dub. Solution of Acetate of Morphia.*

"Take of Acetate of Morphia *four drachms;* Acetic Acid *fifteen minims;* Distilled Water *a pint* [Imperial measure]; Proof Spirit *half a pint* [Imp. meas.]. Mix and dissolve." *Lond.*

"Take of Acetate of Morphia *eighty-two grains;* Rectified Spirit *five fluidounces;* Distilled Water *fifteen* [*fluid*]*ounces.* Having added the Spirit to the Water, dissolve the Acetate of Morphia in the mixture, and, if the solution is not quite clear, pass it through a paper filter." *Dub.*

The object of the Spirit in these solutions is to aid in their preservation. As the acetate often contains some uncombined morphia, in consequence of the partial escape of acetic acid during the evaporation in preparing it, the London College very properly directs a little acetic acid for its solution. The Dublin College less wisely wastes it by filtration. Unfortunately the solutions of the two Colleges are of unequal strength, the London being about twice as strong as the Dublin. The dose of the London solution is from 7·5 to 15 minims, equivalent to from one-eighth to one-quarter of a grain of the salt; that of the Dublin solution is from 15 to 30 minims. The latter was intended to have the same strength as laudanum.

Off. Prep. Syrupus Morphiæ Acetatis. W.

MORPHIÆ MURIAS. *U.S., Ed., Dub.* MORPHIÆ HYDROCHLORAS. *Lond. Muriate of Morphia. Hydrochlorate of Morphia.*

"Take of Morphia, in powder, *an ounce;* Distilled Water *half a pint;* Muriatic Acid *a sufficient quantity.* Mix the Morphia with the Water; then carefully drop in the Acid, constantly stirring, till the Morphia is saturated and dissolved. Evaporate the solution by means of a water-bath, so that it may crystallize upon cooling. Dry the crystals upon bibulous paper." *U. S.*

The *London College* has transferred muriate of morphia to the Materia Medica list.

"Take of Opium *twenty ounces;* Water *eight pints* [Imperial measure]; Muriate of Lime [chloride of calcium] *one ounce,* or *a slight excess.* Macerate the Opium in fragments for twenty-four hours in two pints of the Water; and separate the infusion, squeezing well the residue. Repeat the maceration successively with two pints more of the Water till the whole is made use of. Concentrate the whole infusions over the vapour-bath to one pint, and add the Muriate of Lime dissolved in four fluidounces of Water. Set the whole aside to settle; pour off the liquid; wash the sediment with a little water, adding the washings to the liquid. Evaporate the liquid sufficiently in the vapour-bath for it to solidify on cooling. Subject the cooled mass to very strong pressure in a cloth; redissolve the cake in a sufficiency of warm distilled water; add a little fine powder of white marble, and filter; acidulate the filtered fluid with a very little muriatic acid; and concentrate a second time in the vapour-bath for crystallization. Subject the crystals again to very strong pressure in a cloth. Repeat the process of solution, clarification by marble and muriatic acid, concentration, and crystallization, until a snow-white mass be obtained.

"On the small scale trouble and loss are saved by decolorizing the solution of muriate of morphia by means of a little purified animal charcoal after two crystallizations. But on the large scale it is better to purify the salt by repeated crystallizations alone, and to treat all the expressed fluids, except the first, in the same way with the original solution of impure muriate of morphia. An additional quantity of salt may often be got from the first dark and resinous fluid obtained by expression, on merely allowing it to remain at rest for a few months, when a little muriate of morphia may be deposited in an impure condition.

"The opium which yields the largest quantity of precipitate by carbonate of soda, according to the formula [given in *page* 538], yields muriate of morphia not only in greatest proportion, but likewise with the fewest crystallizations." *Ed.*

"Take of Morphia, in fine powder, *one ounce* [avoirdupois]; Pure Muriatic Acid *four fluidrachms and a half,* or *a sufficient quantity;* Distilled Water *two* [*fluid*]*ounces and a half.* Mix the Acid with the Water, heat to about 200°, and add the Morphia, constantly stirring, so that a solution may be formed having a slightly acid reaction. Set this to cool for twelve hours, and let the crystals which separate be drained of the liquor which surrounds them, and dried on blotting paper. The decanted liquor will, by further concentration and cooling, give additional crystals." *Dub.*

In relation to the process of the U. S. Pharmacopœia, the remarks made upon the preparation of the sulphate of morphia are equally applicable here. (See *Morphiæ Sulphas.*) The Dublin process differs from that of the U. S. Pharmacopœia only in employing heat in effecting the solution of the morphia in the diluted acid, so as to lessen the amount of subsequent evaporation, and in directing a slight excess of acid. The Edinburgh process is based upon the plan, originally suggested by Wittstock, of obtaining muriate of morphia immediately from opium without the use of alcohol. It is that of Dr. Wm. Gregory, which is an improvement on Wittstock's. The meconate and a little sulphate of morphia extracted by water from opium are decomposed by chloride of calcium, yielding muriate of morphia in solution, and meconate and sulphate of lime as precipitates. The remaining steps consist in obtaining the muriate of morphia from the solution by evaporation and crystallization, and in freeing it from colouring impurities. For the latter purpose the College directs repeated solution, clarification by marble and muriatic acid, concentration, and crystallization; advising, when the process is conducted upon a small scale, the use of animal charcoal after two crystallizations. It prevents waste by operating upon

all the liquids expressed from the impure muriate of morphia, except that separated by the first expression, in the same manner as upon the original solution. Points deserving of particular notice in the process are, to obtain the infusion of opium as concentrated as possible without leaving morphia behind, so as to shorten the period of evaporation; and to add the chloride of calcium before instead of after the concentration, as, according to Christison, a larger and purer product is obtained, in the former way, with fewer crystallizations. Dr. Christison says, in favour of Dr. Gregory's process, that the Edinburgh manufacturers, who follow it, produce a salt of unrivalled purity and cheapness. But it is much better calculated for the large laboratory of the manufacturing chemist, than for the smaller operations of the apothecary, who will probably find the U. S. process more convenient.

Muriate of morphia procured by the process of the Edinburgh College is free from narcotina; but always contains a portion of muriate of codeia, which, however, is scarcely sufficient to affect its operation upon the system. Dr. Christison found the proportion to vary between a 60th in the muriate prepared from good Turkey opium, a 30th in that from inferior samples of the same variety, and a 12th in that from the East Indian. This impurity may be separated by precipitating the morphia by means of ammonia; the codeia being left in solution.

The late Dr. A. T. Thomson published a process for procuring muriate of morphia, which he found considerably more productive than that of the British Colleges. After macerating the opium in water, as directed by the Colleges, for thirty hours, and expressing, he rubbed it in a mortar with an equal weight of pure white sand, and enough water to form the mixture into a paste, which he placed in a percolator, and subjected to the action of distilled water till the fluid passed without colour and taste. He then concentrated the liquor to the consistence of a thin syrup, added diacetate of lead, diluted the solution with twice its bulk of distilled water, allowed it to stand for twenty-four hours, decanted the supernatant liquid, washed the precipitate with warm water, added the washings to the decanted solution, and concentrated to one-half. To free the liquid from any remaining acetate of lead, he added diluted sulphuric acid in slight excess, decanted the liquid from the precipitate, washed the latter, added the washings to the solution, and boiled for some minutes to drive off acetic acid. To convert the sulphate of morphia now contained in the solution into muriate, he added a saturated solution of chloride of barium, washed the precipitate, evaporated the conjoined washings and solution to the point of crystallization, pressed the crystals, diluted and again evaporated the mother liquor so long as it afforded crystals, which were purified by means of animal charcoal, and by repeated solution, evaporation, and crystallization. (*Pharm. Journ.*, i. 459.)

Muriate of morphia crystallizes in tufts of feathery acicular crystals. It is white, inodorous, bitter, soluble in 16 parts of water at 60°, and in its own weight at 212°, and soluble also in alcohol. A saturated solution in boiling water forms a solid crystalline mass on cooling. The crystals are said to consist of one equivalent of morphia 292, one of muriatic acid 36·42, and six of water 54. Dr. Christison states that he constantly found the crystals, when dried at 150°, to contain 12·7 per cent. of water; and the Edinburgh College states that the loss of weight at 212° is not above 13 per cent. The salt may be known to be a muriate by yielding in solution with nitrate of silver, a precipitate insoluble in nitric or muriatic acid, but dissolved by an excess of ammonia. Potassa throws down from its solution a precipitate which is redissolved by an excess of the alkali. The salt is affected by heat, nitric acid, sesquichloride of iron, and chlorine followed by ammonia, in the same manner as morphia. Sugar is said to have been used largely in the adulteration of this salt. It may be detected by the test of fermentation.

This preparation of morphia is much used in Great Britain, but, in this country, less than either the sulphate or acetate. The dose, equivalent to a grain of opium, is about one-sixth of a grain.

Off. Prep. Liquor Morphiæ Muriatis; Morphiæ Acetas; Trochisci Morphiæ; Trochisci Morphiæ et Ipecacuanhæ. W.

LIQUOR MORPHIÆ MURIATIS. *Dub.* MORPHIÆ MURIATIS SOLUTIO. *Ed.* LIQUOR MORPHIÆ HYDROCHLORATIS. *Lond. Solution of Muriate of Morphia. Solution of Hydrochlorate of Morphia.*

"Take of Hydrochlorate of Morphia *four drachms;* Distilled Water *a pint* [Imperial measure]; Proof Spirit *half a pint* [Imperial measure]. Mix and dissolve." *Lond.*

"Take of Muriate of Morphia *one drachm and a half;* Rectified Spirit *five fluidounces*; Distilled Water *fifteen fluidounces.* Mix the Spirit and Water, and dissolve the Muriate of Morphia in the mixture with the aid of a gentle heat." *Ed.*

"Take of Muriate of Morphia *ninety grains;* Rectified Spirit *five fluidounces;* Distilled Water *fifteen* [*fluid*]*ounces.* Mix the Spirit and Water, dissolve the Muriate of Morphia in the mixture, and, unless the solution be quite clear, pass it through a paper filter." *Dub.*

The use of the alcohol is to prevent spontaneous decomposition. It is extremely unfortunate that, in the solutions of the salts of morphia, the same degree of strength should not have been directed by the different Pharmacopœias. As they now are, the medical practitioner and apothecary must be constantly on their guard to avoid the most serious results. One grain of the muriate of morphia is contained in 60 minims of the London solution, and in 106·66 minims of the Edinburgh and Dublin solutions which are identical. The dose, therefore, is from 7·5 to 15 minims of the London, and from 13 to 26 minims of the Edinburgh and Dublin solution, equivalent to from one-eighth to one-quarter of a grain of the dry salt. The Edinburgh and Dublin preparation was intended to have the medium strength of laudanum.

Off. Prep. Syrupus Morphiæ Muriatis. W.

MORPHIÆ SULPHAS. *U.S. Sulphate of Morphia.*

"Take of Morphia, in powder, *an ounce;* Distilled Water *half a pint;* Diluted Sulphuric Acid *a sufficient quantity.* Mix the Morphia with the Water, then carefully drop in the Acid, constantly stirring till the Morphia is saturated and dissolved. Evaporate the solution by means of a water-bath, so that it may crystallize upon cooling. Dry the crystals upon bibulous paper." *U. S.*

In this process the morphia is known to be saturated when it is wholly dissolved by the water. To ascertain whether the acid is added in excess, litmus paper may be resorted to. If the morphia employed contain narcotina, this will remain in the mother liquor, and will not contaminate the product. The mother liquor remaining after the first crystallization may be evaporated so as to afford a fresh supply of the sulphate; but, if the morphia was not originally quite pure, the second product will contain the impurities, and should not be used till it has undergone further preparation. When impure morphia is employed, the mother liquor should be mixed with alcohol, or boiled with purified animal charcoal and filtered, and then decomposed by ammonia, which will precipitate the morphia. This may be converted into the sulphate in the manner directed by the Pharmacopœia.

Another mode of obtaining sulphate of morphia, is to dissolve the alkali in boiling alcohol of 36° Baumé (sp. gr. 0·8428), saturate it while hot with sulphuric acid, add purified animal charcoal, boil for a few minutes, and filter the solution while at the boiling temperature. Upon cooling, it deposits most of the sulphate; and the remainder may be obtained by evaporating the mother liquor.

In the evaporation of the solution of this salt, care should be taken not to carry the heat too far; for when pushed to incipient decomposition with an excess of acid, a new substance is formed containing no morphia. (See *Am. Journ. of Pharm.*, xvii. 286.)

Sulphate of morphia crystallizes in beautifully white, minute, feathery crystals, which are soluble in cold water, and in twice their weight of boiling water. They contain, according to Liebig, in 100 parts, 10·33 of sulphuric acid, 75·38 of morphia, and 14·29 of water. By exposure to a heat of 248° F. they lose 9·66 parts of the water, but cannot be deprived of the remainder without decomposition. Their equivalent composition is stated to be one equivalent of morphia 292, one of sulphuric acid 40, and six of water 54, of which five are water of crystallization, and may be expelled by heat. The tests for it are those for sulphuric acid and for morphia.

The dose of sulphate of morphia is from an eighth to a quarter of a grain, which may be given in pill or solution.

Off. Prep. Liquor Morphiæ Sulphatis. W.

LIQUOR MORPHIÆ SULPHATIS. *U. S.* *Solution of Sulphate of Morphia.*

"Take of Sulphate of Morphia *eight grains;* Distilled Water *half a pint.* Dissolve the Sulphate of Morphia in the Water." *U. S.*

Sulphate of morphia, as found in the shops, is not always entirely soluble in water. This sometimes, perhaps, arises from adulterations; but more frequently, in all probability, from the mode of preparing the sulphate. As this salt was formerly prepared, the quantity of water employed for the suspension of the morphia was sometimes insufficient to hold the resulting sulphate in solution; and the consequence was that, upon the addition of sulphuric acid, the crystallization of the sulphate took place before the whole of the morphia was saturated by the acid. A portion of uncombined morphia was therefore necessarily mixed with the salt. Under such circumstances, the addition of a little sulphuric acid usually remedied the defect, and rendered the whole soluble. Pure sulphate of morphia is readily and entirely soluble in water.

This solution is very convenient, by enabling the physician to prescribe a minute dose, which, in consequence of the great energy of the preparations of morphia, is often necessary. It has the advantage that it may be kept for a very considerable length of time unchanged. The full dose for an adult is from one to two fluidrachms, containing from an eighth to a quarter of a grain of the sulphate.

Unfortunately, in some parts of the Union, the formula of Magendie for this solution, containing 16 grains in a fluidounce, is habitually employed under the name of solution of sulphate of morphia. This is the proper name of the officinal solution, which is much weaker; and the most dangerous results may ensue from the confusion. Magendie's solution should never be prescribed or sold unless under some special designation. W.

MUCILAGINES.

Mucilages.

Mucilage, in the ordinary acceptation of the term, and in the sense in which it is employed in the U. S. Pharmacopœia, is an aqueous solution of gum, or of substances closely allied to it. As used by the British Colleges it appears to signify any bland, viscid, aqueous, vegetable solution resembling that of gum in sensible properties. W.

MUCILAGO ACACIÆ. *U. S., Dub.* MUCILAGO. *Ed.* MISTURA ACACIÆ. *Lond. Mucilage of Gum Arabic.*

"Take of Gum Arabic, in powder, *four ounces;* Boiling Water *half a pint.* Add the Water gradually to the Gum, rubbing them together till the mucilage is formed." *U. S.*

The *London College* takes *ten ounces* of powdered gum Arabic, and *a pint* [Imperial measure] of boiling distilled water, and proceeds as above. The *Edinburgh College* directs *nine ounces* of gum Arabic to be dissolved in *a pint* [Imp. meas.] of cold water, without heat, but with occasional stirring, and then to be strained through linen or calico. The *Dublin College* takes *four ounces* (avoirdupois) of the gum, and *six* [*fluid*]*ounces* of water, dissolves the gum with occasional stirring, and strains through flannel.

The gum used for this purpose should be in the state of a coarse powder, as it is more readily dissolved in this state than when finely pulverized. Straining is necessary to separate the foreign substances which are often mixed with gum Arabic. This mucilage is semitransparent, almost colourless if prepared from good gum, viscid, tenacious, of a feeble peculiar odour, and nearly tasteless. If the solution of gum should be coloured, it may be rendered colourless by the addition of a concentrated solution of chlorine; and, by boiling for about half an hour so as to drive off the chlorine and muriatic acid, it may be rendered fit for use. (*Guérin.*) By keeping, mucilage becomes sour, in consequence of the spontaneous generation of acetic acid; and this happens even though it be enclosed in well-stopped bottles. But, according to M. Guérin, the aqueous solution of pure gum undergoes no change in vacuo. Heat in its preparation is said to favour the production of acid, in which case the Edinburgh or Dublin formula is preferable. Mucilage is employed chiefly in the formation of pills, and for the suspension or diffusion of insoluble substances in water. Physicians, in prescribing mucilage in mixtures, should always recollect that it is a solution of definite strength, containing half an ounce of the gum in each fluidounce. Half a fluidounce is usually sufficient for a six or eight ounce mixture.

Off. Prep. Mistura Acaciæ; Mistura Amygdalarum; Mistura Cretæ; Mistura Guaiaci. W.

MUCILAGO AMYLI. *Ed., Dub.* DECOCTUM AMYLI. *Lond. Mucilage of Starch.*

"Take of Starch *four drachms;* Water *a pint* [Imperial measure]. Rub the Starch with the Water gradually added; then boil for a short time." *Lond.*

The *Edinburgh College* takes *half an ounce* of starch and *a pint* [Imp. meas.] of water; the *Dublin, half an ounce* [avoirdupois] of the former, and *half a pint* [Imp. meas.] of the latter; both proceed according to the directions of the London College.

This mucilage has an opaline appearance, and gelatinous consistence, and is much used as a vehicle for laudanum and other active medicines given in the form of enema. In consequence of its demulcent properties, it may be usefully employed as an enema in irritation and inflammation of the mucous coat of the rectum and large intestines. Its unpleasant flavour, when it is prepared from ordinary starch, precludes its employment by the mouth.

Off. Prep. Enema Opii. W.

MUCILAGO HORDEI. *Dub. Mucilage of Barley.*

"Take of ground Pearl Barley *half an ounce* [avoirdupois]; Water *sixteen* [*fluid*]*ounces.* Triturate the Barley with the Water gradually added; then boil for a few minutes." *Dub.*

This is intended simply as an emollient enema, or as a vehicle of other substances given in that form.

Off. Prep. Enema Catharticum; Enema Terebinthinæ. W.

MUCILAGO TRAGACANTHÆ. *U. S., Ed. Mucilage of Tragacanth.*

"Take of Tragacanth *an ounce;* Boiling Water *a pint.* Macerate the Tragacanth in the Water for twenty-four hours, occasionally stirring; then triturate it so as to render the mucilage uniform, and strain forcibly through linen." *U. S.*

The *Edinburgh College* takes *two drachms* of tragacanth and *nine fluidounces* of boiling water, macerates for twenty-four hours, then triturates, and expresses through linen or calico.

A part only of tragacanth is soluble in water. The remainder swells up and forms a soft tenacious mass, which may be mechanically mixed with water, but does not form a proper solution. Hence trituration is necessary to complete the incorporation of the ingredients. This mucilage is thick and very viscid, but not permanent, as the water separates from the insoluble portion of the tragacanth on standing. It is chiefly used in making pills and troches. In consequence of its great tenacity, it may be advantageously employed for the suspension of heavy insoluble substances, such as the metallic oxides in water.

Off. Prep. Trochisci Ipecacuanhæ; Trochisci Magnesiæ; Trochisci Menthæ Piperitæ; Trochisci Sodæ Bicarbonatis. W.

OLEA DESTILLATA.

Distilled Oils.

For an account of the general properties of the volatile, essential, or distilled oils, the reader is referred to the head of *Olea Volatilia* in the first part of this work. The following are the different officinal directions for preparing them.

OLEA DESTILLATA. *U. S.*

"In the preparation of the Distilled Oils, put the substance from which the oil is to be extracted into a retort, or other vessel suitable for distillation, and add enough water to cover it, then distil into a large refrigeratory. Separate the Distilled Oil from the water which comes over with it.

"In this manner prepare Oil of Anise, from Anise; Oil of Caraway, from Caraway; Oil of Cloves, from Cloves; Oil of Wormseed, from Wormseed; Oil of Cubebs, from Cubebs; Oil of Fennel, from Fennel-seed; Oil of Partridge-berry, from Partridge-berry [leaves]; Oil of Pennyroyal [Oleum Hedeomæ], from Pennyroyal; Oil of Juniper, from Juniper [berries]; Oil of Lavender, from Lavender [flowers]; Oil of Peppermint, from Peppermint; Oil of Spearmint, from Spearmint; Oil of Horsemint, from Horsemint; Oil of Origanum, from Origanum [Marjoram]; Oil of Pimento, from Pimento; Oil of Rosemary, from Rosemary [tops]; Oil of Savine, from Savine; Oil of Sassafras, from Bark of Sassafras Root; and Oil of Valerian, from Valerian." *U. S.*

The *London College* gives no directions for the preparation of the volatile oils, but places such as it recognises in the Materia Medica catalogue.

VOLATILE OILS. *Ed.*

"Volatile oils are obtained chiefly from the flowers, leaves, fruit, barks, and roots of plants, by distilling them with water, in which they have been allowed to macerate for some time. Flowers, leaves, and fruits generally yield the finest oils, and in greatest quantity, when they are used fresh. Many, however, answer equally well if they have been preserved by beating them into a pulp with

about twice their weight of muriate of soda, and keeping the mixture in well-closed vessels.

"Substances yielding volatile oils must be distilled with water, the proper proportion of which varies for each article, and for the several qualities of each. In all instances, the quantity must be such as to prevent any of the material from being empyreumatized before the whole oil is carried over. In operations where the material is of pulpy consistence, other contrivances must be resorted to for the same purpose. These consist chiefly of particular modes of applying heat, so as to maintain a regulated temperature not much above 212°. On the small scale, heat may be thus conveniently applied by means of a bath of a strong solution of muriate of lime, or by means of an oil-bath, kept at a stationary temperature with the aid of a thermometer. On the large scale, heat is often applied by means of steam under regulated pressure. In other operations it is found sufficient to hang the material within the still in a cage or bag of fine net-work; and sometimes the material is not mingled with the water at all, but is subjected to a current of steam passing through it.

"The best mode of collecting the oil is by means of the refrigeratory described in the preface [see *page* 793], from which the water and oil drop together into a tall narrow vessel, provided with a lateral tube or lip near the top, and another tube rising from the bottom to about a quarter of an inch below the level of the former. It is evident that with a receiver of this construction, the water will escape by the lower tube; while the volatile oil, as it accumulates, will be discharged by the upper one, except in the very few instances where the oil is heavier than the water.

"By attending to the general principles now explained, Volatile Oils may be readily obtained of excellent quality from the flowers of ANTHEMIS NOBILIS, LAVANDULA VERA, and RUTA GRAVEOLENS; from the fruit of ANETHUM GRAVEOLENS bruised, CARUM CARUI bruised, EUGENIA PIMENTA bruised, FŒNICULUM OFFICINALE bruised, JUNIPERUS COMMUNIS bruised, PIPER CUBEBA ground, and PIMPINELLA ANISUM ground; from the undeveloped dried flowers of CARYOPHYLLUS AROMATICUS; from the tops of JUNIPERUS SABINA and ROSMARINUS OFFICINALIS; from the entire herb of MENTHA PIPERITA, MENTHA PULEGIUM, MENTHA VIRIDIS, and ORIGANUM MAJORANA [vulgare?]; and also from the bruised root of SASSAFRAS OFFICINALE." *Ed.*

OILS. *Dub.*

"The VOLATILE or ESSENTIAL OILS may be obtained by the following general process. The substance from which the oil is to be extracted is macerated for twenty-four hours, with five times its weight of water, in a sheet-tin or copper still, and, a condenser being then attached, half the water is drawn over by distillation, on the surface of which the oil will be found to float, unless (which is rarely the case) it should be heavier than water, when it will be found at the bottom of the receiver. The oil having been separated, the aqueous product, which is a saturated solution of the oil in water, is to be returned to the still, and the distillation resumed, and continued till the resulting liquid has the same volume as before. The oil is again separated, the watery product returned to the still, and the distillation resumed; and this process is to be repeated until it ceases to afford any additional oily product. The oil thus obtained is to be separated as completely as possible from water, and preserved in a well-stopped bottle.

"In this way volatile oils may be obtained from the entire herb of MENTHA PIPERITA, MENTHA PULEGIUM, MENTHA VIRIDIS; from the seeds or fruit of CARUM CARUI, CUBEBA OFFICINALIS, EUGENIA PIMENTA, FŒNICULUM OFFI-

CINALE, JUNIPERUS COMMUNIS, MYRISTICA MOSCHATA, PIMPINELLA ANISUM; from the flowers of ANTHEMIS NOBILIS, LAVANDULA VERA; from the undeveloped dried flowers of CARYOPHYLLUS AROMATICUS; from the tops of JUNIPERUS SABINA, ROSMARINUS OFFICINALIS; from the bark of CINNAMOMUM ZEYLANICUM.

"The water distilled over in the preparation of the several oils should be preserved for medical use." *Dub.*

The substances from which the volatile oils are extracted may be employed either in the recent or dried state. Certain flowers, however, such as orange flowers and roses, must be used fresh, or preserved with salt, as they afford little or no oil after exsiccation. Most of the aromatic herbs, also, as peppermint, spearmint, pennyroyal, and marjoram, are usually distilled while fresh; although it is thought by some that, when moderately dried, they yield a larger and more grateful product. Dried substances, before being submitted to distillation, require to be macerated in water till they are thoroughly penetrated by this fluid; and, to facilitate the action of the water, it is necessary that, when of a hard or tough consistence, they should be properly comminuted by slicing, shaving, rasping, bruising, or other similar mechanical operation.

The water which is put with the subject of distillation into the alembic, answers the double purpose of preventing the decomposition of the vegetable matter by regulating the temperature, and of facilitating the volatilization of the oil, which, though in most instances it readily rises with the vapour of boiling water, requires, when distilled alone, a considerably higher temperature, and is at the same time liable to be partially decomposed. Some oils, however will not ascend readily with steam at 212°; and in the distillation of these it is customary to use water saturated with common salt, which does not boil under 230°. Recourse may also be had to a bath of strong solution of chloride of calcium, or to an oil-bath, the temperature of which is regulated by a thermometer, as suggested by the Edinburgh College in their general directions (see *page* 1095). Other oils again may be volatilized with water at a temperature below the boiling point; and, as heat exercises an injurious influence over the oils, it is desirable that the distillation should be effected at as low a temperature as possible. To prevent injury from heat, it has been recommended to suspend the substance containing the oil in a basket, or to place it upon a perforated shelf, in the upper part of the alembic, so that it may be penetrated by the steam, without being in direct contact with the water. Another mode of effecting the same object is to distil it *in vacuo*. Dr. Duncan stated that the most elegant volatile oils he had ever seen were prepared in this manner by Mr. Barry, the inventor of the process. The employment of steam heat also prevents injury; and the best volatile oils are now prepared in Philadelphia in this way. Steam can be very conveniently applied to this purpose by causing it to pass through a coil of leaden tube of an inch or three-quarters of an inch bore, placed in the bottom of a common still. The end at which the steam is admitted enters the still at the upper part, and the other end at which the steam and condensed water escape, passes out laterally below, being furnished with a stop-cock, by which the pressure of the steam may be regulated, and the water drawn off if necessary. In some instances, it has been found desirable to conduct the steam immediately into the still near the bottom, by which the contents are kept in a state of brisk ebullition. This method is used in the preparation of the oil of bitter almonds and the oil of mustard. The same method is applicable to the preparation of the distilled waters. (Soubeiran, *Trait. de Pharm.*, 3e ed., i. 423.)

The quantity of water added is not a matter of indifference. An excess above what is necessary acts injuriously by holding the oil in solution, when the mixed vapours are condensed; and, if the proportion be very large, it is possible that

no oil whatever may be obtained separate. On the contrary, if the quantity be too small, the whole of the oil will not be distilled; and there will be danger of the substance in the alembic adhering to the sides of the vessel, and thus becoming burnt. Enough water should always be added to cover the solid material, and prevent this latter accident. Dried plants require more water than those which are fresh and succulent. The whole amount of materials in the alembic should not exceed three-fourths of its capacity; as otherwise there would be danger of the liquor boiling over. The form of the alembic has a considerable influence over the quantity of water distilled, which depends more upon the extent of surface than the amount of liquid submitted to evaporation. By employing a high and narrow vessel, we may obviate the disadvantage of an excess of water. The broad shallow alembic, suitable for the distillation of alcohol and the spirituous liquors, will not answer so well in this case. Sometimes the proportion of oil contained in the substance employed is so small that it is wholly dissolved in the water distilled, even though the proportion of the liquid in the alembic is not greater than is absolutely essential. In this case it is necessary to redistil the same water several times from fresh portions of the plant, till the quantity of oil which comes over exceeds its solvent power. This process is called *cohobation.*

The more volatile of the oils pass with facility along with the steam into the neck of the common still; but some which are less volatile are apt to condense in the head, and thus return into the alembic. For the distillation of the latter, a still should be employed with a large and very low head, having a rim or gutter around its internal circumference, into which the oils may be received as they condense, and thence pass into the neck. As, after the distillation of any one oil, it is necessary that the apparatus should be thoroughly cleansed before being used for the preparation of another, it is better that the condensing tube should be straight, than spiral as in the ordinary still. It should be recollected, moreover, that certain oils, such as those of anise and fennel, become solid at a comparatively high temperature; and that, in the distillation of these, the water employed for refrigeration should not be below 42° F.

The mixed vapours are condensed into a milky liquid, which is collected in a receiver, and, after standing for some time, separates into a clear solution of the oil in water, and into the oil itself; the latter floating on the surface, or sinking to the bottom, according as it is lighter or heavier than water. The distillation should be continued so long as the fluid which comes over has this milky appearance.

The last step in the process is to separate the oil from the water. For this purpose the *Florence receiver* may be used. This is a conical glass vessel, broad at the bottom and narrow towards the top, and very near its base furnished with a tubulure or opening, to which is adapted, by means of a pierced cork, a bent tube so shaped as to rise perpendicularly to seven-eighths of the height of the receiver, then to pass off from it at right angles, and near the end to bend downwards. The condensed liquid being admitted through the opening at the top of the receiver, the oil separates, and rising to the top, occupies the upper narrow part of the vessel, while the water remains at the bottom and enters the tube affixed to the receiver. When the surface of the liquid attains in the receiver a higher level than the top of the tube, the water will necessarily begin to flow out through the latter, and may be received in bottles. The oil thus accumulates so long as the process continues; but it is evident that the plan is applicable only to the oils lighter than water. For the heavier oils, cylindrical vessels may be employed, to be renewed as fast as they are filled. But, as all the water cannot be removed by these plans, it is necessary to resort to some other method of effecting a complete separation. An instrument called a *separatory* is usually employed for this purpose. It consists of a glass funnel, bulging at

the top, where it is furnished with a stopper, and prolonged at the bottom into a very narrow tube. (See *figure, page* 775.) The lower opening being closed, the mixed liquids are introduced and allowed to stand till they separate. The orifice at the bottom is then opened, and the stopper at top being a little loosened so as to admit the air, the heavier liquid slowly flows out, and may be separated to the last drop from the lighter, which floats above it. If the oil is heavier than the water, it passes out of the separatory; if lighter it remains within. Another mode of separating the oil is to introduce into the vessel containing the two liquids one end of a cord of cotton, the other end hanging out, and terminating in a suitable receptacle beneath the level of that immersed in the liquid. The oil at top passes through the cord, and may thus be wholly removed. The last drops may be collected by pressing the cord between the fingers.

The water saturated with oil should be preserved for future distillations; as it can dissolve no more of the oil, and will therefore yield a larger product.

When first procured, the oil has a disagreeable empyreumatic odour, from which it may be freed by allowing it to stand for some days in vessels loosely covered with paper. It should then be introduced into small opaque bottles, which should be well stopped so as to exclude the air. When altered by exposure to air, the oils may sometimes be nearly or quite restored to their original appearance and quality by agitation with a little recently heated animal charcoal; and the same method may be employed for freeing oils from adhering water.

The volatile oils have the medical properties of the plants from which they are derived; and, as their remedial application has been mentioned under the heads of these plants respectively, it will be unnecessary to treat of it in this place. They may be administered dropped on a lump of sugar; or triturated with at least ten times their weight of sugar, forming an *oleo-saccharum*, and then dissolved in water; or made into an emulsion with water, sugar, and gum Arabic. They are frequently kept dissolved in alcohol under the name of *essences.** W.

OLEUM ANETHI. *Lond., Ed. Oil of Dill.*

The fruit of dill yields about 3·5 per cent. of volatile oil. This is of a pale-yellow colour, with the odour of the fruit, and a hot sweetish taste. Its specific gravity is stated at 0·881. It is employed to prepare dill water, and may be given as a carminative in the dose of three or four drops; but it is little used in this country.

Off. Prep. Aqua Anethi. W.

OLEUM ANISI. *U. S., Lond., Ed., Dub. Oil of Anise.*

The product of oil from anise is variously stated from 1·56 to 3·12 per cent. The oil employed in this country is imported. It is colourless or yel-

* It is often important to know how many drops a volatile oil will yield to the fluidrachm, in other words the relation of a drop of the oil to a minim. This varies extremely according to the circumstances elsewhere noticed as influencing the size of the drop; so that any results obtained are only approximate and relative. At our request Professor Procter tried the following oils, with the results stated in the table below. The columns of figures represent the number of drops in a fluidrachm of the oils respectively, the first column giving those obtained by dropping the oils from the bottles in which they are commonly kept, the second by dropping them from a minim measure.

Oleum Anisi	85– 86	Oleum Fœniculi	103–103	Oleum Rosmarini	104–105
" Carui	106–108	" Gaultheriæ	102–101	" Sabinæ	102–108
" Caryophylli	103–103	" Hedeomæ	91– 91	" Sassafras	102–100
" Chenopodii	97–100	" Menthæ Piperitæ	103–109	" Tanaceti	92–111
" Cinnamomi	100–102	" Menthæ Viridis	89– 94	" Valerianæ	116–110
" Cubebæ	86– 96			Creasotum	95– 91

lowish, with the peculiar odour and taste of the seed. At 50° it crystallizes in flat tables, and does not melt under 62°. Its sp. gr. increases with age, and is variously given from 0·9768 to 0·9903. It is soluble in all proportions in alcohol of 0·806; but alcohol of 0·840 dissolves at 77° only 42 per cent. It consists of two oils, one solid at ordinary temperatures and heavier than water (*stearoptene*), the other liquid and more volatile (*eleoptene*), both of which are said to have the same atomic constitution, and to consist of carbon, hydrogen, and oxygen ($C_{10}H_6O$). It absorbs oxygen from the air, and becomes less disposed to concrete. Oil of anise is said to be sometimes adulterated with spermaceti, wax, or camphor. The first two may be detected by their insolubility in cold alcohol, the last by its odour. The dose of the oil is from five to fifteen drops. Its comparative mildness adapts it to infantile cases. We are informed that the oil of anise has, in this country, been almost entirely superseded by the *oil of star aniseed* (*oleum badiani*), which closely resembles it in flavour. (See *page* 101.)

Off. Prep. Essentia Anisi; Extractum Rhei Fluidum; Extract. Spigeliæ et Sennæ Fluidum; Spiritus Anisi; Syrupus Sarsaparillæ Compositus; Tinctura Opii Ammoniata; Tinctura Opii Camphorata; Trochisci Glycyrrhizæ et Opii. W.

OLEUM ANTHEMIDIS. *Lond., Ed., Dub. Oil of Chamomile.*

This is seldom prepared or used in this country. Baumé obtained thirteen drachms of the oil from eighty-two pounds of the flowers; according to Mr. Brande, the average product of 100 pounds is two pounds twelve ounces. It has the peculiar smell of chamomile, with a pungent somewhat aromatic taste. When recently distilled it is of a sky-blue colour, which changes to yellow or brownish on exposure. The sp. gr. of the English oil is said to be 0·9083. According to M. Gerhardt, oil of chamomile is a mixture of a carbohydrogen ($C_{20}H_{16}$) with an oxygenated oil ($C_{10}H_6O_2$). (*Chem. Gaz.* vi. 483.) It has sometimes been used in spasm of the stomach, and as an adjunct to purgative medicines. The dose is from five to fifteen drops.

On the continent of Europe, an oil extracted from *Matricaria Chamomilla* is employed under the name of oil of chamomile. It is dark-blue, thick, and nearly opaque, becoming brown and unctuous by time. It has the odour of the plant from which it is derived, and an aromatic taste. W.

OLEUM CARI. *U.S.* OLEUM CARUI. *Lond., Ed. Dub. Oil of Caraway.*

This oil is prepared to a considerable extent by our distillers. The fresh fruit yields on an average about 4·7 per cent. (Recluz); but the product is very variable. The oil of caraway is somewhat viscid, of a pale-yellow colour becoming brownish by age, with the odour of the fruit, and an aromatic acrid taste. Its sp. gr. is 0·946 according to Baumé, 0·931 according to Brande. Its constituents are carbon, hydrogen, and oxygen. It is much used to impart flavour to medicines, and to correct their nauseating and griping effects. The dose is from one to ten drops.

When oil of caraway is distilled with hydrated phosphoric acid, the distilled liquor being poured back into the retort until it ceases to have the smell of caraway, an oily liquid separates from the phosphoric acid, having a very disagreeable odour, and a strong taste. This product, to which the name of *carvacrol* has been applied, has been found to give immediate relief to toothache, when inserted on cotton into the cavity of a carious tooth. (See *Am. Journ. of Med. Sci*, N. S. xv. 532.)

Off. Prep. Aqua Carui; Confectio Scammonii; Confectio Sennæ; Essentia Carui; Extractum Spigeliæ et Sennæ Fluidum; Pilulæ Aloës Compositæ; Pil. Rhei Compositæ; Spiritus Juniperi Compositus. W.

OLEUM CARYOPHYLLI. *U. S., Lond., Ed., Dub. Oil of Cloves.*

This oil is obtained by distilling cloves with water, to which it is customary to add common salt, in order to raise the temperature of ebullition; and the water should be repeatedly distilled from the same cloves, in order completely to exhaust them. Professor Scharling has found advantage from the application of super-heated steam to the distillation of this oil. (*Pharm. Journ. and Trans.*, xi. 469.) The product of good cloves is said to be about one-fifth or one-sixth of their weight. The oil was formerly brought from Holland or the East Indies; but, since the introduction of the Cayenne cloves into our markets, the reduced price and superior freshness of the drug have rendered the distillation of oil of cloves profitable in this country; and the best now sold is of domestic extraction. We have been informed that from seven to nine pounds of cloves yield to our distillers about one pound of the oil.

Properties. Oil of cloves, when recently distilled, is very fluid, clear, and colourless, but becomes yellowish by exposure, and ultimately reddish-brown. It has the odour of cloves, and a hot, acrid, aromatic taste. Its sp. gr. is variously stated at from 1·034 to 1·061, the latter being given by Bonastre as the sp. gr. of the rectified oil. It is one of the least volatile of the essential oils, and requires for congelation a temperature from zero of Fahrenheit to —4°. It is completely soluble in alcohol, ether, and strong acetic acid. Nitric acid changes its colour to a deep red, and converts it by the aid of heat into oxalic acid. When long kept it deposits a crystalline *stearoptene*. It is frequently adulterated with fixed oils, and sometimes also with oil of pimento and with copaiba. When pure it sinks in distilled water. According to Zeller, its character of congealing entirely into a crystalline mass with the alcoholic solution of potassa, losing at the same time its peculiar odour, affords a sufficient criterion of its purity.

According to Ettling, the oil of cloves consists of two distinct oils, one lighter, the other heavier than water. They may be obtained separate by distilling the oil from a solution of potassa. The lighter comes over, the heavier remains combined with the potassa, from which it may be separated by adding sulphuric acid, and again distilling. *Light oil of cloves* is colourless, has the sp. gr. 0·918, and consists exclusively of carbon and hydrogen, being isomeric with pure oil of turpentine. It is said not to possess active properties. (*Kane.*) *Heavy oil of cloves* is colourless at first, but darkens with age, has the odour and taste of cloves, is of the sp. gr. 1·079, boils at 470°, and forms soluble and crystallizable salts with the alkalies. Hence it has been called *eugenic* or *caryophyllic acid.* It consists of carbon, hydrogen, and oxygen; the formula, according to Ettling, being $C_{24}H_{15}O_5$.

Medical Properties and Uses. The medical effects of the oil are similar to those of cloves, and it is used for the same purposes; but its most common employment is as a corrigent of other medicines. Like other powerful irritants, it is sometimes effectual in relieving toothache, when introduced into the cavity of a carious tooth. The dose is from two to six drops.

Off. Prep. Confectio Aromatica; Confectio Scammonii; Pilulæ Colocynthidis Compositæ. W.

OLEUM CHENOPODII. *U. S. Oil of Wormseed.*

This oil is peculiar to the United States. The best is prepared in the vicinity of Baltimore. (See *page* 212.) It is of a light-yellow colour when recently distilled, but becomes deeper yellow, and even brownish by age. It has in a high degree the peculiar flavour of the plant. Its sp. gr. is 0·908. It is used as an anthelmintic, in the dose of from four to eight drops for a child, repeated morning and evening for three or four days, and then followed by a brisk cathartic. The case of a child, six years old, is recorded in the *Boston Med. and Surg.*

Journ. (xlv. 373), in which death is supposed to have resulted from the use of overdoses of this oil. W.

OLEUM COPAIBÆ. *U.S., Lond., Ed. Oil of Copaiba.*

"Take of Copaiba *two pounds;* Water *four gallons.* Add the Copaiba to the Water in a tinned still, and, having adapted a proper refrigeratory, distil three gallons. Separate the Oil which comes over from the water, return the latter to the Copaiba, and again distil three gallons. Lastly, separate the Oil obtained in the second distillation, add to it that first obtained, and keep the whole in a well stopped bottle." *U. S.*

"Take of Copaiva *one ounce;* Water *one pint and a half* [Imperial measure]. Distil, preserving the water; when most of the water has passed over, heat it, return it into the still, and resume the distillation; repeat this process so long as a sensible quantity of oil passes over with the water." *Ed.*

The oil constitutes from one-third to one-half or more of the copaiba. From one specimen of recent copaiba as much as 80 per cent. of oil has been obtained. (*Am. Journ. of Pharm.*, xxii. 289). It is prepared largely in Philadelphia by the application of steam heat. (See page 1096). As it first comes over it is colourless, but the latter product is of a fine greenish hue. By redistillation it may be rendered wholly colourless. It has the odour and taste of copaiba, boils at about 470° (*Christison*), is soluble in ether and alcohol, absorbs muriatic acid gas and forms with it crystals of artificial camphor, and when pure consists exclusively of carbon and hydrogen, being isomeric with pure oil of turpentine. In consequence of its want of oxygen, it answers even better than naphtha for preserving potassium, a fact first observed by Mr. Durand, of Philadelphia.

Its effects on the system are those of copaiba. From the experiments of C. Mitscherlich it is one of the least injurious to the animal system of the volatile oils; six drachms of it having been introduced into the stomach of a rabbit without causing death. Externally applied it produces much less irritation than the oil of turpentine. It may be given for the same purposes as copaiba in the dose of ten or fifteen drops; and may be administered in emulsion, or simply dropped on sugar. W.

OLEUM CUBEBÆ. *U.S., Ed., Dub. Oil of Cubebs.*

This oil is obtained from cubebs, by grinding them, and then distilling with water. From ten pounds Schönwald procured eleven ounces of oil, and this result very nearly coincides with the experiments of Christison, who obtained seven per cent. When perfectly pure, the oil is colourless; but as usually found, is yellowish or greenish. It has the smell of cubebs, and a warm, aromatic, camphorous taste; is of a consistence approaching that of almond oil; is lighter than water, having the sp. gr. 0·929; and, when exposed to the air, is said to thicken without losing its odour. Upon standing, it sometimes deposits crystals, which are thought to be a hydrate of the oil. It consists of carbon and hydrogen, and its formula is stated to be $C_{15}H_{12}$.

The oil has the medicinal properties of cubebs, but it is probably not the sole active ingredient; as it is much less pungent than the fluid extract or oleo-resin. It may, however, often be advantageously substituted for the powder, in the commencing dose of ten or twelve drops, to be gradually increased until its effects are obtained, or until it proves offensive to the stomach. It may be given suspended in water by means of sugar, or in the form of emulsion, or enclosed in capsules of gelatin. W.

OLEUM FŒNICULI. *U. S., Lond., Ed., Dub. Oil of Fennel.*

Fennel seeds yield about 2·5 per cent. of oil. That used in this country is imported. It is colourless or yellowish, with the odour and taste of the seeds. Its sp. gr. is 0·997. It congeals below 50° into a crystalline mass, separable by

pressure into a solid and liquid oil (*stearoptene* and *eleoptene*); the former heavier than water, and less volatile than the latter, which rises first when the oil is distilled. As found in the shops, therefore, the oil of fennel is not uniform; and Dr. Montgomery found that a specimen which he examined did not congeal at 22°. It consists of carbon, hydrogen, and oxygen; its formula being, according to Blanchet and Sill, $C_{13}H_8O_2$. The dose is from five to fifteen drops.

Off. Prep. Aqua Fœniculi; Confectio Piperis Nigri; Essentia Fœniculi; Extractum Rhei Fluidum; Extractum Sennæ Fluidum; Spiritus Juniperi Compositus. W.

OLEUM GAULTHERIÆ. *U. S.* *Oil of Partridge-berry.*

This oil is a product of the United States, and is prepared chiefly in New Jersey. It is directed by the Pharmacopœia to be prepared from the leaves of *Gaultheria procumbens;* but the whole plant is usually employed. It has been obtained by Prof. Procter from the bark of *Betula lenta* or sweet birch, and has been supposed to exist also in the root of *Polygala paucifolia*, and the roots and stems of *Spiræa ulmaria*, *Spiræa lobata*, and *Gaultheria hispidula*, which have its peculiar flavour.

Oil of partridge-berry when freshly distilled is nearly colourless, but as found in the shops has a brownish-yellow or reddish colour. It is of a sweetish, slightly pungent, peculiar taste, and a very agreeable characteristic odour, by which it may be readily distinguished from all other officinal oils. It is the heaviest of the known essential oils, having the sp. gr. 1·173. Its boiling point is 412°. (*Am. Journ. of Pharm.*, iii. 199, and xiv. 213.) Its unusual weight affords a convenient test of its purity. Prof. Procter proved it to possess acid properties, and to be closely analogous to *salicylous acid*, one of the results of the decomposition of salicin by sulphuric acid and bichromate of potassa, and an ingredient in the oil of *Spiræa ulmaria*. (See *Salix.*) By M. Cahours it has since been shown to have the same composition as the salicylate of methylene; and a product having its properties was obtained by distilling a mixture of pyroxylic spirit, salicylic acid, and sulphuric acid. (*Am. Journ. of Pharm.*, xiv. 211, and xv. 241.) Dr. T. J. Gallaher, of Pittsburg, Pa., records the case of a boy, nine years old, who took about half an ounce of this oil, with the effect of producing severe vomiting, purging, epigastric pain, hot skin, frequent pulse, slow and laboured respiration, dulness of hearing, and, notwithstanding excessive gastric irritability, an uncontrollable desire for food. After two or three days of great danger, he began to improve, and in two weeks was entirely restored to health. (*Med. Examiner*, N. S., viii. 347.) Oil of gaultheria is used chiefly, on account of its pleasant flavour, to cover the taste of other medicines.

Off. Prep. Syrupus Sarsaparillæ Compositus. W.

OLEUM HEDEOMÆ. *U. S.* *Oil of Pennyroyal.*

This, though analogous in properties to the oil of European pennyroyal, is derived from a distinct plant (*Hedeoma pulegioides*) peculiar to North America. It has a light-yellow colour, with the odour and taste of the herb. Its sp. gr. is 0·948. It may be used as a remedy in flatulent colic and sick stomach, to correct the operation of nauseating or griping medicines, and to impart flavour to mixtures. It is also much employed as a domestic remedy in amenorrhœa. The dose is from two to ten drops. W.

OLEUM JUNIPERI. *U.S., Lond., Ed., Dub.* *Oil of Juniper.*

The proportion of oil which juniper berries afford is stated very differently by different authors. Trommsdorff obtained one per cent. The highest quantity given in the table of Recluz is 2·34, the lowest 0·31 per cent. The berries are most productive when bruised. The oil of juniper consumed in this country is brought from Europe, and is believed to be procured chiefly from the tops of

the plant, being sold for a price which is altogether incompatible with the idea that it is prepared from the fruit alone. It is colourless, or of a light greenish-yellow, with a terebinthinate odour, and a hot acrid taste. Its sp. gr. is 0 911. It is not very soluble in alcohol. According to Blanchet, it contains two isomeric oils, of which one is colourless, and the other coloured and less volatile. It is, when pure, a carbohydrogen, and is said to have the same composition as oil of turpentine ($C_{10}H_8$); but it does not form a solid compound with muriatic acid. (*Journ. de Pharm.*, xxvi. 80.) Oil of turpentine is often fraudulently added, but may be detected by the specific gravity of the mixture, which is considerably less than that of the unadulterated oil of juniper.

The oil is stimulant, carminative, and diuretic; and may be employed advantageously in debilitated dropsical cases, in connexion with other medicines, especially digitalis. It is this oil which imparts to Holland gin its peculiar flavour and diuretic power. The dose is from five to fifteen drops two or three times a day, and may be considerably increased.

Off. Prep. Spiritus Juniperi Compositus. W.

OLEUM LAVANDULÆ. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Oil of Lavender.*

This oil is usually distilled from the flowers and flower-stems conjointly, though of finer quality when obtained from the former exclusively. Dried lavender flowers yield from 1 to 1·5 per cent. of a very fluid, lemon-yellow oil, having the fragrance of the flowers, and an aromatic, burning taste. That met with in commerce has the sp. gr. 0·898 at 68° F., which is reduced to 0·877 by rectification. (*Berzelius.*) According to Brande, the sp. gr. of the oil obtained from the whole herb is 0·9206. Alcohol of 0·830 dissolves oil of lavender in all proportions; that of 0·877, only 42 per cent. (*Berzelius.*) Proust states that, when allowed to stand in imperfectly stopped bottles, it lets fall a crystalline deposit, which often amounts to one-fourth of its weight. It is said that the portion of oil first distilled is most agreeably fragrant, and is often kept separate, and sold at a higher price. Oil of lavender is used chiefly as a perfume, though possessed of carminative and stimulant properties, and sometimes useful in cases of nervous languor and headache. The dose is from one to five drops.

Oil of Spike is procured from the broad-leaved variety of lavender which grows wild in Europe, the *Lavandula Spica* of De Candolle. Its odour is less fragrant than that of common oil of lavender, and is somewhat analogous to that of oil of turpentine, with which it is said to be often adulterated. It is used by artists in the preparation of varnishes.

Off. Prep. Linimentum Camphoræ Compositum; Tinctura Ammoniæ Composita; Tinctura Lavandulæ Composita. *Lond.* W.

OLEUM MENTHÆ PIPERITÆ. *U.S*, *Lond.*, *Ed.*, *Dub.* *Oil of Peppermint.*

Peppermint varies exceedingly in the quantity of oil which it affords. Four pounds of the fresh herb yield, according to Baumé, from a drachm and a half to three drachms of the oil. The product is generally less than one per cent. This oil is largely distilled in the United States. It is of a greenish-yellow colour or nearly colourless, but becomes reddish by age. Its odour is strong and aromatic, its taste warm, camphorous, and very pungent, but succeeded, when air is admitted into the mouth, by a sense of coolness. Its sp. gr. is stated differently from 0·902 to 0·920; its boiling point at 365°. Upon long standing it deposits a *stearoptene*, which, according to Kane, has the same composition as the oil, viz., $C_{21}H_{20}O_2$. Berzelius states that at 8° below zero the oil deposits small capillary crystals. This oil is frequently adulterated with alcohol, and occasionally, there is reason to believe, with oil of turpentine. This is detected by its odour, by its

deficient solubility in cold alcohol, and by imparting the property of exploding with iodine.

Oil of peppermint is stimulating and carminative, and is much used in flatulence, nausea, spasmodic pains of the stomach and bowels, and as a corrigent or adjuvant of other medicines. The dose is from one to three drops, and is most conveniently given rubbed up with sugar and then dissolved in water. The oil is more frequently employed, dissolved in alcohol, in the form of *essence of peppermint*, which is now an officinal preparation. (See *Tinctura Olei Menthæ Piperitæ.*)

Off. Prep. Aqua Menthæ Piperitæ; Essentia Menthæ Piperitæ; Pilulæ Rhei Compositæ; Spiritus Menthæ Piperitæ; Tinctura Olei Menthæ Piperitæ; Trochisci Menthæ Piperitæ. W.

OLEUM MENTHÆ VIRIDIS. *U. S., Lond., Ed., Dub. Oil of Spearmint.*

According to Lewis, ten pounds of spearmint yield an ounce of oil; by others the product is stated not to exceed one part from five hundred. The oil is largely distilled in this country. It is pale-yellow or greenish when recently prepared, but becomes red with age, and ultimately almost of a mahogany colour. Its flavour is analogous to that of the oil of peppermint, but less agreeable and less pungent. Its sp. gr. is stated differently from 0·914 to 0·975; its boiling point at 320°. Kane gives the formula $C_{35}H_{28}O$, as representing its composition. It is used for the same purposes as the oil of peppermint, in the dose of from two to five drops. An *essence of spearmint*, prepared by dissolving the oil in alcohol, is now officinal. (See *Tinctura Olei Menthæ Viridis.*)

Off. Prep. Aqua Menthæ Viridis; Essentia Menthæ Viridis; Spiritus Menthæ Viridis; Tinctura Olei Menthæ Viridis. W.

OLEUM MONARDÆ. *U. S. Oil of Horsemint.*

This is prepared by our distillers from the fresh herb of *Monarda punctata.* It has a reddish-amber colour, a fragrant odour, and a warm, very pungent taste. At the temperature of 40° F. or lower, especially in the presence of moisture, it is gradually transformed by oxidation into a crystalline body, having the odour and taste of the oil. This appears to be analogous in constitution to camphor, being the oxide of a carbohydrogen radical ($C_{10}H_7$), three eqs. of which with one eq. of oxygen form the liquid oil. (C. T. Bonsall, *Am. Journ. of Pharm.*, xxv. 200.) Applied to the skin, monarda oil acts as a powerful rubefacient, quickly producing heat, pain, redness, and even vesication. This property of the oil was made known to the profession by Dr. Atlee, of Philadelphia, who employed it externally with advantage in low forms of typhus fever, cholera infantum, chronic rheumatism, and other affections in which rubefacients are indicated. In ordinary cases it should be diluted before being applied. It may be given internally as a stimulant and carminative, in the dose of two or three drops mixed with sugar and water. W.

OLEUM ORIGANI. *U. S., Ed. Oil of Origanum.*

This is obtained from the common marjoram, *Origanum vulgare*, and is frequently called *oil of marjoram.* The plant varies exceedingly in the proportion which it affords. The mean product may be stated at from four to six parts from a thousand. The recent oil, when properly prepared, is yellow; but if too much heat is used in the distillation, it is said to be reddish, and it acquires the same tint by age. It may be obtained colourless by rectification. It has the odour of the plant, and a hot acrid taste. Kane gives its sp. gr. 0·867, its boiling point 354°, and its composition $C_{50}H_{40}O$. According to Lewis its sp. gr. is 0·940, according to Brande 0·909. It is sometimes used as an external irritant, and to allay the pain of toothache, by being introduced, on lint or cotton, into the cavity

of a carious tooth. It is not employed internally. The oil commonly sold as oil of origanum has been ascertained by Mr. Daniel Hanbury to be the oil of thyme (*Thymus vulgaris*), and is prepared in the South of France. As it reaches this country it is generally largely adulterated with oil of turpentine.

It can scarcely be doubted that the oil directed by the Edinburgh College from *Origanum Majorana*, or *sweet marjoram*, was intended for that of *Origanum vulgare;* as the latter plant is indicated, under the name of *Origanum*, in the Materia Medica list of the College, where the former is not mentioned; and the oil is referred to in the Index of the Pharmacopœia with the title of Oleum Origani. The *oil of sweet marjoram* is obtained from the plant by distillation, in the quantity of from 2·5 to 6 parts from 1000. It is of a lemon-yellow colour, light, and camphorous, and is said upon long standing to deposit a substance resembling camphor. It is not used in this country.

Off. Prep. Linimentum Saponis Camphoratum. W.

OLEUM PIMENTÆ. *U. S., Lond., Ed., Dub. Oil of Pimento.*

The berries yield from 1 to more than 4 per cent. of oil, which, as found in the shops, has a brownish-red colour, and the odour and taste of pimento, though warmer and more pungent. It is said, when freshly distilled, to be colourless or yellowish. Nitric acid reddens it. Bonastre states that it combines with salifiable bases like the oil of cloves. Its sp. gr. has been stated at 1·021, but varies. It consists, like the oil of cloves, of two distinct oils, a lighter and heavier, the former of which comes over first in distillation. They may be separated by distilling the oil with caustic potassa. The light oil comes over, and the heavy remains combined with the potassa. The latter may be obtained by distilling the residue with sulphuric acid. The light oil is lighter than water, and is a pure carbohydrogen. The heavy has the acid property of forming crystalline compounds with the alkalies. They are analogous to the light and heavy oils of cloves. The oil of pimento is given for the same purposes with the other aromatic stimulant oils. The dose is from three to six drops.

Off. Prep. Aqua Pimentæ; Essentia Pimentæ. W.

OLEUM PULEGII. *Lond., Ed.* Oleum Menthæ Pulegii. *Dub. Oil of European Pennyroyal.*

About 1 part of this oil on an average is obtained from 100 parts of the plant. It is yellowish when freshly distilled, but becomes reddish by age. Its sp. gr. is stated differently from 0·925 to 0·978. It possesses medical properties similar to those of the oil of peppermint; but is seldom used in this country. The dose is from one to five drops.

Off. Prep. Aqua Pulegii; Essentia Menthæ Pulegii; Spiritus Pulegii. W.

OLEUM ROSMARINI. *U. S., Lond., Ed., Dub. Oil of Rosemary.*

The fresh leaves of rosemary yield, according to Baumé, 0·26 per cent. of oil; but the product is stated much higher by other authors. According to Brande, a pound of the fresh herb yields about a drachm of the oil, which is about one per cent. This oil is colourless, with an odour similar to that of the plant, though less agreeable. Its sp. gr. is 0·911, but is reduced to 0·8886 by rectification. It is soluble in all proportions in alcohol of 0·830; but requires for solution at 64°, forty parts of alcohol of the sp. gr. 0·887. (*Berzelius.*) Kane gives its sp. gr. 0·897, its boiling point 365°, and its composition $C_{45}H_{38}O_2$. Kept in bottles imperfectly stopped, it deposits a *stearoptene* analogous to camphor, and sometimes amounting, according to Proust, to one-tenth of the oil. Bucholz states that it affords camphor when digested with from one-half its weight to an equal weight of potassa, and distilled. It is said to be sometimes

adulterated with oil of turpentine, which may be detected by mixing the suspected liquid with an equal volume of pure alcohol. The oil of rosemary is dissolved, and that of turpentine left. This oil is possessed of stimulant properties, but is employed chiefly as an ingredient of rubefacient liniments. The dose is from three to six drops.

A case of death is recorded, in a child four or five years old, from a mixture of six measures of this oil, and two of oil of wormseed, given in repeated doses of a tablespoonful. (*Am. Journ. of Pharm.*, xxiii. 286.)

Off. Prep. Essentia Rosmarini; Linimentum Opii; Linimentum Saponis Camphoratum; Spiritus Ammoniæ Aromaticus; Spiritus Rosmarini; Tinctura Lavandulæ Composita; Tinctura Saponis Camphorata. W.

OLEUM RUTÆ. *Lond., Ed. Oil of Rue.*

Rue yields a very small proportion of a yellow or greenish oil, which becomes brown with age. It has the strong unpleasant odour of the plant, and an acrid taste. Kane gives its sp. gr. 0·837, its boiling point 446°, and its composition $C_{28}H_{28}O_3$. It is stimulant and antispasmodic, and has been given in hysteria, convulsions, and amenorrhœa. The dose is from two to five drops. W.

OLEUM SABINÆ. *U. S., Lond., Ed., Dub. Oil of Savine.*

According to the more recent authorities, the proportion of volatile oil obtained from savine varies from less than 1 to 2·5 per cent. The oil is nearly colourless or yellow, limpid, strongly odorous, and of a bitterish, extremely acrid taste. Kane gives its sp. gr. 0·915, its boiling point 315°, and its composition $C_{10}H_8$, equivalent to that of oil of turpentine. According to Winckler, it is converted by sulphuric acid into an oil not distinguishable from that of thyme. (*Chem. Gaz.*, Jan. 1847, p. 11.) The oil of savine is stimulant, emmenagogue, and actively rubefacient, and may be given for the same purposes as the plant in substance. It has been much employed empirically in amenorrhœa, and with a view to produce abortion, and in some instances with fatal effects. The dose is from two to five drops. W.

OLEUM SASSAFRAS. *U. S., Ed. Oil of Sassafras.*

The proportion of oil yielded by the root of sassafras is variously stated from less than 1 to somewhat more than 2 per cent. The bark of the root, directed by the U. S. Pharmacopœia, would afford a larger quantity. The oil is of a yellow colour, becoming reddish by age. It has the fragrant odour of sassafras, with a warm, pungent, aromatic taste. It is among the heaviest of the volatile oils, having the sp. gr. 1·094. According to Bonastre, it separates, by agitation with water, into two oils, one lighter, the other heavier than water. Berzelius states that the first is often nothing more than oil of turpentine existing as an adulteration in the oil of sassafras. Nitric acid colours it red, and fuming nitric acid inflames it more readily than most other oils. It has the property of dissolving caoutchouc. When kept for a long time it deposits transparent crystals, having the same odour as the liquid oil. By treating the oil with chlorine, neutralizing with lime, and distilling, a product is obtained identical in properties and composition with common camphor. (See *Am. Journ. of Pharm.*, xxvi. 166.) Oil of sassafras is stimulant, carminative, and supposed to be diaphoretic; and may be employed for the same purposes with the bark from which it is derived. The dose is from two to ten drops.

Off. Prep. Syrupus Sarsaparillæ Compositus. W.

OLEUM SUCCINI. *U. S., Dub. Oil of Amber.*

"Take of Amber, in powder, *any quantity*. Put the Amber, previously mixed with an equal weight of sand, into a glass retort, which is to be only half filled; then distil, by means of a sand-bath, with a gradually increasing heat, an acid

liquor, an oil, and a concrete acid impregnated with oil. Separate the Oil from the other matters, and keep it in well stopped bottles." *U. S.*

The *Dublin College* has transferred the oil of amber from the preparations to the Materia Medica list.

The amber in this process undergoes decomposition, and affords, among other products, an empyreumatic oil, which floats in the receiver upon the surface of an acid liquor. The heat requisite for the complete decomposition of the amber cannot be supported by a glass retort; and, in order that all the oil which it is capable of yielding may be collected, the distillation should be performed in a tubulated iron or earthenware retort, which may be placed immediately upon the fire. The sand is added to prevent the amber from swelling too much. The oil may be separated from the acid liquor by means of the separating funnel. As first procured, it is a thick, very dark-coloured liquid, of a peculiar strong empyreumatic odour. In this state it is occasionally employed as a liniment; but for internal use it should be rectified. It is said that the scrapings of *copal* and the resin *dammar* are often substituted for amber, and yield an oil scarcely distinguishable from the genuine. (*Pereira's Mat. Med.*)

Off. Prep. Oleum Succini Rectificatum. W.

OLEUM SUCCINI RECTIFICATUM. *U. S. Rectified Oil of Amber.*

"Take of Oil of Amber *a pint;* Water *six pints.* Mix them in a glass retort, and distil until four pints of the Water shall have passed with the oil into the receiver; then separate the Oil from the Water, and keep it in well stopped bottles." *U. S.*

By successive distillations the oil of amber is rendered thinner and more limpid, till at length it is obtained colourless. The first portions which distil are less coloured than those which follow, and may be separated for keeping, while the remainder is submitted to another distillation. For practical purposes, however, the oil is sufficiently pure when once redistilled, as directed in the U. S. Pharmacopœia. As usually found in the shops, the rectified oil is of a light yellowish-brown or amber colour. When quite pure it is colourless, as fluid as alcohol, of the sp. gr. 0·758 at 75°, and boils at 186°. It has a strong, peculiar, unpleasant odour, and a hot, acrid taste. It imparts these properties in some degree to water without being perceptibly dissolved. It is soluble in eight parts of alcohol of the sp. gr. 0·847 at 55°, in five parts of the sp. gr. 0·825, and in all proportions in absolute alcohol. The fixed oils unite with it. On exposure to the light and air, it slowly changes in colour and consistence, becoming ultimately black and solid. It appears, when quite pure, to be a carbohydrogen, consisting, according to Dr. Döpping, of 88·46 parts of carbon and 11·54 of hydrogen in 100 parts. (*Chem. Gaz.*, Nov. 1845, p. 447.) It is said to be sometimes adulterated with oil of turpentine, which may be detected by passing muriatic acid gas through the suspected oil. If pure it will remain wholly liquid; while oil of turpentine if present will give rise to the formation of solid artificial camphor. (*Pharm. Journ. and Trans.*, 13, 292.)

Medical Properties and Uses. Rectified oil of amber is stimulant and antispasmodic, and occasionally promotes the secretions, particularly that of urine. It has been employed with advantage in amenorrhœa, and in various spasmodic and convulsive affections, as tetanus, epilepsy, hysteria, hooping-cough, and infantile convulsions from intestinal irritation, &c. The dose is from five to fifteen drops, diffused in some aromatic water by means of sugar and gum Arabic. Externally applied the oil is rubefacient, and is considerably employed as a liniment in chronic rheumatism and palsy, and in certain spasmodic disorders, as hooping-cough and infantile convulsions. In the latter affection it should be

rubbed along the spine, and was highly recommended by the late Dr. Joseph Parrish, mixed with an equal measure of laudanum, and diluted with three or four parts of olive oil and of brandy. W.

OLEUM TABACI. *U. S. Oil of Tobacco.*

"Take of Tobacco, in coarse powder, *a pound.* Put the Tobacco into a retort of green glass, connected with a refrigeratory, to which a tube is attached for the escape of the incondensible products; then, by means of a sand-bath, heat the retort gradually to dull redness, and maintain that temperature until empyreumatic oil ceases to come over. Lastly, separate the dark oily liquid in the receiver from the watery portion, and keep it for use." *U. S.*

This is a black, thickish liquid, of a strong characteristic odour, identical with that of old tobacco pipes, and in no degree resembling that of undecomposed tobacco. It may be obtained colourless by rectification, but soon becomes yellowish, and ultimately brown. It probably contains a portion of nicotia volatilized unchanged, and is a powerful poison, unfit for internal use, and when employed externally requiring much caution. Mixed with simple ointment or lard in the proportion of twenty drops to an ounce, it has been used as an application to indolent tumours, buboes, ulcers, and obstinate cutaneous eruptions; but in all cases where the cuticle is wanting, it should be employed with reserve, and carefully watched. W.

OLEUM TEREBINTHINÆ PURIFICATUM. *Ed. Purified Oil of Turpentine.*

"Take of Oil of Turpentine *one pint;* Water *four pints.* Distil as long as Oil comes over with the Water." *Ed.*

Oil of turpentine becomes impure by exposure, in consequence of the absorption of oxygen and the production of resin. From this it may be freed by distillation, as above directed, or by the agency of alcohol. (See *Oleum Terebinthinæ.*) The process for distilling it is attended with some danger, in consequence of the great inflammability of the vapour, and its rapid formation, which causes the liquor to boil over. In this country, the apothecary can almost always purchase the oil sufficiently pure for medical use without the necessity of rectifying it. The presence of a little resin does not interfere with its efficiency as a medicine. W.

OLEUM VALERIANÆ. *U. S. Oil of Valerian.*

This was introduced for the first time as an officinal into the U. S. Pharmacopœia of 1850. It is obtained from the root of Valeriana officinalis by the usual process of distillation with water. Very good oil has been distilled from the root cultivated in this country. As first procured, it is of a pale-greenish colour, of the sp. gr. 0·934, with a pungent odour of valerian, and an aromatic taste. Upon exposure, it becomes yellow and viscid. It is a complex substance, containing 1. a carbohydrogen isomeric with pure oil of turpentine, 2. a small proportion of stearoptene of an odour resembling that of camphor and pepper, and formed probably by the combination of water with the preceding constituent, 3. a peculiar oxygenated oil, called *valerol* ($C_{20}H_{12}O$, Kane's *Chemistry*), which by the agency of the air is converted into *valerianic* (*valeric*) *acid* and a resinous matter; and 4. valerianic acid, which always exists in the oil in small proportion, but is increased by exposure. The conversion of valerol into valerianic acid through the agency of atmospheric oxygen is very much promoted by the presence of caustic alkalies, which combine with the acid when formed, to produce valerianates. The oil of valerian exercises the influence of the root upon the nervous system, and is frequently administered as a substitute for it in the dose of four or five drops. W.

PILULÆ.

Pills.

These are small globular masses of a size convenient for swallowing. They are well adapted for the administration of medicines which are unpleasant to the taste or smell, or insoluble in water, and do not require to be given in large doses. Deliquescent substances should not be made into pills; and those which are effloresceent should be previously deprived of their water of crystallization. Care should also be taken not to combine materials, the mutual reaction of which may result in a change of form.

Some substances have a consistence which enables them to be made immediately into pills. Such are the softer extracts and certain gum-resins; and the addition of a little water to the former, and a few drops of spirit to the latter, will give them the requisite softness and plasticity, if previously wanting. Substances which are very soft, or in the liquid state, are formed into the pilular mass by incorporation with dry and inert powders, such as crumb of bread, wheat flour, starch, and powdered gum Arabic. Powders must be mixed with soft, solid bodies, as extracts, confections, soap, &c., or with tenacious liquids, as syrup, molasses, honey, or mucilage. Heavy metallic powders are most conveniently made into pills with the former; light vegetable powders with the latter. Mucilage is very often used; but pills made with it are apt when kept to become hard, and of difficult solubility in the liquors of the stomach, and if metallic substances are mixed with it, the mass does not work well. A mixture of syrup and powdered gum Arabic is not subject to the same inconveniences, and is an excellent material for the formation of pills. Conserve of roses and molasses are among the best excipients, when the pills are to be long kept. For the same purpose of keeping the pill soft, a small portion of some fixed oil or deliquescent salt has been recommended as an addition to the mass. Many powders require only the addition of water. Such are all those which contain ingredients capable of forming an adhesive or viscid solution with that liquid. Care should always be taken that the matter added be not incompatible with the main ingredients of the pill.

The materials should be accurately mixed together, and beat in a mortar till formed into a perfectly uniform and plastic mass. This should be of such a consistence that the pills may preserve their form, without being so hard as to resist the solvent power of the gastric liquors. As pills often become very hard by time, it is often convenient to keep the mass in a state fit to be divided when wanted for use. This may be done by wrapping it in bladders, putting it in covered pots, and occasionally moistening it as it becomes dry; or more effectually by keeping it in glass or well glazed jars, accurately closed with varnished bladder.

The mass, having been duly prepared, is made into pills by rolling it with a spatula into a cylinder of precisely the same thickness throughout, and of a length corresponding to the number of pills required. It is then divided as equally as possible by the hand, or more accurately by a machine made for the purpose.* The pills receive a spherical form by being rolled between the fingers. M. Mialhe describes a little instrument for rolling pills, composed of two circular plates, one about 12, the other 6 inches in diameter, the former having a ledge at the border one-third of an inch high, the latter with a similar ledge varying

* The common pill-machine is too well known to require description. In the *Am. Journ. of Pharm.* (xxiv. 315) the reader will find the description of a rotary pill-machine, calculated to prepare large numbers of pills in a short time; and in the same journal (xxvi. 118) another, which is considered to be an improvement on the first.

according to the size of the pills from less than a line to nearly two lines, and with a strap on the back by which it can be fitted to the hand. This is to be moved in a rotary manner upon the larger plate holding the divided portions of the pill mass. (*Journ. de Pharm. et de Chim.*, xvii. 218.) In order to prevent the adhesion of pills to one another, or to the sides of the vessel in which they may be placed, it is customary to agitate them with some dry powder, which gives them an external coating, that serves also to conceal their taste. For this purpose, carbonate of magnesia, starch, or powdered liquorice root may be used. Carbonate of magnesia is sometimes incompatible with one of the ingredients of the pills; and liquorice root will, as a general rule, be found the best. The powder of *lycopodium* is much employed on the continent of Europe; and it was formerly the custom to give the pill a coating of gold or silver leaf.

It has been proposed by M. Garot to cover pills with gelatin, which answers the purpose of concealing their taste and odour, and counteracting deliquescence or chemical change from exposure to the air, without interfering with their solubility in the stomach. He dips each pill, sustained on the point of a pin, into melted gelatin, withdraws it with a rotary motion, then fixes the pin in a paste so as to allow the coating to dry in the air, and, having prepared about fifty pills in this way, proceeds to complete the operation by holding the pin in the flame of a taper so as to melt the gelatin near its point, and then withdrawing it from the pill so as to close up the orifice. The purest glue should be selected for this purpose, melted with the addition of two or three drachms of water to an ounce of the glue, and kept liquid by means of a salt-bath.

Another plan of attaining the same objects, less effectual, but more convenient than the above, is to introduce the pills into a spherical box, to drop on them enough syrup simply to moisten their surface, then to give a rotary movement to the box until the pills are uniformly covered, and finally to add by degrees a powder consisting of equal parts of gum, sugar, and starch, shaking the box with each addition, and continuing the process until nothing more will adhere to the pills. The investing material may be rendered agreeable to the taste and smell by aromatic additions, if deemed advisable. (*Journ. de Pharm. et de Chim.*, x. 32.) M. Calloud finds that a better powder for the purpose, because less disposed to attract moisture, is made by boiling one part of flaxseed and three parts of white sugar with sufficient water till a thick mucilage is formed, evaporating this carefully to dryness, and then pulverizing. (*Ibid.*, xxiii. 301.)

Still another method, proposed by Mr. E. K. Durden, is to cover the pill with a coating of collodion, which completely conceals the taste. The solution employed by Mr. Durden had the sp. gr. of 0·810; and two dippings gave a sufficient coating. (See *Am. Journ. of Pharm.*, xxi. 183.) It is, however, yet to be determined whether a coating of collodion would yield readily to the solvent powers of the gastric juice.

Pills which are to be long kept should be well dried, and put into bottles with accurately fitting stoppers. If it is desirable that they should be kept soft, the better plan is to preserve them in mass as above recommended.

Though the U. S. Pharmacopœia, in almost every instance, orders the mass to be divided into pills; yet it should be understood rather as indicating the number of pills to be made from a certain quantity of the mass when particular directions are not given by the physician, than as requiring the division to be made immediately after the materials have been mixed. It will be found convenient by the apothecary to keep a portion of the mass undivided. W.

PILULÆ ALOËS. *U. S.*, *Ed.* PILULA ALOËS CUM SAPONE. *Lond.* *Aloetic Pills. Pill of Aloes with Soap.*

"Take of Aloes, in powder, Soap, each, *an ounce*. Beat them with water so as to form a mass, to be divided into two hundred and forty pills." *U. S.*

The *London College* takes *equal parts* of extract of Barbadoes aloes, soft soap, and liquorice (extract), and *a sufficiency* of molasses, beats the aloes with the soap, then adds the other ingredients, and beats the whole together.

The *Edinburgh College* directs *equal quantities* of Socotrine or East India aloes and Castile soap to be beat with conserve of red roses into a mass fit for forming pills.

The soap, in this formula, not only serves to impart a proper consistence to the aloes, but is thought to qualify its operation, and diminish its liability to irritate the rectum. Five of the U. S. pills, containing ten grains of aloes, may be given with a view to their purgative effect; but the preparation is usually employed as a laxative in habitual costiveness, in the quantity of one, two, or three pills, taken before breakfast or dinner, or at bedtime. W.

PILULÆ ALOËS COMPOSITÆ. *Dub.* PILULA ALOËS COMPOSITA. *Lond. Compound Pills of Aloes.*

"Take of Aloes, in powder, *an ounce;* Extract of Gentian *half an ounce;* Oil of Caraway *forty minims;* Molasses *a sufficient quantity.* Beat them together, so that they may be intimately mixed in a mass fit for forming pills." *Lond.*

The *Dublin College* directs *two ounces* [avoirdupois] of hepatic aloes, *an ounce* [avoird.] of extract of gentian, *a fluidrachm* of oil of caraway, and *an ounce* [avoird.] of molasses.

A reaction takes place between the aloes and extract of gentian when rubbed together, which renders the mass so soft as sometimes to require the addition of a light powder. This combination is well adapted as a laxative to the costiveness of sedentary and dyspeptic persons. The dose is from five to twenty grains, according to the degree of effect desired.* W.

PILULÆ ALOËS ET ASSAFŒTIDÆ. *U. S., Ed. Pills of Aloes and Assafetida.*

"Take of Aloes, in powder, Assafetida, Soap, each, *half an ounce.* Beat them with water so as to form a mass, to be divided into one hundred and eighty pills." *U. S.*

The *Edinburgh College* takes equal parts of Socotrine or East India aloes, assafetida, and Castile soap, and beats them into a mass with conserve of red roses.

These pills are peculiarly adapted, by the stimulant and carminative properties of the assafetida, to cases of costiveness attended with flatulence and debility of the digestive organs. Each pill contains about four grains of the mass. From two to five may be given for a dose. W.

* The following is the formula for the aloetic pills usually called *dinner pills, or Lady Webster's pills.* They are the *pilulæ stomachicæ* of the fifth edition of the Paris Codex, A. D. 1758. Take of the best Aloes six drachms; Mastich and Red Roses, each, two drachms; Syrup of Wormwood sufficient to form a mass, to be divided into pills of three grains each. Common syrup may be substituted for the syrup of wormwood. One or two of these pills, taken shortly before a meal, will usually produce one free evacuation.

The Philadelphia College of Pharmacy has adopted the following formulæ for the compound aloetic preparations commonly called *Hooper's* and *Anderson's pills.*

"*Hooper's female pills.* ℞. Aloës Barbadensis ʒviij., Ferri Sulphatis Exsiccati ʒij., ʒiss., *vel* Ferri Sulphatis Crystal. ʒiv., Extracti Hellebori ʒij., Myrrhæ ʒij., Saponis ʒij., Canellæ in pulv. tritæ ʒj., Zingiberis in pulv. trit. ʒj.—Beat them well together into a mass with water, and divide into pills, each containing two and a half grains." (*Journ. of the Phil. Col. of Pharm.*, v. 25.)

"*Anderson's Scots' pills.* ℞. Aloës Barbadensis ʒxxiv., Saponis ʒiv., Colocynthidis ʒj., Gambogiæ ʒj., Olei Anisi fʒss. Let the aloes, colocynth, and gamboge be reduced to a very fine powder; then beat them and the soap with water into a mass, of a proper consistence to divide into pills, each containing three grains." *Ibid.*

PILULÆ ALOËS ET FERRI. *Ed.* *Pills of Aloes and Iron.*

"Take of Sulphate of Iron *three parts;* Barbadoes Aloes *two parts;* Aromatic Powder *six parts;* Conserve of Red Roses *eight parts.* Pulverize the Aloes and Sulphate of Iron separately; mix the whole ingredients; and beat them into a proper mass; which is to be divided into five-grain pills." *Ed.*

It is said that the laxative power of aloes is increased, and its tendency to irritate the rectum diminished, by combination with the sulphate of iron. (*Christison's Dispensatory.*) This combination is useful in constipation with debility of stomach, especially when attended with amenorrhœa. The dose is from one to three pills. W.

PILULÆ ALOËS ET MYRRHÆ. *U. S., Ed.* PILULA ALOËS CUM MYRRHÂ. *Lond.* PILULÆ ALOËS CUM MYRRHÂ. *Dub.* *Pills of Aloes and Myrrh.*

"Take of Aloes, in powder, *two ounces;* Myrrh, in powder, *an ounce;* Saffron *half an ounce;* Syrup *a sufficient quantity.* Beat the whole together so as to form a mass, to be divided into four hundred and eighty pills." *U. S.*

The *London College* takes *half an ounce* of Socotrine or hepatic aloes, *two drachms,* each, of saffron, myrrh, and soft soap, and *a sufficiency* of molasses, and beats them together; the *Edinburgh* takes *four parts* of Socotrine or East India aloes, *two parts* of myrrh, and *one part* of saffron, and beats them with conserve of red roses; the *Dublin* takes *two ounces* of hepatic aloes, *an ounce* of myrrh, *half an ounce* of saffron, and *two ounces and a half* of molasses; rubs the first three ingredients together and sifts them; then adds the treacle, and beats the whole into a uniform mass.

This composition has been long in use, under the name of *Rufus's pills.* It is employed as a warm stimulant cathartic in general debility attended with constipation, and retention or suppression of the menses. From three to six pills, or from ten to twenty grains of the mass may be given for a dose. W.

PILULÆ ASSAFŒTIDÆ. *U. S.* *Assafetida Pills.*

"Take of Assafetida *an ounce and a half;* Soap *half an ounce.* Beat them with water so as to form a mass, to be divided into two hundred and forty pills." *U. S.*

Each of these pills contains three grains of the gum-resin. They are a convenient form for administering assafetida, the unpleasant odour and taste of which render it very offensive in the liquid state. W.

PILULÆ CALOMELANOS COMPOSITÆ. *Ed., Dub.* PILULA HYDRARGYRI CHLORIDI COMPOSITA. *Lond.* *Compound Calomel Pills. Compound Pill of Chloride of Mercury.*

"Take of Chloride of Mercury [calomel], Oxysulphuret of Antimony, each, *two drachms;* Guaiacum [resin], in powder, Molasses, each, *half an ounce.* Rub the Chloride with the Oxysulphuret, then with the Guaiacum and Molasses, so as to form a mass." *Lond.*

The *Edinburgh College* takes of calomel and golden sulphuret of antimony, each, *one part;* guaiac, in fine powder, and treacle, each, *two parts;* mixes the solids in fine powder, then the treacle, and beats the whole into a mass, to be divided into six-grain pills. The *Dublin College* agrees with the London, employing about half the quantity of the active ingredients, and *a fluidrachm* of castor oil instead of the molasses.

We prefer the title "compound calomel pills" of the Edinburgh and Dublin Pharmacopœias; as, though not scientific, it is not, like the London name, liable to be confounded with that of corrosive sublimate. The antimonial employed by the Colleges is the same, though under different names, and is identical with

the U. S. precipitated sulphuret. According to Vogel, a reaction takes place between the calomel and sulphuret of antimony, resulting in the production of chloride of antimony and sulphuret of mercury. (*Annal. der Pharm.*, xxviii. 236.) The preparation was originally introduced to the notice of the profession by Dr. Plummer, who found it useful as an alterative, and upon whose authority it was at one time much employed under the name of *Plummer's pills.* The combination is well adapted to the treatment of chronic rheumatism, and of scaly and other eruptive diseases of the skin, especially when accompanied with a syphilitic taint. Four grains of the mass contain about one grain of calomel. From three to six grains or more may be given morning and evening. W.

PILULÆ CALOMELANOS ET OPII. *Ed. Pills of Calomel and Opium.*

"Take of Calomel *three parts;* Opium *one part;* Conserve of Red Roses *a sufficiency.* Beat them into a proper mass, which is to be divided into pills, each containing two grains of Calomel." *Ed.*

The proportion in which opium is united with calomel to meet different indications is so various, that such a combination as the above is scarcely a proper subject for officinal direction. W.

PILULA CAMBOGIÆ COMPOSITA. *Lond.* PILULÆ CAMBOGIÆ. *Ed. Compound Pill of Gamboge.*

"Take of Gamboge, in powder, *two drachms;* Socotrine or Hepatic Aloes, in powder, *three drachms;* Ginger, in powder, *a drachm;* Soft Soap *half an ounce.* Mix the powders together; then add the Soap, and beat the whole together so as to form a mass." *Lond.*

The *Edinburgh College* takes of gamboge, East India or Barbadoes aloes, and aromatic powder, each, *one part,* and of Castile soap *two parts;* pulverizes the gamboge and aloes separately, mixes all the powders, adds the soap, and then a sufficiency of syrup; and beats the whole into a proper pill mass.

This is an active purgative pill, and may be given in the dose of ten or fifteen grains. The formula is that of Dr. George Fordyce simplified. W.

PILULÆ CATHARTICÆ COMPOSITÆ. *U. S. Compound Cathartic Pills.*

"Take of Compound Extract of Colocynth, in powder, *half an ounce;* Extract of Jalap, Mild Chloride of Mercury [calomel], each *three drachms;* Gamboge, in powder, *two scruples.* Mix them together; then with water form a mass, to be divided into one hundred and eighty pills." *U. S.*

This cathartic compound was first made officinal in the second edition of the U. S. Pharmacopœia. It was intended to combine smallness of bulk with efficiency and comparative mildness of purgative action, and a peculiar tendency to the biliary organs. Such an officinal preparation was much wanted in this country, in which bilious fevers, and other complaints attended with congestion of the liver and portal circle generally, so much abound. The object of smallness of bulk is accomplished by employing extracts and the more energetic cathartics; that of a peculiar tendency to the liver, by the use of calomel; and that of efficiency with mildness of operation, by the union of several powerful purgatives. It is a fact, abundantly proved by experience, that drastic cathartics become milder by combination, without losing any of their purgative power. Nor is it difficult, in this case, to reconcile the result of observation with physiological principles. Cathartic medicines act on different parts of the alimentary canal and organs secreting into it. In small doses, both the irritation which they occasion and their purgative effect are proportionably lessened. If several are administered at the same time, each in a diminished dose, it is obvious that

the combined purgative effect of all will be experienced; while the irritation, being feeble in each part affected, and diffused over a large space, will be less sensible to the patient, and will more readily subside. In the compound cathartic pills, most of the active purgatives in common use are associated together in proportions corresponding with their respective doses, so that an excess of any one ingredient is guarded against, and violent irritation from this cause prevented. The name of the preparation may at first sight seem objectionable, as it might be applied to any compound pills possessing cathartic properties; but, when it is considered that the ingredients cannot all be expressed in the title, that no one is sufficiently prominent to give a designation to the whole, and that the preparation is intended as the representative of numerous cathartics, and calculated for a wide range of application, the name will not be considered an inexcusable deviation from ordinary medical nomenclature. It is highly important, for the efficiency of these pills, that they be prepared in exact compliance with the directions, and that the *compound extract of colocynth* and the *extract of jalap* used be of good quality. When they fail, the result is generally ascribable to the substitution of jalap for the extract, or to the use of a compound extract of colocynth made with nearly inert scammony, inferior aloes, and insufficient colocynth, and altogether badly prepared.

Three of the pills, containing 10⅔ grains of the mass, are a medium dose for an adult. In this quantity are four grains of compound extract of colocynth, three of extract of jalap, three of calomel, and two-thirds of a grain of gamboge. A single pill will generally be found to operate as a mild laxative. In a full dose, the preparation acts vigorously on the bowels, producing bilious stools, generally without much pain or disorder of the stomach. It may be employed in most instances where a brisk cathartic is required; but is particularly applicable to the early stages of bilious fevers, to hepatitis, jaundice, and all those derangements of the alimentary canal, or of the general health, which depend on congestion of the portal circle. W.

PILULA COLOCYNTHIDIS COMPOSITA. *Lond.* PILULÆ COLOCYNTHIDIS. *Ed.* PILULÆ COLOCYNTHIDIS COMPOSITÆ. *Dub. Compound Pill of Colocynth.*

"Take of Extract of Colocynth *a drachm;* Extract of Aloes, in powder, *six drachms;* Scammony, in powder, *two drachms;* Cardamom, in powder, *half a drachm;* Soft Soap *a drachm and a half.* Mix the powders together; then add the other ingredients, and beat all together so as to form a mass." *Lond.*

"Take of Socotrine or East India Aloes, and Scammony, of each, *eight parts;* Colocynth *four parts;* Sulphate of Potash and Oil of Cloves, of each, *one part;* Rectified Spirit *a sufficiency.* Pulverize the Aloes, Scammony, and Sulphate of Potash together; mix with them the Colocynth previously reduced to fine powder; add the Oil of Cloves; and with the aid of a small quantity of Rectified Spirit beat the whole into a proper pill mass; which is to be divided into five-grain pills." *Ed.*

"Take of Pulp of Colocynth, in fine powder, *one ounce* [avoirdupois]; Hepatic Aloes, in fine powder, *two ounces* [avoird.]; Scammony, in fine powder, Castile Soap, of each, *one ounce* [avoird.]; Oil of Cloves *one fluidrachm;* Treacle [molasses] *ten drachms* [Dub. weight.]. Reduce the Soap to a fine powder, and mix it with the Colocynth, Aloes, and Scammony; then rub all together with the Oil of Cloves and Treacle, and beat them into a mass of a uniform consistence." *Dub.*

The London preparation is only another form of the *compound extract of colocynth,* for which it was intended as a substitute; the ingredients, the proportions, and the dose being essentially the same. (See *Extractum Colocynthidis Com-*

positum.) The Edinburgh and Dublin preparations are imitations, differing in the proportions of their ingredients, and in containing colocynth in substance instead of the extract of colocynth. The sulphate of potassa is used by the Edinburgh College to promote the more complete division of the aloes and scammony; the rectified spirit, because it is believed to be retained by the mass more firmly than water, and thus to preserve the due consistence longer. The preparation is actively cathartic in the dose of from five to twenty grains.*

Off. Prep. Pilulæ Colocynthidis et Hyoscyami. W.

PILULÆ COLOCYNTHIDIS ET HYOSCYAMI. *Ed.* *Pills of Colocynth and Henbane.*

"Take of the Colocynth-pill mass *two parts;* Extract of Hyoscyamus *one part.* Beat them well together, adding a few drops of rectified spirit if necessary; and divide the mass into five-grain pills." *Ed.*

It is asserted that the compound pill and compound extract of colocynth are almost entirely deprived of their griping tendency by combination, as above, with the extract of hyoscyamus, without losing any of their purgative power. The dose is from five to twenty grains. W.

PILULA CONII COMPOSITA. *Lond.* *Compound Pill of Hemlock.*

"Take of Extract of Hemlock *five drachms;* Ipecacuanha, in powder, *a drachm;* Molasses *a sufficient quantity.* Beat them together so as to form a mass." *Lond.*

An anodyne and expectorant combination, useful in chronic bronchial diseases. The dose is five grains three times a day. W.

PILULÆ COPAIBÆ. *U.S.* *Pills of Copaiba.*

"Take of Copaiba *two ounces;* Magnesia, recently prepared, *a drachm.* Mix them, and set the mixture aside till it concretes into a pilular mass, which is to be divided into two hundred pills." *U.S.*

When copaiba is mixed with pure magnesia, it gradually loses its fluidity, forming at first a soft tenacious mass, and ultimately becoming dry, hard, and brittle. The quantity of magnesia, and the length of time requisite for this change, vary with the condition of the copaiba; being greater in proportion to the fluidity of this substance, or, in other words, to its amount of volatile oil. The quantity of magnesia directed by the Pharmacopœia, one-sixteenth of the weight of the copaiba, is sufficient to solidify the latter, as it is often found in the shops, in the course of six or eight hours; but, when the copaiba is fresh, or has been kept in closely stopped bottles, and retains, therefore, nearly the whole of its oil, it is necessary either to augment the proportion of magnesia, or to expose the mixture for a much longer time, or to diminish the volatile oil of the copaiba by evaporation. The magnesia combines chemically with the copaivic acid or hard resin, but, in relation to the volatile oil, acts merely as an absorbent; for, when the solidified mass is submitted to the action of boiling alcohol, a part is dissolved, abandoning the magnesia with which it was mixed, while the resin combined with another portion of the earth remains undissolved. Varieties of copaiba, therefore, are solidifiable by magnesia, directly in proportion to the hard resin they contain, and inversely in proportion to the volatile oil; the soft resin being indifferent. According to Guibourt, copaiba not solidifiable by mag-

* For some observations relative to the present simple extract of colocynth of the London College, employed in making these pills, showing that there has probably been an error in the last edition of the Pharmacopœia in reference to this extract, and suggesting the course which, under these circumstances, it would be safest for the apothecary to pursue, see *Extractum Colocynthidis*, p. 974.—*Note to the tenth edition.*

nesia, may be made so by adding one-sixth of Bordeaux or common European turpentine. (*Journ. de Pharm.*, xxv. 499.) The magnesia employed should not have been allowed to become hydrated by exposure to a moist air or otherwise. (*Ibid.*, 3e *sér.*, v. 475.) In the preparation of the pills of copaiba, care should be taken to divide the mass before it has become too hard. The advantage of this preparation is, that the copaiba is brought to the state of pill with little increase of bulk. Each pill contains nearly five grains of copaiba, and from two to six may be taken for a dose twice or three times a day.

Hydrate of lime produces the same effect as magnesia, and, as stated by M. Thierry, in a shorter time, if employed according to his formula. He takes 15 parts of copaiba and 1 part of slaked lime, mixes them in a marble mortar, transfers the mixture to an open vessel, places this upon a sand-bath, and sustains the heat for four hours, occasionally stirring. The hydrate of lime must have been freshly prepared from recently burnt lime. The mixture loses only a twenty-fourth of its weight, which is chiefly the water of the hydrate. (*Journ. de Pharm.*, 3e *sér.*, i. 310.) W.

PILULÆ CUPRI AMMONIATI. *Ed. Pills of Ammoniated Copper.*

"Take of Ammoniated Copper, in fine powder, *one part;* Bread-crumb *six parts;* Solution of Carbonate of Ammonia *a sufficiency.* Beat them into a proper mass, and divide it into pills, containing each half a grain of ammoniated copper." *Ed.*

This is a convenient form for administering ammoniated copper. One pill may be given night and morning, and the dose gradually increased to five or six pills. W.

PILULÆ DIGITALIS ET SCILLÆ. *Ed. Pills of Digitalis and Squill.*

"Take of Digitalis and Squill, of each, *one part;* Aromatic Electuary *two parts.* Beat them into a proper mass with Conserve of Red Roses; and divide the mass into four-grain pills." *Ed.*

These pills combine the diuretic properties of digitalis and squill, and may be given in dropsy. One or two pills constitute a dose. W.

PILULÆ FERRI CARBONATIS. *U. S., Ed. Pills of Carbonate of Iron. Vallet's Ferruginous Pills.*

"Take of Sulphate of Iron *eight ounces;* Carbonate of Soda *ten ounces;* Clarified Honey *three ounces;* Sugar, in powder, *two ounces;* Boiling Water *two pints;* Syrup *a sufficient quantity.* Dissolve the Sulphate of Iron and Carbonate of Soda, each, in a pint of the Water, a fluidounce of Syrup having been previously added to each pint; then mix the two solutions, when cold, in a bottle just large enough to hold them, close it accurately with a stopper, and set it by that the carbonate of iron may subside. Pour off the supernatant liquid, and, having washed the precipitate with water sweetened with Syrup, in the proportion of a fluidounce of the latter to a pint of the former, until the washings no longer have a saline taste, place it upon a flannel cloth to drain, and afterwards express as much of the water as possible; then immediately mix the precipitate with the Honey and Sugar, and by means of a water-bath evaporate the mixture, constantly stirring, until it is so far concentrated as to have a pilular consistence on cooling." *U. S.*

"Take of the Saccharine Carbonate of Iron *four parts;* Conserve of Red Roses *one part.* Beat them into a proper mass, to be divided into five-grain pills." *Ed.*

The effect of saccharine matter in protecting iron from oxidation has been explained under the heads of *Ferri Carbonas Saccharatum* and *Liquor Ferri Iodidi.* The *U. S.* pill of carbonate of iron is another example of a ferruginous

preparation, in which the iron is protected from further oxidation by the same means. The salts employed are the same as those used for obtaining the officinal subcarbonate of iron; but, in forming that preparation, the carbonate which is at first precipitated absorbs oxygen and loses nearly all its carbonic acid in the processes of washing and drying. When, however, as in the U. S. formula, above given, the reacting salts are dissolved in weak syrup instead of water, and the washing is performed with the same substance, the absorption of oxygen and loss of carbonic acid, during the separation of the precipitate, are almost completely prevented. It only remains, therefore, to preserve it unaltered, and to bring it to the pilular consistence, and this is effected by admixture with honey and sugar, and evaporation by means of a water-bath. Of course it is essential to the success of this process, that the sulphate of iron should be pure; otherwise some sesquioxide will be present in the product. The process just explained is that of M. Vallet, of Paris, after whom the preparation is popularly called. The *Edinburgh* pill of carbonate of iron is made from the saccharine carbonate, which is brought to the pilular consistence by being mixed with conserve of roses. This mode of making it is inferior to that of Vallet; for, in the first place, the saccharine carbonate is admitted to contain sesquioxide of iron, and secondly conserve of roses is a less efficient preservative of the pilular mass than honey and sugar. (See *Ferri Carbonas Saccharatum.*)

Properties. The U. S. preparation is in the form of a soft pilular mass, of a uniform black colour, and strong ferruginous taste. When carefully prepared, it is wholly and readily soluble in acids. It contains nearly half its weight of carbonate of protoxide of iron. The corresponding pill, obtained from the saccharine carbonate, may be supposed to contain one-third of ferruginous matter.

Medical Properties. The U. S. pill of carbonate of iron, or Vallet's ferruginous mass, is admirably adapted to cases in which ferruginous preparations are indicated. It is considered particularly useful in chlorosis, amenorrhœa, and other female complaints, and appears to act favourably by increasing the colouring matter of the blood, causing the capillary system to become more fully injected, and the lips to assume a redder colour. It may be given in divided doses to the extent of from ten to thirty grains in the course of the day, and continued for a month or six weeks, if improvement takes place. As the mass is not divided in the U. S. formula, it is necessary in prescription to indicate the weight of each pill, which may vary from three to five grains, according to the views of the prescriber. There can be but little doubt that, in cases in which the alterative effects of iron are called for, Vallet's preparation is one of the best that can be employed. Its chief merits are its unchangeableness and ready solubility in acids. For further information respecting it, see the favourable report made on Vallet's ferruginous pills to the French Royal Academy of Medicine, in 1837, by M. Soubeiran, republished in the *Am. Journ. of Pharm.*, x. 244, and the paper on carbonate of iron by Professor Procter, contained in the same journal, x. 272. B.

PILULÆ FERRI COMPOSITÆ. *U. S.* PILULA FERRI COMPOSITA. *Lond. Compound Pills of Iron.*

"Take of Myrrh, in powder, *two drachms;* Carbonate of Soda, Sulphate of Iron, each, *a drachm;* Syrup *a sufficient quantity.* Rub the Myrrh with the Carbonate of Soda; then add the Sulphate of Iron, and again rub them; lastly, beat them with the Syrup so as to form a mass, to be divided into eighty pills." *U. S.*

The directions of the *London College* are essentially the same as the above, *a drachm* of molasses being substituted for the indefinite quantity of syrup, and the previous heating of the mortar ordered. The London preparation is not divided into pills.

This preparation is closely analogous to the Mistura Ferri Composita in properties and composition. It is a good emmenagogue and antihectic tonic. As its peculiar advantages depend upon the presence of carbonate of protoxide of iron, which speedily changes into the sesquioxide on exposure, it is proper that only so much of the mass should be prepared as may be wanted for immediate use. It is said that the iron will be better preserved in the state of protoxide, if, instead of mixing the ingredients as directed in the Pharmacopœia, the operator should first dissolve the sulphate of iron, finely powdered, in the syrup, with a moderate heat, then add the carbonate of soda, stirring till effervescence ceases, and lastly incorporate the myrrh. From two to six pills may be given at a dose, three times a day. W.

PILULÆ FERRI IODIDI. *U. S. Pills of Iodide of Iron.*

"Take of Sulphate of Iron *a drachm;* Iodide of Potassium *four scruples;* Tragacanth, in powder, *ten grains;* Sugar, in powder, *half a drachm.* Beat them with Syrup so as to form a mass, to be divided into forty pills." *U. S.*

These pills are formed on the plan proposed by M. Calloud. The iodide of iron results from a double decomposition between crystallized sulphate of protoxide of iron and iodide of potassium; and sulphate of potassa is at the same time formed, which, consequently, is an ingredient in the pill. There is also present some iodide of potassium, which is taken in a quantity more than sufficient to decompose all the sulphate of iron. In forming the pill, the sulphate and iodide should be rubbed together until they are thoroughly mixed; after which the sugar and tragacanth should be incorporated, and lastly the syrup. The sugar used is intended to protect the iodide of iron formed from oxidation.

This pill is a new officinal of the U. S. Pharmacopœia of 1850. It was considered desirable to have a pill of iodide of iron; and as the officinal iodide does not keep well, and is not readily made into pills, it was thought by the revisers of our national standard that the process of Calloud, by double decomposition, would, probably, furnish a convenient extemporaneous pill, which would not be injured by the presence of a little sulphate of potassa. But the presence also of some iodide of potassium also renders it still more complex, and forms an objection to it. This pill should never be kept, but made only when wanted for immediate use. It is rather friable in its consistence, and exhales iodine slightly when made for some time. Its taste is styptic and rather acrid, and it is, therefore, unpleasant to swallow. It may be presumed to create some irritation of the stomach before it is dissolved. When freshly prepared, each pill contains a little over a grain and a half of iodide of iron. The therapeutic applications of this preparation are the same as those of the solution of iodide of iron. (See *Liquor Ferri Iodidi.*) The latter, however, is in all respects a preferable form. For other formulæ for making a pill of iodide of iron from the solid iodide directly, see *Ferri Iodidum,* page 1005. B.

PILULÆ FERRI SULPHATIS. *Ed. Pills of Sulphate of Iron.*

"Take of Dried Sulphate of Iron *two parts;* Extract of Taraxacum *five parts;* Conserve of Red Roses *two parts;* Liquorice-root powder *three parts.* Beat them together into a proper mass, which is to be divided into five-grain pills." *Ed.*

There may be some doubt of the propriety of mixing the sulphate of iron with the confection of roses, by the tannic acid of which it must be decomposed. The dose is from five to twenty grains. W.

PILULÆ GALBANI COMPOSITÆ. *U. S.* PILULA GALBANI COMPOSITA. *Lond.* PILULÆ ASSAFŒTIDÆ. *Ed.* PILULÆ ASSAFŒTIDÆ COMPOSITÆ. *Dub. Compound Pills of Galbanum.*

"Take of Galbanum, Myrrh, each, *six drachms;* Assafetida *two drachms;*

Syrup *a sufficient quantity.* Beat them together, so as to form a mass, to be divided into two hundred and forty pills." *U. S.*

The *London College* beats together into a mass *two drachms* of prepared galbanum, *three drachms*, each, of myrrh and prepared sagapenum, *a drachm* of prepared assafetida, *two drachms* of soft soap, and *a sufficient quantity* of molasses. The *Edinburgh College* takes of assafetida, galbanum, and myrrh, each, *three parts*, conserve of red roses *four parts* or *a sufficient quantity*, mixes them, and beats them into a proper pilular mass. The *Dublin College* takes *two ounces* of assafetida, and *an ounce*, each, of galbanum, myrrh, and molasses, heats them in a capsule, by means of a steam or water bath, and stirs the mass until it assumes a uniform consistence.

This compound is given as an antispasmodic and emmenagogue in chlorosis and hysteria. The dose is from ten to twenty grains. W.

PILULÆ HYDRARGYRI. *U. S., Ed., Dub.* PILULA HYDRARGYRI. *Lond. Mercurial Pills. Blue Pills.*

"Take of Mercury *an ounce;* Confection of Roses *an ounce and a half;* Liquorice Root, in powder, *half an ounce.* Rub the Mercury with the Confection till all the globules disappear; then add the Liquorice Root, and beat the whole into a mass, to be divided into four hundred and eighty pills." *U. S.*

The process of the *London College* is the same with the above, one-half only of the quantity of materials being used. The *Dublin* process differs only in about doubling the quantity of the materials. Neither of these Colleges orders the mass to be divided into pills. The *Edinburgh* process corresponds with that of the U. S. Pharmacopœia, except that the relative quantity of the ingredients is expressed in parts, and the mass is divided into five-grain pills.

This preparation is very generally known by the name of *blue pill* or *blue mass.* The mercury constitutes one-third of the mass; and consequently the pill of our Pharmacopœia, which weighs three grains, contains one grain of the metal.

The precise condition of the mercury in this preparation is somewhat uncertain. By far the greater portion is in a state of minute mechanical division, and not chemically altered. Some maintain that the whole of the metal is in this state, others, that a small portion is converted during the trituration into protoxide, and that this is the ingredient upon which the activity of the pill depends. The supposed oxidation is attributed partly to the influence of the air upon the surface of the metal, greatly extended by the separation of its particles, partly to the action of the substance used in the trituration. If the mercury be not oxidized during the trituration, there can be little doubt that it becomes so to a slight extent by subsequent exposure. The obvious changes which the mass undergoes by time can be explained in no other way; and protoxide of mercury is asserted to have been actually extracted from old mercurial pill. Nevertheless, it scarcely admits of dispute, that the metal, quite independently of oxidation out of the body, is capable of producing the peculiar mercurial effects when introduced into the stomach, probably undergoing chemical changes there. According to M. Mialhe, mercury is slowly converted into corrosive sublimate in the stomach, under the combined agency of air and chloride of sodium. All agree that the efficacy of the preparation is proportionate to the extinction of the mercury, in other words, to the degree in which the metallic globules disappear. This extinction may be effected by trituration with various substances; and manna, syrup, honey, liquorice, mucilage, soap, guaiac, and extract of dandelion have been recommended, among others, for this purpose; but the confection of roses has been adopted in all the Pharmacopœias, as less liable to objection than any other. The mercury is known to be completely extinguished, when, upon rubbing a small portion of the mass with the end of the finger upon a piece of paper or glass, no globules appear. Powdered liquorice root is added in order

to give due consistence to the mass. Some prefer for the purpose powdered marshmallow root. As the trituration requires to be long continued, and renders the process very laborious, it is customary to prepare the mass by machinery. At Apothecaries' Hall, in London, the trituration is effected by the agency of steam. The machine there employed consists of "a circular iron trough for the reception of the materials, in which revolve four wooden cylinders, having also a motion on their axis." A machine for preparing blue mass, capable of being worked by the hand or by steam-power, has been invented by Mr. J. W. W. Gordon, of Baltimore, and, having been found to answer well, is in extensive use. It is described and figured in the *American Journal of Pharmacy* (xxi. 6).* Formerly much of the blue mass used in this country was imported; but at present the market is chiefly supplied by our own druggists. The preparation slowly changes colour upon being kept, assuming an olive and sometimes even a reddish tint, in consequence, probably, of the further oxidation of the mercury.†

Medical Properties and Uses. These pills are among the mildest of the mercurials, being less liable than most others to act upon the bowels, and exercising the peculiar influence of the remedy upon the system with less irritation. They are much employed for producing the sialagogue and alterative action of mercury. For the former purpose, one pill may be given two or three times a day; and in urgent cases the dose may be increased. Even this preparation sometimes disturbs the bowels. It should then be given combined with a little opium, or in very minute doses, as half a grain or a grain of the mass repeated every hour or two through the day, so as to allow of its absorption before a sufficient quantity has been administered to act as an irritant. With a view to the alterative effect upon the digestive organs, one pill may be given every night, or every other night, at bedtime, and followed in the morning, if the bowels should not be opened, by a small dose of laxative medicine. From five to fifteen grains of the mass are occasionally given as a cathartic, in cases requiring a peculiar impression upon the liver; but when used for this purpose, it should always either be combined with or speedily followed by a more certain purgative. The *blue mass* may frequently be administered with advantage, suspended in water by the intervention of thick mucilage; and it forms an excellent addition to the chalk mixture in diarrhœa, particularly that of children, when the biliary secretion is deficient, or otherwise deranged. W.

* Mr. James Beatson, Apothecary of the U. S. Naval Hospital at New York, has found great advantage in the following mode of preparing the mercurial pill, which, while much easier than the officinal method, yields the same results. Instead of mixing the mercury with the confection, he first rubs it with the honey directed in the preparation of the confection, until the globules disappear, then adds the heated rose water and sugar, and lastly the powdered red roses and liquorice root in succession, all in the officinal proportions. For the quantity of the material directed in the U. S. process for the confection of roses, he employs 32 ounces of mercury. (*Am. Journ. of Pharm.*, xxiv. 204.)

† This preparation is very apt to contain less than the due proportion of mercury. This was frequently the case with the mass as formerly imported. The fraud may be detected by the following plan of estimating the proportion of mercury, suggested by Prof. Reid of New York, and modified by a committee of the Philadelphia College of Pharmacy. A certain weight of the mercurial pill, say fifty grains, is mixed with about one-fourth of its weight of iron filings, and introduced into a small green glass bulb, at the end of a somewhat curved tube, the open extremity of which is inserted through a cork, into alcohol contained in a broad-mouthed glass vial; another tube, open at both ends, passing through the cork in order to permit the escape of uncondensed gases. Heat is then applied to the bulb by means of a spirit lamp, is gradually increased until the glass becomes red-hot, and continued for an hour. The alcohol in the vial dissolves the empyreumatic products, and, by being allowed to rise in the tube, and then expelled, serves to wash out any mercury that may be condensed upon its sides. The alcohol is poured off from the condensed mercury, which is then washed with fresh alcohol, dried, and weighed. (See *Am. Journ. of Pharm.*, xvii. 151 and 309.)

PILULÆ HYDRARGYRI CHLORIDI MITIS. *U. S. Pills of Mild Chloride of Mercury. Calomel Pills.*

"Take of Mild Chloride of Mercury [calomel] *half an ounce;* Gum Arabic, in powder, *a drachm;* Syrup *a sufficient quantity.* Mix together the Chloride of Mercury and the Gum; then beat them with the Syrup so as to form a mass, to be divided into two hundred and forty pills." *U. S.*

This is a convenient form for administering calomel, of which one grain is contained in each pill. Soap, which was directed in the preparation of this pill in the first edition of the Pharmacopœia, is objectionable on account of its chemical incompatibility with calomel.* Mucilage of gum Arabic alone does not form a sufficiently plastic mass; but gum and syrup united, as in the officinal formula, answer admirably well, forming a mass which is easily made into pills, and which readily yields to the solvent power of the stomach. W.

PILULA IPECACUANHÆ CUM SCILLÂ. *Lond. Pill of Ipecacuanha with Squill.*

"Take of Compound Powder of Ipecacuanha [Dover's powder] *three drachms;* Squill, recently powdered, Ammoniac, in powder, each, *a drachm;* Molasses a *sufficient quantity.* Beat them together so as to form a mass." *Lond.*

An anodyne, somewhat stimulating, and expectorant combination, applicable to cases of chronic bronchial disease. The dose is from five to ten grains. W.

PILULÆ IPECACUANHÆ ET OPII. *Ed. Pills of Ipecacuanha and Opium.*

"Take of Powder of Ipecacuan and Opium *three parts;* Conserve of Red Roses *one part.* Beat them into a proper mass, which is to be divided into four-grain pills." *Ed.*

This is merely the Dover's powder in a pilular form; as there can scarcely be a doubt that the College intended by the name "powder of ipecacuan and opium," to designate the preparation which they now call "compound powder of ipecacuanha." These pills are narcotic and sudorific. The quantity of the mass equivalent to a grain of opium is about thirteen grains; but it is usually employed in smaller doses. W.

PILULÆ OPII. *U. S.* PILULÆ OPII *sive* THEBAICÆ. *Ed. Pills of Opium.*

"Take of Opium, in powder, *a drachm;* Soap *twelve grains.* Beat them with water so as to form a mass, to be divided into sixty pills." *U. S.*

"Take of Opium *one part;* Sulphate of Potassa *three parts;* Conserve of Red Roses *one part.* Beat them into a proper mass, which is to be divided into five-grain pills." *Ed.*

The process of the U. S. Pharmacopœia is designed merely to furnish a convenient formula for putting opium into the pilular form, preferable to the mode sometimes practised of making the pills directly from the unpowdered mass of opium as found in commerce. The soap answers no other purpose than to give a due consistence, and is therefore in small proportion. Each pill contains a grain of opium.

* In order to test the point of this presumed incompatibility, Prof. Procter, at our request, made some experiments, from which it resulted that a hot solution of pure white Castile soap, allowed to cool, produces no change in calomel with which it is agitated; but that, if the same solution is heated with calomel, a somewhat vigorous reaction takes place, resulting, by double decomposition, in the production of chloride of sodium, and oleo-margarate of the protoxide of mercury. But the experiment does not decide, whether long contact between calomel and soap, as in the form of pill, might not be followed by the same effects as when heat is employed. There can be no doubt of the incompatibility of calomel and common soap with an excess of alkali.—*Note to the tenth edition.*

The object intended to be answered by the Edinburgh preparation is somewhat uncertain. The proportion of the opium corresponds with that in the *Pilulæ Saponis Compositæ* of the other Pharmacopœias, but the name given to the preparation indicates that there could be no intention to conceal its nature; while the direction to divide the mass into pills of five grains, each containing a grain of opium, shows that the design was not to offer the means of exhibiting small doses of that narcotic in the pilular form. The object probably was merely to separate the particles of opium by the intervention of sulphate of potassa, and thus to render it more soluble in the gastric liquors. In this case, the preparation ranks rather with the U. S. *pills of opium*, with which we have placed it, than with the *compound pills of soap.*

As hard old opium pills are sometimes preferred, in cases of irritable stomach, in consequence of their slow solution, it is proper for the apothecary to keep some in this state to meet the prescription of the physician.

Of either of the officinal pills above directed, one is a medium dose in reference to the full effects of opium. W.

PILULÆ PLUMBI OPIATÆ. *Ed. Opiate pills of Lead.*

"Take of Acetate of Lead *six parts;* Opium *one part;* Conserve of Red Roses about *one part.* Beat them into a proper mass, which is to be divided into four-grain pills. This pill may be made also with twice the quantity of opium." *Ed.*

This pill would be better left to extemporaneous prescription; the requisite proportion of opium to the acetate varying in different cases. Besides, to have two preparations under the same name, one containing twice as much opium as the other, must lead to confusion, and is altogether objectionable. The tannic acid of the confection of roses decomposes a portion of the acetate; but the resulting tannate of lead is not inert. Each pill contains three grains of acetate of lead, which is generally too much for a commencing dose. W.

PILULÆ QUINIÆ SULPHATIS. *U. S. Pills of Sulphate of Quinia.*

"Take of Sulphate of Quinia *an ounce;* Gum Arabic, in powder, *two drachms;* Honey *a sufficient quantity.* Mix together the Sulphate of Quinia and the Gum; then beat them with the Honey so as to form a mass, to be divided into four hundred and eighty pills." *U. S.*

As the pills made as here directed are apt to become hard, and of difficult solubility when long kept, various other excipients have been recommended to obviate this disadvantage, as honey alone, and confection of roses. Mr. Edward Parrish has long been in the habit of preparing pills of sulphate of quinia, by taking 20 grains of the salt, adding 15 drops of aromatic sulphuric acid, and triturating with a spatula until the mixture assumes a pilular consistence. Though at first liquid, the mixture soon thickens, and finally becomes quite solid. The officinal sulphate is thus rendered more soluble by combining with an additional eq. of sulphuric acid. The advantages of this process are the solubility of the resulting pill, and the smallness of its bulk. A five-grain pill made in this way is not inconveniently large. (*Am. Journ. of Pharm.*, xxv. 292.)

Each of the officinal pills contains a grain of sulphate of quinia, and twelve are equivalent to an ounce of good Peruvian bark. W.

PILULÆ RHEI. *U. S., Ed. Pills of Rhubarb.*

"Take of Rhubarb, in powder, *six drachms;* Soap *two drachms.* Beat them with water so as to form a mass, to be divided into one hundred and twenty pills." *U. S.*

"Take of Rhubarb, in fine powder, *nine parts;* Acetate of Potash *one part;* Conserve of Red Roses *five parts.* Beat them into a proper mass, and divide it into five-grain pills." *Ed.*

Rhubarb is so often given in the pilular form, that it is convenient both for the physician and apothecary to have an officinal formula, indicating the mode of preparing the pills, as well as the quantity of rhubarb to be contained in each. Soap, as directed by the U. S. Pharmacopœia, has stood the test of long experience as a good excipient for rhubarb. The medicine is sufficiently disposed to constipate without the addition of the confection of roses, ordered by the Edinburgh College. The acetate of potassa directed by the College is probably intended to keep the pill soft. The U. S. formula is decidedly preferable. According to both, each pill contains three grains of rhubarb. W.

PILULÆ RHEI COMPOSITÆ. *U. S., Ed., Dub.* PILULA RHEI COMPOSITA. *Lond. Compound Pills of Rhubarb.*

"Take of Rhubarb, in powder, *an ounce;* Aloes, in powder, *six drachms;* Myrrh, in powder, *half an ounce;* Oil of Peppermint *half a fluidrachm.* Beat them with water so as to form a mass, to be divided into two hundred and forty pills." *U. S.*

The *London College* takes *half of the above quantities* of powdered rhubarb, aloes, and myrrh; mixes them; then adds *half a drachm* of soft soap, *fifteen minims* of oil of caraway, and *sufficient* molasses; and beats them all together. The *Edinburgh College* takes of rhubarb *twelve parts*, aloes *nine parts*, myrrh and Castile soap, each, *six parts*, oil of peppermint *one part*, and conserve of red roses *five parts;* mixes them, and beats them into a mass, which is divided into five-grain pills. This College also allows the pills to be made without oil of peppermint, when so preferred. The *Dublin College* uses the same ingredients as the *Edinburgh*, in the same relative proportions, except that sixteen parts of molasses are used instead of five parts of conserve of roses. The proportion of molasses ("treacle," *Dub.*) is so large that we suspect some error of the press.

This is a warm tonic laxative, useful in costiveness with debility of stomach. From two to four pills, or from ten to twenty grains of the mass, may be taken twice a day. W.

PILULÆ RHEI ET FERRI. *Ed. Pills of Rhubarb and Iron.*

"Take of Dried Sulphate of Iron *four parts;* Extract of Rhubarb *ten parts;* Conserve of Red Roses *five parts.* Beat them into a proper pill mass, and divide it into five-grain pills." *Ed.*

Tonic and laxative in the dose of two or three pills. W.

PILULÆ SAPONIS COMPOSITÆ. *U. S., Dub.* PILULA SAPONIS COMPOSITA. *Lond. Compound Pills of Soap.*

"Take of Opium, in powder, *half an ounce;* Soap *two ounces.* Beat them with water so as to form a pilular mass." *U. S.*

The *London College* takes of opium and liquorice root, each, in powder, *two drachms*, of soft soap *six drachms*, and beats them into a mass; the *Dublin* takes of opium, in fine powder, *half an ounce* [avoirdupois], Castile soap *two ounces* [avoird.], and of distilled water *half a fluidrachm* or *a sufficiency*, reduces the soap to a fine powder, adds the opium and water, and beats into a mass.

This preparation is useful by affording the opportunity of conveniently administering opium, in a pilular and readily soluble form, in small fractions of a grain. The name adopted in the Pharmacopœias was probably intended to conceal the nature of the preparation from the patient. One grain of opium is contained in five of the mass. W.

PILULÆ SCILLÆ COMPOSITÆ. *U. S., Dub.* PILULA SCILLÆ COMPOSITA. *Lond.* PILULÆ SCILLÆ. *Ed. Compound Pills of Squill.*

"Take of Squill, in powder, *a drachm;* Ginger, in powder, Ammoniac, in powder, each, *two drachms;* Soap *three drachms;* Syrup *a sufficient quantity.*

Mix the powders together; then beat them with the Soap, and add the Syrup so as to form a mass, to be divided into one hundred and twenty pills." *U. S.*

The *London College* employs the same materials, in the same quantities, except that it substitutes soft soap for Castile soap, and *a drachm* of molasses for the sufficiency of syrup; and completes the process in the same manner, but without dividing the mass. The *Edinburgh College* takes of squill, in fine powder, *five parts;* ammoniac, ginger, in fine powder, and Spanish soap, each, *four parts;* conserve of red roses *two parts;* mixes the powders; then adds the other ingredients; and beats them into a uniform mass, which is divided into five-grain pills. The *Dublin College* reduces *two ounces* [avoirdupois] of Castile soap to fine powder, adds *half an ounce* [avoird.] of finely powdered opium, and *half a fluidrachm* or *as much as may be sufficient* of distilled water, and beats the mixture into a uniform mass.

This is a stimulant expectorant compound, depending for its virtues chiefly on the squill, and applicable to the treatment of chronic affections of the bronchial mucous membrane. From five to ten grains may be given three or four times a day. The preparation should be made when wanted for immediate use, as the squill which it contains is liable to be injured by keeping. W.

PILULA STYRACIS COMPOSITA. *Lond.* PILULÆ STYRACIS. *Ed. Compound Pill of Storax.*

"Take of Prepared Storax *six drachms;* Opium, in powder, Saffron, each, *two drachms.* Beat them together, so as to form a mass." *Lond.*

The *Edinburgh College* takes of opium and saffron, each, *one part,* and of extract of storax *two parts,* and beats them into a uniform mass, which is divided into four-grain pills.

In these pills, the storax and saffron are added merely to conceal the taste and smell of the opium, as the name of the pills is intended to conceal their real character. This contrivance is deemed necessary; as some individuals have a prejudice against the use of opium, which reason cannot overcome. Five grains of the mass contain a grain of opium. W.

PLUMBUM.

Preparations of Lead.

LIQUOR PLUMBI SUBACETATIS. *U.S., Dub.* LIQUOR PLUMBI DIACETATIS. *Lond.* PLUMBI DIACETATIS SOLUTIO. *Ed. Solution of Subacetate of Lead.*

"Take of Acetate of Lead *sixteen ounces;* Semivitrified Oxide of Lead, in fine powder, *nine ounces and a half;* Distilled Water *four pints.* Boil them together in a glass or porcelain vessel for half an hour, occasionally adding Distilled Water so as to preserve the measure, and filter through paper. Keep the solution in closely stopped bottles." *U. S.* The sp. gr. of this solution is 1·267.

"Take of Acetate of Lead *two pounds and three ounces;* Oxide of Lead [litharge], rubbed into powder, *a pound and four ounces;* Distilled Water *six pints* [Imperial measure]. Boil for half an hour, occasionally stirring, and, when the solution has cooled, add enough Distilled Water to make it fill six pints [Imp. meas.]; lastly filter. Let it be kept in well stopped bottles." *Lond.* The sp. gr. of the solution is 1·260.

"Take of Acetate of Lead *six ounces and six drachms;* Litharge, in fine powder, *four ounces;* Water *a pint and a half* [Imperial measure]. Boil the Salt and Litharge with the Water for half an hour, stirring occasionally. When the solution is cold add Water, if necessary, to make up a pint and a half [Imp. meas.]; and then filter. Preserve the solution in well closed bottles." *Ed.*

"Take of Acetate of Lead *six ounces* [avoirdupois]; Litharge, in fine powder, *four ounces* [avoird.]; Distilled Water *two pints* [Imperial measure]. Dissolve the Acetate of Lead in the Water, and, when the solution is raised to its boiling temperature, add the Litharge in successive portions, and boil gently for half an hour. Add now as much distilled water as will supply what has been lost by evaporation, and filter through paper into a bottle, which should be furnished with an air-tight stopper. The sp. gr. of this solution is 1·066." *Dub.*

Crystallized acetate of lead consists of one equivalent of acetic acid 51, one of protoxide of lead 111·6, and three of water 27=189·6. Litharge, as usually found in the shops, is an impure protoxide of lead. When a solution of the former is boiled with the latter, a large quantity of the protoxide is dissolved, and a subacetate of lead is formed, which remains in solution. The precise composition of the subacetate varies with the proportion of acetate of lead and of litharge employed. When the quantity of the latter exceeds that of the former by one-half or more, the acetic acid of the acetate unites, according to the highest chemical authorities, with two additional equivalents of protoxide, forming a tris-acetate; when the two substances are mixed in proportions corresponding with their equivalent numbers, that is, in the proportion of 189·6 of salt to 111·6 of oxide, or 10 to 6 nearly, only one additional equivalent of protoxide unites with the acid, and a diacetate of lead is produced. In all the present officinal processes, the proportions appear to have been arranged in reference to this result. In executing the process, the litharge should be employed in the state of very fine powder, and, according to Thenard, should be previously calcined in order to decompose the carbonate of lead, which it always contains in greater or less proportion, and which is not dissolved by the solution of the acetate.

In former editions of the London and Dublin Pharmacopœias, a different process was directed, consisting in boiling litharge with distilled vinegar, the former being in much larger proportion than necessary to form the neutral acetate. A diacetate was thus produced; but as the vinegar was of uncertain strength, there was necessarily more or less inequality of strength in the preparation. This process, therefore, has been abandoned. The solution prepared from litharge and distilled vinegar has a pale greenish-straw colour, owing to impurities in the vinegar. When made with common vinegar it is brown.

Properties. The solution of subacetate of lead of the Pharmacopœias is colourless, and of a sweetish, astringent taste. When concentrated by evaporation, it deposits on cooling crystalline plates, which, according to Dr. Barker, are flat rhomboidal prisms, with dihedral summits. It has an alkaline reaction, tinging the syrup of violets green, and reddening turmeric paper. One of its most striking properties is the extreme facility with which it is decomposed. Carbonic acid throws down a white precipitate of carbonate of lead; and this happens by mere exposure to the air, or by mixture even with distilled water, if this has had an opportunity of absorbing carbonic acid from the atmosphere. It affords precipitates also with the alkalies, alkaline earths, and their carbonates, with sulphuric and muriatic acids free or combined, with hydrosulphuric acid and the hydrosulphates, with the soluble iodides and chlorides, and, according to Thenard, with solutions of all the neutral salts. Solutions of gum, tannin, most vegetable colouring principles, and many animal substances, particularly albumen, produce with it precipitates consisting of the substance added and oxide of lead. It should be kept in well stopped bottles. It is known to contain a salt of acetic acid by emitting an acetous smell when treated with sulphuric acid; and a salt of lead by yielding a white precipitate with an alkaline carbonate, a yellow one with iodide of potassium, and a black one with hydrosulphuric acid. It is distinguished from the solution of acetate of lead by being precipitated by gum Arabic.

Medical Properties and Uses. This solution is astringent and sedative, but is employed only as an external application. It is highly useful in inflammation arising from sprains, bruises, burns, blisters, &c., to which it is applied by means of linen cloths, which should be removed as fast as they become dry. It always, however, requires to be diluted. From four fluidrachms to a fluidounce, added to a pint of distilled water, forms a solution sufficiently strong in ordinary cases of external inflammation. When applied to the skin denuded of the cuticle, the solution should be still weaker; as constitutional effects might result from the absorption of the lead. Paralysis is said to have been produced by its local action; but we have not witnessed such an effect. The solution has the common name of *Goulard's extract*, derived from a surgeon of Montpellier, by whom it was introduced into general notice, though previously employed.

Off. Prep. Ceratum Plumbi Subacetatis; Ceratum Saponis; Liquor Plumbi Subacetatis Dilutus. W.

LIQUOR PLUMBI SUBACETATIS DILUTUS. *U. S.* LIQUOR PLUMBI DIACETATIS DILUTUS. *Lond.* PLUMBI SUBACETATIS LIQUOR COMPOSITUS. *Dub. Diluted Solution of Subacetate of Lead. Lead-water.*

"Take of Solution of Subacetate of Lead *two fluidrachms;* Distilled Water *a pint.* Mix them." *U. S.*

The *London College* mixes *a fluidrachm and a half* of the solution with *a pint* [Imperial measure] of distilled water, and *two fluidrachms* of proof spirit; the *Dublin*, *two fluidounces* of the solution, with *half a gallon* [Imp. meas.] of distilled water, and *two fluidounces* of proof spirit.

This preparation is convenient; as, in consequence of the subsidence of the carbonate of lead usually formed on the dilution of the strong solution, it enables the apothecary to furnish clear lead-water when it is called for. The strength of the U. S. preparation, though double what it formerly was, might be still further increased without disadvantage. The London preparation is much too feeble. The Dublin College in its Pharmacopœia for 1850 has about tripled the former strength; and its solution is about one-third stronger than that of our own Pharmacopœia. The old French Codex directed two drachms of the strong solution to a pound of distilled water, and an ounce of alcohol of 22° Baumé, and thus formed the *vegeto-mineral water* of Goulard. The minute proportion of proof spirit added by the British Colleges can have little sensible effect. The preparation should be as much as possible excluded from the air. W.

PLUMBI IODIDUM. *U. S., Lond., Ed., Dub. Iodide of Lead.*

"Take of Nitrate of Lead, Iodide of Potassium, each, *four ounces;* Distilled Water *a sufficient quantity.* With the aid of heat, dissolve the Nitrate of Lead in a pint and a half, and the Iodide of Potassium in half a pint of Distilled Water, and mix the solutions. Having allowed the insoluble matter to subside, pour off the supernatant liquid, wash the precipitate with Distilled Water, and dry it with a gentle heat." *U. S.*

"Take of Acetate of Lead *eight ounces;* Iodide of Potassium *seven ounces;* Distilled Water *a gallon* [Imperial measure]. Dissolve the Acetate in six pints of the Water, and filter; and to these add the Iodide of Potassium previously dissolved in two pints of the Water. Wash the precipitate with cold distilled water and dry it. Let it be kept excluded from the light." *Lond.*

"Take of Iodide of Potassium and Nitrate of Lead, of each, *an ounce;* Water *a pint and a half* [Imperial measure]. Dissolve the salts separately, each in one-half of the Water; add the solutions; collect the precipitate on a filter of linen or calico, and wash it with water. Boil the powder in three gallons of water acidulated with three fluidounces of Pyroligneous Acid [acetic acid]. Let any undissolved matter subside, maintaining the temperature near the boiling

point; and pour off the clear liquor, from which the Iodide of Lead will crystallize on cooling." *Ed.*

The *Dublin* process differs from that of the U. S. Pharmacopœia simply in the use of a much larger proportion of water of solution, and in directing the two solutions to be cold before being mixed.

In the U. S. process the nitrate of lead gives up its metal to the iodine, from which it receives the potassium; the operation taking place between single equivalents of the several ingredients. The nitrate of potassa thus formed remains in solution, while the iodide of lead is precipitated. The saturating proportions of nitrate of lead and iodide of potassium are 165·6 of the former and 165·5 of the latter, or almost precisely equal quantities. The proportions should be as nearly as possible those of exact saturation. An excess of the iodide of potassium, independently of the waste, has the disadvantage of holding a portion of the iodide of lead in solution; while, according to Christison, an excess of lead over the iodine disposes to the formation of the lemon-yellow insoluble oxyiodide of lead. By the use of equal quantities of the two salts, these disadvantages are avoided. As iodide of lead is slightly soluble in cold water, it is desirable to use as little of the menstruum as will answer; and hence the comparatively small proportion of water employed in the U. S. process.

The Edinburgh and Dublin processes are based upon the same principle as that of the U. S. Pharmacopœia. In both, however, an unnecessarily large proportion of water is employed. The iodide of potassium of commerce is apt to be contaminated with carbonate of potassa, which occasions a precipitation of carbonate of lead. It is to free the precipitated iodide of lead from this impurity, and from any oxyiodide that may be formed by an accidental excess of lead, that the Edinburgh College directs it to be boiled with water acidulated with acetic acid, which dissolves any carbonate or oxide of lead present, as well as the iodide, and deposits only the last upon cooling. But some waste is incurred in this operation; and it would be better to ascertain beforehand that the materials employed are pure.

In the process of the London College, acetate of lead is used instead of the nitrate. In the Pharmacopœia of 1836, an excess of the acetate was directed; but the error was corrected in the last edition. There are, however, other objections to this process. Acetate of lead is very liable to contain an excess of the oxide, and, as iodide of potassium is often impure, it follows that a portion of oxyiodide of lead will be very apt to form, even when the two materials are used apparently in mutually saturating proportions. To obviate the disadvantage of an excess of oxide in the acetate, it is recommended to add a little acetic acid to the solution of that salt before mixing it with the iodide of potassium.

M. Depaire, of Brussels, ascertained that, in the process in which acetate of lead and iodide of potassium are employed, a considerable amount of iodine remains in solution after the precipitation of the iodide of lead; and M. F. Boudet states that the quantity of the iodide resulting from the process is 10 per cent. less than theory would indicate. By the addition of nitric acid to the solution, after precipitation, an additional quantity of iodide of lead is obtained. M. Boudet ascribes this result to the formation of a portion of soluble iodide of potassium and lead, whenever iodide of lead and acetate of potassa are in contact. By substituting nitrate for acetate of lead, he found that a quantity of iodide of lead was obtained, as near that required by theory as the solubility of the iodide of lead permits. (*Journ. de Pharm.*, 3e *sér.*, xi. 274.)

From the above remarks it would appear that the process of the U. S. Pharmacopœia is on the whole to be preferred, and especially over that in which the acetate of lead is used, as the nitrate is more easily obtained pure. Some interesting experiments have been made by M. T. Huraut, of Paris, on the different

methods of preparing iodide of lead. It may be obtained by the reaction between any of the soluble iodides and the soluble salts of lead. It resulted from his observations that of the two salts of lead employed, the nitrate was to be preferred, and of the various iodides, though iodide of potassium yielded a very handsome product, yet iodide of calcium afforded one not inferior in quality, and somewhat greater in quantity. Upon a small scale, as the process is performed by the apothecary, the difference would be of little or no consequence; but it might be important to the manufacturer. (See *Am. Journ. of Pharm.*, xxi. 228.)

As obtained by the U.S., London, and Dublin processes, iodide of lead is in the form of a bright-yellow, heavy, tasteless, inodorous powder. It is soluble in 1235 parts of cold water (Soubeiran, *Trait. de Pharm.*), and 194 of boiling water, which, on cooling, deposits it in minute, shining, golden-yellow, crystalline scales. In this form it is presented by the Edinburgh process. It melts by heat, and is dissipated in vapours which are at first yellow, and ultimately violet in consequence of the disengagement of the iodine. It consists of one equivalent of iodine 126·3, and one of lead 103·6=229·9. As a test of its purity, the Edinburgh College states that five grains are entirely dissolved, with the aid of heat, by a fluidrachm of pyroligneous acid, diluted with a fluidounce and a half of distilled water; and golden crystals are copiously deposited when the solution cools. According to the London Pharmacopœia, 100 grains of it, dissolved at a boiling heat in nitric acid diluted with two parts of water, will, after the expulsion of the iodine, yield with sulphate of soda, a precipitate of sulphate of lead weighing 66 grains. It should be kept excluded from the light.

Medical Properties and Uses. This compound is supposed to have the resolvent properties of iodine, combined with those which are peculiar to lead, and was at one time recommended in tuberculous diseases, in which however it has proved wholly inefficient. It is said to have been usefully employed in the discussion of scrofulous tumours and other indolent swellings, and in the cure of obstinate ulcers; and for these purposes has been used both internally, and locally in the form of an ointment. According to Dr. Cogswell, if given for some time in small doses, it produces the effects of lead, but not those of iodine, upon the system. (*Christison's Dispensatory.*) The dose is from half a grain to three or four grains. Dr. O'Shaughnessy states that ten grains are borne without inconvenience.

Off. Prep. Unguentum Plumbi Iodidi. W.

POTASSA.

Preparations of Potassa.

LIQUOR POTASSÆ. *U. S.*, *Lond.* POTASSÆ AQUA. *Ed.* POTASSÆ CAUSTICÆ LIQUOR. *Dub.* *Solution of Potassa.*

"Take of Carbonate of Potassa *a pound;* Lime *half a pound;* Boiling Distilled Water *a gallon.* Dissolve the Carbonate of Potassa in half a gallon of the Water. Pour a little of the Water on the Lime, and, when it is slaked, add the remainder. Mix the hot liquors, and boil for ten minutes, stirring constantly; then set the mixture aside, in a covered vessel, until it becomes clear. Lastly, pour off the supernatant liquor, and keep it in well-stopped bottles of green glass. The specific gravity of this solution is 1·056." *U. S.*

"Take of Carbonate of Potassa *fifteen ounces;* Lime *eight ounces;* boiling Distilled Water *a gallon* [Imp. meas.]. Dissolve the Carbonate in half a gallon of the Water. Sprinkle a little of the Water upon the Lime in an earthen vessel, and, the Lime being slaked, add the remainder of the Water. The liquors being immediately mixed together in a close vessel, shake them frequently

until they are cold. Then set the mixture by, that the carbonate of lime may subside. Lastly, pour off the supernatant liquor, and keep it in a well stopped green glass bottle. The specific gravity is 1·063." *Lond.*

"Take of Carbonate of Potash (dry) *four ounces;* Lime, recently burnt, *two ounces;* Water *forty-five fluidounces* [Imp. meas.]. Let the lime be slaked and converted into milk of lime with seven fluidounces of the Water. Dissolve the Carbonate in the remaining thirty-eight fluidounces of Water; boil the solution, and add to it the milk of lime in successive portions, about an eighth at a time, boiling briskly for a few minutes after each addition. Pour the whole into a deep narrow glass vessel for twenty-four hours; and then withdraw with a syphon the clear liquid, which should amount to at least thirty-five fluidounces, and ought to have a density of 1·072." *Ed.*

"Take of Pure Carbonate of Potash *one pound* [avoirdupois]; fresh-burned Lime *ten ounces* [avoird.]; Distilled Water *one gallon and seven ounces* [Imp. meas.]. Slake the Lime with seven ounces of the Water. Dissolve the Carbonate of Potash in the remainder of the Water, and, having raised the solution to the boiling point in a clean iron vessel, gradually mix with it the slaked Lime, and continue the ebullition for ten minutes with constant stirring. Remove the vessel now from the fire, and when, by the subsidence of the insoluble matters, the supernatant liquor has become perfectly clear, transfer it by means of a syphon to a green glass bottle furnished with an air-tight stopper. The specific gravity of this solution is 1·068." *Dub.*

The object of these processes is to separate carbonic acid from the carbonate of potassa, so as to obtain the alkali in a caustic state. This is effected by hydrate of lime; and the chemical changes which take place are most intelligibly explained by supposing the occurrence of a double decomposition. The lime of the hydrate of lime, by its superior affinity, combines with the carbonic acid, and precipitates as carbonate of lime; while the water of the hydrate of lime unites with the potassa, and remains in solution as hydrate of potassa. The proportion indicated by theory for this decomposition would be 69·2 of the dry carbonate to 28·5 of lime, or one eq. of each; but in practice it is found necessary to use an excess of lime. In the U. S. and Edinburgh formulæ the alkaline salt is treated with half its weight of lime; in the London, with eight-fifteenths; and in the Dublin, with five-eighths; proportions, the lowest of which exceeds the theoretical quantity. The proportion of water employed has a decided influence on the result. If the water be deficient in quantity, the decomposing power of the lime, on account of its sparing solubility, will be lessened; and more of it will be required to complete the decomposition of the carbonate than if the solutions had been more dilute. Taking the lime at three ounces in each formula, the quantity of water directed in ounces is expressed by the following numbers nearly: 61½ *Ed.*, 60½ *U. S.*, 54 *Lond.*, and 45 *Dub.* Straining must not be used; as it causes a prolonged contact with the air, and risk of the absorption of carbonic acid, and is apt, moreover, to introduce organic matter from the strainer into the solution. The direction to keep the solution in green glass bottles is judicious; as white flint glass is slightly acted on.

As the solution of potassa is frequently made by the manufacturing chemist in considerable quantities, the following details, taken from Berzelius, of the best mode of conducting the process, may not be without their use. Dissolve one part of carbonate of potassa in from seven to twelve parts of water in a bright iron vessel, and decant the solution after it has become clear by standing. Boil the solution in an iron vessel, and while it is boiling, add, at intervals, small quantities of slaked lime, reduced to a thin paste with water; allowing the solution to boil a few minutes after each addition. One and a half parts of pure lime will be more than sufficient to decompose one part of the carbonate. When

about half the hydrate of lime has been added, take out about a teaspoonful of the boiling solution, and, after dilution and filtration through paper, test it by adding it to some nitric acid, or by mixing it with an equal bulk of lime-water. If the solution has not been completely freed from carbonic acid, the first reagent will cause an effervescence, and the second a milky appearance; in either of which events the addition of the lime must be continued as before, until the above-mentioned tests give negative indications. In conducting the process, several advantages are gained by keeping the solution constantly boiling. One is that the carbonate of lime formed is in this way rendered granular and heavy, and more disposed to subside; another, that it prevents the precipitated carbonate from coalescing into a mass at the bottom of the vessel, an occurrence which causes the ebullition, when subsequently renewed, to take place imperfectly and by jerks; and a third, that any silica present is precipitated in combination with lime and potassa. The process here described is essentially the same with those introduced into the last editions of the Edinburgh and Dublin Pharmacopœias.

According to M. Wöhler, pure hydrate of potassa in solution for analytic purposes may be conveniently obtained by exposing for half an hour to a moderate red heat, in a copper crucible, one part of pure nitre and two or three parts of copper, cut into small pieces. The resulting mass, consisting of hydrate of potassa and black oxide of copper, is treated with water, and the solution poured into a narrow cylindrical vessel, where it is left until it gets perfectly clear by the deposition of the oxide of copper. The solution is then drawn off with a syphon, and kept in well-stopped bottles. (*Chem. Gaz.*, Nov. 15, 1853, p. 429, from the *Ann. der Chem. und Pharm.*)

Properties, &c. Solution of potassa is a limpid, colourless liquid, without smell, and having an acrid caustic taste, and alkaline reaction. It acts rapidly on animal and vegetable substances, and when rubbed between the fingers, produces a soapy feel, in consequence of a partial solution of the cuticle. It dissolves gum, resins, and extractive matter, and by union with oily and fatty bodies forms soap. The U. S., London, and Edinburgh solutions are never pure, but contain either some undecomposed carbonate, or free lime, in addition to minute portions of sulphate of potassa, chloride of potassium, silica, and alumina; impurities usually present in the carbonate of potassa obtained from pearlash, which is used in their preparation. The Dublin solution, from the use of pure carbonate of potassa, is purer. Undecomposed carbonate may be detected in the manner explained in the preceding paragraph, and free lime, by the production of a milky appearance on the addition of a few drops of carbonate of potassa, which serves to precipitate the lime as a carbonate. When saturated with nitric acid, it gives little or no precipitate with carbonate of soda, chloride of barium, or nitrate of silver. With chloride of platinum it produces a yellow precipitate, showing that the alkali present is potassa. It is incompatible with acids, acidulous salts, and all metallic and earthy preparations held in solution by an acid; also with all ammoniacal salts, and with calomel and corrosive sublimate. The officinal solutions of potassa vary in strength; the U. S. solution having the specific gravity 1·056; the London, 1·063; the Edinburgh, 1·072; and the Dublin, 1·068. These solutions are quite dilute; that of the London College, which is of medium strength, containing only 6·7 per cent. of potassa. On account of its strong attraction for carbonic acid, the solution of potassa should be carefully preserved from contact with the air. B.

Medical Properties and Uses. Solution of potassa is antacid, diuretic, and antilithic. It has been much employed in calculous complaints, under the impression that it has the property of dissolving urinary concretions in the kidneys and bladder; but experience has proved that the stone once formed cannot be removed by remedies internally administered, and the most that the alkaline medicines can

effect, is to correct that disposition to the superabundant secretion of uric acid, or the insoluble urates, upon which gravel and stone often depend. For this purpose, however, the carbonated alkalies are preferable to caustic potassa, as they are less apt to irritate the stomach, and to produce injurious effects when long continued. It has been proposed to dissolve calculi by injecting immediately into the bladder the solution of potassa in a tepid state, and so much diluted that it can be held in the mouth; but this mode of employing it has not been found to answer in practice. This solution has also been highly recommended in lepra, psoriasis, and other cutaneous affections; and is said to have proved peculiarly useful in scrofula; but in all these cases it probably acts simply by its antacid property, and is not superior to the carbonate of potassa or of soda. Externally it has been used, in a diluted state, as a stimulant lotion in rachitis and arthritic swellings, and concentrated, as an escharotic in the bite of rabid or venomous animals. The dose is from ten to thirty minims, repeated two or three times a day, and gradually increased in cutaneous affections to one or two fluidrachms; but the remedy should not be too long continued, as it is apt to debilitate the stomach. It may be given in sweetened water or some mucilaginous fluid. Veal broth and table beer have been recommended as vehicles; but the fat usually present in the former would be liable to convert the alkali into soap, and the acid in the latter would neutralize it. In dyspeptic cases it may be associated with the simple bitters. In excessive doses it irritates, inflames, or corrodes the stomach. Oils and the milder acids, such as vinegar and lemon-juice, are the antidotes to its poisonous action. They operate by neutralizing the alkali.

It is employed pharmaceutically in the preparation of Oxide of Antimony, Precipitated Sulphuret of Antimony, Ethereal Oil, Hydrated Peroxide of Iron, Magnetic Oxide of Iron, and Oxide of Silver.

Off. Prep. Potassa; Potassa cum Calce. W.

POTASSA. *U. S., Ed.* Potassæ Hydras. *Lond.* Potassa Caustica. *Dub. Potassa. Hydrate of Potassa. Caustic Potassa.*

"Take of Solution of Potassa *a gallon.* Evaporate the Solution rapidly in a clean iron vessel, over the fire, till ebullition ceases, and the Potassa melts. Pour this into suitable moulds, and keep it, when cold, in well stopped bottles." *U. S.*

The *London* formula is essentially the same with the above.

"Take *any convenient quantity* of Aqua Potassæ; evaporate it in a clean and covered iron vessel, increasing gradually the heat, till an oily-looking fluid remains, a drop of which, when removed on a rod, becomes hard on cooling. Then pour out the liquid upon a bright iron plate, and as soon as it solidifies, break it quickly, and put it into glass bottles secured with glass stoppers." *Ed.*

"Take of Solution of Caustic Potash *any convenient quantity.* Boil it in a silver or bright iron vessel, until its water has been evaporated away, and then raise the temperature until ebullition ceases, and a liquid is obtained which flows like oil. Pour this out upon a silver or iron dish, and, the moment it has set, break it into fragments, and enclose these in a green glass bottle, furnished with an air-tight stopper." *Dub.*

The concrete alkali, obtained by these processes, is the hydrate of potassa, sufficiently pure for medicinal purposes. The solution of the alkali freed from carbonic acid having been obtained by another formula (see *Liquor Potassæ*), the formation of the present preparation requires merely the evaporation of this solution, until the whole of its uncombined water is driven off. The evaporation is required to be performed in metallic vessels, as those of glass or earthenware are acted on by the alkali; and it should be completed as quickly as possible, in order to abridge the period during which the solution would be liable to absorb

carbonic acid from the atmosphere. When poured out on a metallic plate or dish, the cake, just as it concretes, may be marked with a knife in the directions in which it is to be divided, and when cold it readily breaks in those directions. A better plan, however, is to run the fused alkali into suitable moulds, as directed in the U. S. and London formulæ. These should be made of iron and have a cylindrical shape, which is the most convenient form of the alkali for the use of the surgeon. Green glass bottles with ground stoppers are the best adapted for preserving this preparation, as white flint glass is slightly acted on.

Properties, &c. In its officinal form, potassa is usually in sticks which have a fibrous fracture, a dingy gray or greenish colour, occasionally a bluish tint, and the peculiar odour of slaking lime. It is extremely caustic and very deliquescent, and dissolves in less than its weight of water, leaving but a slight residue. Its aqueous solution agrees in properties with Liquor Potassæ. It is also readily soluble in alcohol. When exposed to a low red heat it melts, and at bright redness is volatilized. On account of its deliquescent property, and its strong attraction for carbonic acid, it requires to be kept in very accurately stopped bottles. In the state here described, the alkali always contains combined water as a part of its composition. As obtained by the U. S., London, and Edinburgh formulæ, it contains various impurities, which, however, do not interfere with its medicinal value; such as sulphate of potassa, chloride and teroxide of potassium, sesquioxide of iron, lime, silica, alumina, and a portion of the alkali itself still in a carbonated state. The insoluble impurities, according to the Edinburgh Pharmacopœia, should not exceed 1·25 per cent. The Dublin alkali, being obtained from a solution derived from pure carbonate of potassa, is purer than that of the other Pharmacopœias. Officinal potassa may be rendered nearly pure by digestion in alcohol, which takes up only the hydrated alkali, evaporating the solution to dryness, and fusing the dry mass obtained. *Hydrate of potassa*, when thus procured, is called *alcoholic potassa*. It is generally in the form of flat white pieces, which are dry, hard, brittle, and extremely caustic. Its other properties are similar to those of the impure hydrate above described. According to Mr. H. Wurtz, of New York, alcoholic potassa usually contains a trace of silicate of potassa, which appears to be taken up by the alcohol. The source of this is the carbonate of potassa employed, which may be freed from this impurity by evaporating its aqueous solution, in a sheet-iron dish, to dryness, and adding, from time to time, lumps of carbonate of ammonia. The silicate is thus converted into the carbonate; and, on dissolving the residue, the silica appears in flakes, which may be separated by filtration. (*N. Y. Journ. of Pharm.*, Feb. 1852.) Potassa may be discriminated from the other fixed alkalies (soda and lithia) by affording, when in solution, a crystalline precipitate (cream of tartar) with an excess of tartaric acid, and a yellow one with chloride of platinum. The officinal potassa, apart from impurities, consists of one eq. of dry potassa 47·2 and one of water 9=56·2. Dry potassa is composed of one eq. of potassium 39·2, and one of oxygen 8=47·2. (See *Potassium.*) B.

Medical Properties and Uses. This is the old *causticum commune acerrimum*, or *strongest common caustic*. It is a very powerful escharotic, quickly destroying the life of the part with which it comes in contact, and extending its action to a considerable depth beneath the surface. In this latter respect, it differs from the nitrate of silver or lunar caustic, to which it is, therefore, preferred for the purposes of forming issues and opening abscesses. It has been used for removing stricture of the urethra; but, in consequence of its tendency to spread, it may, unless carefully applied, produce such a destruction of the lining membrane, as to open a passage for the urine into the cellular tissue, and thus involve the patient in danger. The most convenient mode of employing the caustic for the formation of an issue, is to apply to the skin a piece of linen spread with adhe-

sive plaster, having a circular opening in its centre corresponding with the intended size of the issue, and then to rub upon the skin, within the opening, a piece of the caustic previously moistened at one end. The application is to be continued till the life of the part is destroyed, when the caustic should be carefully washed off with a wet sponge or wet tow, or neutralized by vinegar. The preparation is also employed for forming solutions of potassa of definite strength, whether for medicinal or pharmaceutic use. A solution of one drachm and a half of caustic potassa in two fluidounces of distilled water, was highly recommended by the late Dr. Hartshorne, of Philadelphia, as an application to the spine in tetanus. It may be applied by means of a sponge attached to the end of a stick, which should be drawn quickly along the back from the nape of the neck to the sacrum. It produces a very powerful rubefacient effect.

The U. S. Pharmacopœia employs caustic potassa in the preparation of Ether, and of Black Oxide of Mercury.

Off. Prep. Potassa cum Calce; Potassii Iodidum. W.

POTASSA CUM CALCE. *U. S., Lond., Ed.* POTASSA CAUSTICA CUM CALCE. *Dub. Potassa with Lime.*

"Take of Potassa, Lime, each, *an ounce.* Rub them together, and keep the mixture in a well stopped bottle." *U. S.*

The *London* and *Dublin* formulæ are the same as the above.

"Take *any convenient quantity* of Aqua Potassæ; evaporate it in a clean, covered iron vessel to one-third of its volume; add slaked Lime till the fluid has the consistence of firm pulp. Preserve the product in carefully covered vessels." *Ed.*

The U. S., London, and Dublin preparation is a mixture of equal parts of hydrate of potassa and lime. The Edinburgh College employs the solution of potassa, which is first concentrated, and then thickened by the addition of lime until the mixture becomes a pulpy mass, consisting of the mixed hydrates of potassa and lime.

The U. S., London, and Dublin preparation is a powder, sometimes called *Vienna caustic.* It is prepared for use by being made up into a paste with a little alcohol. The paste is applied to the part to be cauterized for ten or fifteen minutes, and is conveniently limited in its operation by a piece of adhesive plaster, in the manner explained under potassa. The Edinburgh preparation is in the form of a firm pulp, formerly called *causticum commune mitius*, or *milder common caustic.* Potassa with lime is a more manageable caustic than the officinal potassa, on account of the presence of the lime, which renders it milder, slower in its operation, and less deliquescent, and causes it to spread less beyond the part intended to be affected. Dr. Filhos has improved this caustic by forming it in sticks. To prepare it thus, the potassa is perfectly fused in an iron spoon, and one-third of its weight of quicklime is added in divided portions; the whole being stirred with an iron rod. The fused mass is then run into lead tubes, closed at one end, about three inches long, and from a quarter to half an inch in diameter in the clear. The sticks are kept, still enclosed in the lead tubes, with the open end downwards, in thick glass tubes, containing some powdered quicklime, and closed with a cork, between which and the stick some cotton is put to steady the caustic. When employed, as much of the caustic is uncovered at the end, by scraping off the lead, as it is proposed to use. This form of caustic is particularly recommended for cauterizing the neck of the uterus. (*Journ. de Pharm.*, 3e *sér.*, vi. 137.) B.

POTASSÆ ACETAS. *U. S., Lond., Ed., Dub. Acetate of Potassa.*

"Take of Acetic Acid *a pint;* Carbonate of Potassa *a sufficient quantity.*

Add the Carbonate of Potassa gradually to the Acetic Acid till it is saturated; then filter, and evaporate cautiously, by means of a sand-bath, until a dry salt remains. Keep this in closely stopped bottles." *U. S.*

"Take of Acetic Acid *twenty-six fluidounces* [Imp. meas.]; Carbonate of Potassa *a pound*, or *a sufficient quantity;* Distilled Water *twelve fluidounces* [Imp. meas.]. To the Acid, mixed with the Water, gradually add the Carbonate to saturation; then strain. Evaporate the liquor in a sand-bath, with a heat cautiously applied, until the salt is dried." *Lond.*

"Take of Pyroligneous Acid [acetic acid, sp. gr. 1·034] *a pint and a half* [Imp. meas.]; Carbonate of Potash (dry) *seven ounces* or *a sufficiency*. Add the Carbonate gradually to the Acid till complete neutralization is accomplished. Evaporate the solution over the vapour-bath till it is so concentrated as to form a concrete mass when cold. Allow it to cool and crystallize in a solid cake; which must be broken up and immediately put into well closed bottles." *Ed.*

"Take of Pure Carbonate of Potash *one pound* [avoirdupois]; Acetic Acid of Commerce (sp. gr. 1·044) *two pints* [Imp. meas.]. To the Acid, placed in a porcelain capsule, gradually add the Carbonate of Potash, and, when effervescence has ceased, boil for a couple of minutes. Add now, if necessary, a few drops of the same Acetic Acid, so that the solution may have a slightly acid reaction; and, having evaporated to dryness, melt the residue, by the cautious application of heat, in a clean pot of cast iron. The liquefied salt is now to be removed from the fire, and when, upon cooling, it has solidified, it should be quickly broken into fragments of a suitable size, and enclosed in a bottle, furnished with an air-tight stopper." *Dub.*

The process for forming acetate of potassa is a case of single elective affinity. The form of acid employed for generating the salt in the several Pharmacopœias is officinal acetic acid; the pyroligneous acid of the Edinburgh College being equivalent to that acid. Distilled vinegar should never be employed to form this salt, on account of its containing organic matter, which gives the solution, when concentrated, a reddish or brownish colour. When acetic acid is used a colourless solution is obtained. This is evaporated to dryness, according to the U. S. and London Pharmacopœias, and to such an extent as to concrete into a mass when cold, according to the Edinburgh. The Dublin College fuses the dry salt, and obtains it as a solid mass on cooling. When fusion is resorted to, great care must be taken not to use too high a heat; otherwise part of the acetic acid will be decomposed, and a colourless salt will not be obtained. For drying the acetate of potassa, Dr. Christison considers the heat of a vapour-bath too low, and that of a sand-bath apt to become too high. He, therefore, recommends the use of a bath of chloride of calcium, when operating on a small scale. In conducting the evaporation, it is best to have the solution always slightly acid; for if the alkali predominate, it will react upon the acetic acid when the solution is concentrated, and give rise to discoloration.

Acetate of potassa may also be obtained by double decomposition between acetate of lead and sulphate of potassa. When thus procured it is very white and pure, but liable to the objection, for medical use, that it may possibly contain a little lead. Another method by double decomposition is between acetate of lime and sulphate of potassa.

Properties, &c. Acetate of potassa when pure is a white salt, perfectly neutral to test paper, unctuous to the touch, and of a warm, pungent, saline taste. When unskilfully prepared, it is apt to be more or less coloured. Its state of aggregation differs with the manner in which it is prepared. As obtained by evaporating the solution to dryness, agreeably to the directions of the U. S. and London Pharmacopœias, it is in the form of soft fibrous masses. As usually prepared and found in the shops, it has a foliated texture, which is given to it

by fusion and cooling. On account of this appearance it was formerly called *foliated earth of tartar.* This salt is extremely deliquescent, and, if exposed to the air, becomes converted into a liquid of an oleaginous appearance. It is on account of this property that it must always be preserved in well stopped bottles. It dissolves in about half its weight of water, and twice its weight of alcohol. Anything remaining undissolved by these menstrua is impurity. Heated above its point of fusion it is decomposed into acetone and carbonate of potassa; the acetic acid being resolved into this volatile liquid and carbonic acid. When treated with sulphuric acid, acetous vapours are copiously evolved, and sulphate of potassa is formed. One hundred grains of the salt, decomposed by sulphuric acid, furnish a salt (sulphate of potassa), which, after exposure to a strong heat, weighs 88·8 grains. (*Lond. Pharm.*) The most usual impurities contained in it are sulphate and tartrate of potassa, chloride of potassium, and the salts of lead and copper. A soluble sulphate may be detected by chloride of barium; and chloride of potassium, or any soluble chloride, by nitrate of silver added to a *dilute* solution. If the nitrate be added to a concentrated solution, crystals of acetate of silver will be precipitated, soluble in water or dilute nitric acid. With chloride of platinum it yields a yellow precipitate, showing it to be a salt of potassa. If tartrate of potassa be present, it will remain undissolved when the salt is acted on by alcohol. Lead and copper may be detected by sulphuretted hydrogen and ferrocyanuret of potassium; the former test producing with the lead a blackish, and the latter with the copper a brown precipitate. Since the introduction of the cheap method of obtaining pure acetic acid from wood, this salt has scarcely been subject to adulteration. Acetate of potassa is incompatible with the mineral acids, which expel the acetic acid; with sulphate of soda and sulphate of magnesia; with corrosive sublimate and nitrate of silver; and with several other earthy and metallic salts. This salt exists in the juices of many plants, and especially in the sap of trees, and is the principal source of the carbonate of potassa existing in the ashes of wood. It consists of one eq. of acetic acid 51, one of potassa 47·2, and two of water 18=116·2.

Medical Properties and Uses. Acetate of potassa acts as a diuretic in doses of from a scruple to a drachm, and as a mild cathartic when given to the extent of two or three drachms. It is employed in dropsies, and often with good effect. The late Dr. Duncan considered it to be a medicine of great efficacy, and one of our best saline deobstruents. We have ourselves used it in dropsical affections, and can bear testimony to its powers. Dr. J. A. Easton, of Glasgow, has found it a useful remedy in several skin diseases, such as psoriasis, eczema, and lepra. Cases which had resisted the ordinary remedies were cured, after a treatment occupying from three weeks to two months. The dose given by Dr. Easton was half a drachm, three times a day, dissolved in water. The remedy seemed to act through the kidneys, the urine being remarkably increased, both in its aqueous and solid contents. (*Edin. Month. Journ. of Med. Sci.*, May, 1850.) The salt, equally efficacious, may be made extemporaneously in the liquid form by saturating distilled vinegar with carbonate of potassa. Two drachms of the carbonate, saturated with vinegar, will sometimes produce in hydropic cases ten or twelve stools, and a copious discharge of urine. (*Duncan.*) Acetate of potassa, like the other alkaline salts containing a vegetable acid, may be given in the uric acid diathesis, to render the urine alkaline; for the experiments of Wöhler have shown that the acid of these salts undergoes decomposition in the digestive and assimilating processes, while the alkali enters the current of the circulation. From the decided property which this salt possesses of increasing the secretion of the kidneys, it was formerly called *sal diureticus*, or *diuretic salt.*

Off. Prep. Pilulæ Rhei; Tinctura Ferri Acetatis. B.

POTASSÆ CARBONAS. *U. S., Lond., Ed.* POTASSÆ CARBONAS E LIXIVO CINERE. *Dub. Carbonate of Potassa. Carbonate of Potassa from Pearlash.*

"Take of Impure Carbonate of Potassa [pearlash] *three pounds;* Water *two pints and a half.* Dissolve the Impure Carbonate of Potassa in the Water, and filter the solution; then pour it into a clean iron vessel, and evaporate over a gentle fire till the solution thickens; lastly, remove it from the fire, and stir it constantly with an iron spatula till the salt granulates." *U. S.*

The *London College,* in its Pharmacopœia of 1851, has placed this salt in the Materia Medica list. The Edinburgh College also includes it in the Materia Medica list, designating it by this note. "Carbonate of potash not quite pure, obtained by lixiviating, evaporating, and granulating by fusion and refrigeration the potashes [pearlash] of commerce."

"Take of Pearlash *ten pounds* [avoirdupois]; Distilled Water *one gallon* [Imp. meas.]. Pour the Water on the Pearlash, and macerate for a week, occasionally stirring the mixture. Filter through calico, and, having evaporated the solution nearly to dryness, reduce the heat, and stir constantly with an iron rod, until granular crystals are obtained. Let these be immediately enclosed in well stopped bottles." *Dub.*

The object of the above processes is to purify the impure carbonate of potassa, or pearlash. This generally contains certain insoluble impurities, as well as small portions of sulphate and silicate of potassa, and chloride of potassium, as explained under another head. (See *Potassæ Carbonas Impurus.*) By dissolving it in a due proportion of water, and filtering the solution, the insoluble impurities are got rid of, as well as the greater part of the foreign salts, which, being much less soluble than the carbonate of potassa, are excluded by the superior affinity of this salt for the water. The proper way of conducting the purification is to mix the impure carbonate with an equal weight of *cold* water, and to allow the mixture to stand for a day or two, stirring it frequently to promote the action of the water. The clear liquor obtained by decantation or filtration is then evaporated to dryness. The officinal processes are conducted very much in this way; cold water being employed, and equal weights of alkali and water being used in the Dublin formula, and about equal weights in the process of the U. S. Pharmacopœia. The prolonged contact of the water with the salt, and the occasional stirring of the mixture, ordered by the Dublin College, are useful directions. In no case should the undissolved residue be washed with a fresh portion of water; as, by such a proceeding, the foreign salts, which it is the object of the process to separate, would be dissolved. Iron vessels are directed, because this metal is not acted on by the alkali, while glass is attacked by it. In granulating the salt by stirring, it is better, when the solution is brought nearly to dryness, to keep it on the fire at a reduced heat, as recommended by the Dublin College, until the process is finished, than to remove it the moment it thickens.

According to Berzelius, a more productive process for purifying pearlash, though the resulting salt is not so pure as when obtained in the way just described, is to dissolve the pearlash in more than its weight of water, to evaporate the solution till it has the density of 1·52, and then to put it in a cool place, that the foreign salts, principally sulphate of potassa and chloride of potassium, may crystallize. The solution is then decanted, and evaporated to dryness.

Properties, &c. Carbonate of Potassa, as found in the shops, is in the form of a coarse granular white powder, having a nauseous, alkaline taste, and acting as an alkali on vegetable colours. It is very soluble in water, dissolving in its weight of that liquid; but is insoluble in alcohol. It is extremely deliquescent, and hence a portion of it, exposed to the air for some time, attracts so much water as completely to dissolve into an oily liquid, called by the older chemists,

oleum tartari per deliquium. On account of this property, carbonate of potassa should be kept in bottles with accurately ground stoppers. If exposed, in its usual state, to a red heat, it retains its carbonic acid, but loses 16 per cent. of water; and, when decomposed by dilute sulphuric acid, evolves 26·3 per cent. of carbonic acid. (*Lond. Pharm.*) When pure it is completely soluble in water; but, generally, a small insoluble portion is left of earthy matter. An aqueous solution, when saturated with an acid, slowly deposits a slight gelatinous precipitate, derived from silica. The usual impurities are earthy matter, sulphate of potassa, chloride of potassium, and silica in the state, probably, of silicate of potassa. When dissolved in water and supersaturated with nitric acid, it affords a faint cloudiness with chloride of barium, and a slight precipitate with nitrate of silver; effects showing the presence of minute portions of a sulphate and of a chloride. The nitric solution is also precipitated by carbonate of soda, if earthy matter be present. If the indications of these tests are decided, the salt is below the officinal standard of purity. It is incompatible with acids and acidulous salts, muriate and acetate of ammonia, lime-water, chloride of calcium, sulphate of magnesia, alum, tartar emetic, nitrate of silver, ammoniated copper and ammoniated iron, sulphate of iron and tincture of chloride of iron, calomel and corrosive sublimate, acetate and subacetate of lead, and sulphate of zinc. It is not decomposed by tartrate of iron and potassa, and, therefore, may be associated with it in prescriptions.

Composition. Carbonate of potassa, after exposure to a red heat, is an anhydrous salt, consisting of one eq. of carbonic acid 22, and one of potassa 47·2 = 69·2. As obtained by the officinal formulæ, it is, according to Mr. Phillips, a sesquihydrate, consisting of two eqs. of carbonate and three of water. B.

Medical Properties and Uses. Purified pearlash is the form of carbonate of potassa usually employed in this country, where it is frequently, though incorrectly, called *salt of tartar*, the latter name being strictly applicable to the purer carbonate, obtained by decomposing cream of tartar. It is occasionally used as an antacid in dyspepsia, as a diuretic in dropsy, and as an antilithic in gravel attended with red deposits from the urine; but the purpose to which it is most commonly applied is the formation of the *neutral mixture* and *effervescing draught.* (See *Liquor Potassæ Citratis.*) It is worthy of observation, that its solution, on exposure to air, or on the addition of an acid, deposits flocculi consisting of hydrate of silica, resulting from the decomposition of the silicated potassa, which is always present as an impurity. The spontaneous deposition of silica is owing to the absorption of carbonic acid. Carbonate of potassa is also used with much advantage in some cases of jaundice, in which it probably operates by entering the circulation, and directly exciting the hepatic function. It has enjoyed some popular reputation mixed with cochineal in hooping-cough, and is supposed by some, in common with other alkaline remedies, to operate favourably in those inflammations in which there is a disposition to the exudation of coagulable lymph, or the formation of false membranes. It is considered among the most effectual remedies in obstinate cutaneous eruptions, in which it is employed both internally and externally. The dose is from ten to thirty grains, given in some aromatic water sweetened with sugar. In large quantities it acts as a corrosive poison, and is capable of producing death in a few hours. The antidotes are the fixed oils and vegetable acids.

As an external remedy in cutaneous affections, it is used in the form of bath, of lotion, and of ointment. From eight to sixteen ounces may be used for a single bath, the quantity being gradually increased. Lotions may be made by dissolving two or three drachms in a pint of water; and ointments by rubbing from ten grains to a drachm with an ounce of lard.

Carbonate of Potassa is used in the formulæ for Precipitated Sulphuret of Antimony, and Spirit of Nitric Ether.

Off. Prep. Decoctum Aloës Compositum; Enema Aloës; Extractum Spigeliæ et Sennæ Fluidum; Liquor Potassæ; Liquor Potassæ Arsenitis; Liquor Potassæ Carbonatis; Mistura Ferri Composita; Potassæ Acetas; Potassæ Bicarbonas; Potassæ Sulphas; Potassæ Tartras; Potassii Bromidum; Potassii Cyanuretum; Potassii Iodidum; Potassii Sulphuretum; Spiritus Ammoniæ Aromaticus; Spiritus Ammoniæ Fœtidus. W.

POTASSÆ CARBONAS PURUS. *U. S.* POTASSÆ CARBONAS PURUM. *Ed., Dub. Pure Carbonate of Potassa. Salt of Tartar.*

"Take of Bicarbonate of Potassa *a pound.* Put the Bicarbonate, previously powdered, into a capacious iron crucible, heat gradually until the water of crystallization is driven off, then raise the heat to redness, and maintain that temperature for half an hour. Having taken the crucible from the fire, and allowed it to cool, remove its contents, dissolve them in distilled water, filter the solution, and complete the process by evaporating and granulating as directed for Carbonate of Potassa." *U. S.*

"Pure Carbonate of Potash may be most readily obtained by heating crystallized Bicarbonate of Potash to redness in a crucible; but more cheaply by dissolving Bitartrate of Potash in thirty parts of boiling Water, separating and washing the crystals which form on cooling, heating these in a loosely covered crucible to redness so long as fumes are discharged, breaking down the mass, and roasting it in an open crucible for two hours, with occasional stirring, lixiviating the product with Distilled Water, filtering the solution thus obtained, evaporating the solution to dryness, granulating the salt towards the close by brisk agitation, and heating the granular salt nearly to redness. The product of either process must be kept in well closed vessels." *Ed.*

"Take of white Bitartrate of Potash *two pounds* [avoirdupois]; Sesquicarbonate of Ammonia *half an ounce* [avoird.]; Distilled Water *three pints* [Imp. meas.]. Place the Bitartrate of Potash in an iron pot or crucible, and, constantly stirring it with an iron rod, expose it to a red heat until vapours cease to be evolved. Reduce the residuum to a coarse powder, and having boiled it for twenty minutes with one quart [two pints, Imp. meas.] of the Water, filter through paper, washing the filter and its contents with the residual pint of Water, in which the Sesquicarbonate of Ammonia has been first dissolved. The filtered solution is now to be evaporated to dryness, and, a low red heat being finally applied, the product is to be rapidly reduced to powder in a warm mortar, and enclosed in well-stopped bottles." *Dub.*

In the *U. S.* process for pure carbonate of potassa, the bicarbonate is ignited, whereby it loses its water of crystallization, and second equivalent of carbonic acid, and is reduced to the state of carbonate. As the bicarbonate is a very pure salt, so the carbonate, obtained from it, is also very pure.

The first process of the *Edinburgh* College is the same as the above; the second directs the pure carbonate to be obtained from bitartrate of potassa, by first purifying it by solution and crystallization, and then incinerating it. The tartaric acid, which consists of carbon, hydrogen, and oxygen, is decomposed, and gives rise, among other products, to carbonic acid, which combines with the potassa. The matter, after ignition, contains, besides carbonate of potassa, certain impurities derived from those pre-existing in the bitartrate. These are carbonate of lime, arising from the decomposition of tartrate of lime, alumina, silica, and minute portions of the oxides of iron and manganese; and, being all insoluble in water, are left behind when the mass is acted on by that liquid, the alkaline carbonate alone being taken up. The Dublin process is the same as the second Edinburgh, with the additional step of washing the filter and its contents with

a solution of sesquicarbonate of ammonia. This addition to the filtered solution of the carbonate of potassa supplies any deficiency in its carbonic acid which may have been caused by the previous ignition; while, by the evaporation to dryness, and final exposure to a low red heat, the whole of the ammonia is dissipated.

Properties, &c. Pure carbonate of potassa, obtained from the bicarbonate or from cream of tartar, differs from the same salt procured from pearlash, in containing no impurities. With the tests mentioned under the carbonate it gives negative indications, showing the entire absence of foreign substances. When obtained from cream of tartar, it was formerly called *salt of tartar*, in allusion to its source; but at present this name is usually applied to any pure carbonate of potassa, without reference to its mode of preparation. It may, indeed, be very much doubted whether the real salt of tartar is often kept in our shops; the ordinary carbonate as purified from pearlash being generally substituted for it, and answering, in ordinary cases, every medicinal purpose that could be expected from the use of the purer salt.

Medical Properties and Uses. These are the same with those of the carbonate of potassa described in the preceding article. The pure carbonate, on account of its freedom from silica, furnishes the best material for forming the solution of citrate of potassa, or neutral mixture.

Off. Prep. Decoctum Aloës Compositum; Liquor Potassæ Arsenitis; Mistura Ferri Composita; Potassæ Acetas; Potassæ Carbonatis Liquor; Potassæ Causticæ Liquor; Potassii Iodidum. B.

LIQUOR POTASSÆ CARBONATIS. *U. S., Lond.* POTASSÆ CARBONATIS LIQUOR. *Dub. Solution of Carbonate of Potassa.*

"Take of Carbonate of Potassa *a pound;* Distilled Water *twelve fluidounces.* Dissolve the Carbonate of Potassa in the Water, and filter the solution." *U. S.*

"Take of Carbonate of Potassa *twenty ounces;* Distilled Water *a pint* [Imp. meas.]. Dissolve and filter. The specific gravity is 1·473." *Lond.*

"Take of Pure Carbonate of Potash *ten ounces* [avoirdupois]; Distilled Water *one pint* [Imp. meas.]. Dissolve and filter. The specific gravity of this solution is 1·310." *Dub.*

This is a solution of carbonate of potassa in water, and furnishes a convenient form for the administration of the salt. An ounce is dissolved in a fluidounce of water in the U. S. formula, and in an Imperial fluidounce in the London. In the Dublin solution, half an ounce avoirdupois is dissolved in an Imperial fluidounce. This statement in relation to the British solutions will be understood, when the fact is adverted to that the Imperial pint contains twenty fluidounces. The London solution is somewhat stronger than that of the U. S. Pharmacopœia, because the Imperial fluidounce weighs a little less than a fluidounce, wine measure. The Dublin process differs in using the pure carbonate, and in furnishing a solution considerably less than half as strong as the U. S. and London solutions. Solution of carbonate of potassa should be colourless and inodorous, and possess the general alkaline qualities of the salt from which it is made. The dose of the U. S. or London solution is from ten minims to a fluidrachm, sufficiently diluted with water or other bland liquid. B.

POTASSÆ BICARBONAS. *U. S., Lond., Ed., Dub. Bicarbonate of Potassa.*

"Take of Carbonate of Potassa *four pounds;* Distilled Water *ten pints.* Dissolve the Carbonate of Potassa in the Water, and pass carbonic acid through the solution till it is fully saturated. Then filter, and evaporate the filtered liquor that crystals may form, taking care that the heat does not exceed 160°. Pour off the supernatant liquid, and dry the crystals upon bibulous paper. Carbonic acid is obtained from Marble by the addition of dilute sulphuric acid." *U. S.*

In the London Pharmacopœia of 1851, bicarbonate of potassa is placed in the list of the Materia Medica.

"Take of Carbonate of Potash from Pearlash *one pound* [avoirdupois]; Distilled Water *one quart* [two pints, Imp. meas.]; Muriatic Acid of Commerce *one pint and a half* [Imp. meas.]; Water *three pints* [Imp. meas.]; Chalk, in small fragments, *one pound* [avoird.], or *a sufficient quantity*. Dilute the Muriatic Acid with the Water, and having dissolved the Carbonate of Potash in the *Distilled* Water, filter the solution into a three-pint bottle, capable of being tightly closed by a cork, traversed by a glass tube sufficiently long to pass to the bottom of the solution. A second bottle, in the bottom of which a few holes are drilled, and the mouth of which admits of being closed by a cork, also traversed by a glass tube, having been filled with the Chalk, and placed in a glass or porcelain jar of the same height with itself, but of somewhat larger diameter, the exterior ends of the two tubes are to be connected *air-tight* by a tube of vulcanized Indian rubber. The cork of the bottle containing the Carbonate of Potash being placed *loosely*, and that of the other bottle tightly in its place, and the Muriatic Acid having been poured into the jar in which is lodged the perforated bottle containing the Chalk, the liberation of carbonic acid commences, and as soon as it is judged that a sufficient amount of it has been developed to expel completely the air from the apparatus, the cork of the Carbonate of Potash bottle is to be forced into it quite tight, and the process is to be abandoned to itself for a week. At the end of this time numerous crystals of the Bicarbonate of Potash will have formed, which are to be removed, shaken in a capsule with twice their bulk of cold water, which is to be rapidly decanted, next drained, and finally dried on bibulous paper by mere exposure to the atmosphere. The mother liquor, if filtered, and concentrated to one-half, at a temperature not exceeding 110°, will yield additional crystals. The tube immersed in the solution of Carbonate of Potash will have to be occasionally cleared of the crystals with which it is liable to become plugged, else the process will be suspended." *Dub.*

"Take of Carbonate of Potash *six ounces;* Carbonate of Ammonia *three ounces and a half.* Triturate the Carbonate of Ammonia to a very fine powder; mix it with the Carbonate of Potash; triturate them thoroughly together, adding by degrees a very little water, till a smooth and uniform pulp be formed. Dry this gradually at a temperature not exceeding 140°, triturating occasionally towards the close; and continue the desiccation till a fine powder be obtained, entirely free of ammoniacal odour." *Ed.*

In these processes, the carbonate of potassa, consisting of one eq. of acid and one of base, is combined with an additional equivalent of carbonic acid. In the U. S. and Dublin processes the combination is effected by passing a stream of this acid through a solution of the carbonate, so long as it is absorbed. In the U. S. formula the distilled water taken is about three times the weight of the carbonate. As the bicarbonate of potassa requires four times its weight of water to dissolve it, the quantity of water ordered in the U. S. formula would seem not to be sufficient to dissolve the new salt; unless it be assumed that the solution becomes heated in consequence of the reaction. The solution of the whole of the new salt is not intended in the Dublin process, which proceeds on the plan of forming crystals of bicarbonate at once in the original solution, without concentration by heat. The filtration directed in the U. S. formula is ordered on the presumption that the whole of the bicarbonate formed is dissolved; and is intended to separate silica, which is always deposited during the progress of the saturation, when carbonate of potassa from pearlash is employed. On a small scale the saturation of the carbonate is best conducted in a Wolfe's apparatus of three bottles; the first containing water to wash the carbonic acid gas, the two others, solutions of the carbonate. The bottles should be connected by means

of wide tubes, to prevent their being obstructed by the crystals formed. On a large scale the saturation is performed in strong vessels, into which the carbonic acid is driven under pressure. Sulphuric acid is always used by the manufacturing chemist for generating the carbonic acid; but in small operations, muriatic acid, diluted with twice its bulk of water, is more convenient; inasmuch as it generates with the marble or chalk a soluble salt (chloride of calcium), which does not interfere with the extrication of the carbonic acid, as the insoluble sulphate of lime does. In the Dublin process dilute muriatic acid is used for the extrication of the carbonic acid, which is effected in a self-regulating generator of that gas.

In the Edinburgh process, carbonate of ammonia, in very fine powder, is thoroughly incorporated with carbonate of potassa, by the assistance of a little water, so as to form a uniform pulp, which is dried by a gentle heat. By the combined influence of the volatility of the ammonia, and the affinity of the carbonate of potassa for carbonic acid, the carbonate of ammonia is totally decomposed; its carbonic acid generating the bicarbonate by uniting with the carbonate, and its ammonia being evolved during the drying of the pulp, which is then reduced to a fine powder. This process is alleged by Dr. Christison to be superior to the other process, "in point of economy, dispatch, and certainty in small operations."

Mr. Brande gives the following proportions for the preparation of bicarbonate of potassa on the large scale: "100 lbs. of purified carbonate of potassa are dissolved in 17 gallons of water, which, when saturated with carbonic acid, yield from 35 to 40 lbs. of crystallized bicarbonate; 50 lbs. of carbonate of potassa are then added to the mother liquor, with a sufficient quantity of water to make up 17 gallons, and the operation repeated."

Wöhler states that charcoal, when mixed with the carbonate, facilitates by its porosity, in a remarkable degree, the formation of the bicarbonate. Thus he found that when crude tartar was charred in a covered crucible, and the carbonaceous mass, after having been slightly moistened with water, was subjected to a stream of carbonic acid, the gas was absorbed with great rapidity, and heated the mass so considerably, as to render it necessary to surround the vessel with cold water, to prevent the decomposition of the bicarbonate that had been formed. When the temperature diminished, the saturation was known to be completed. The mass was lixiviated in the smallest quantity of water at the temperature of from 85° to 100°, and the solution, after filtration and cooling, deposited the greater part of the bicarbonate in fine crystals. (*Am. Journ. of Pharm.*, x. 82, from the *Annalen der Physik und Chemie.*)

M. Behrens has proposed to obtain bicarbonate of potassa by partially saturating the carbonate, dissolved in an equal weight of water, with acetic acid gradually added. Up to a certain point, no carbonic acid is extricated, and a precipitate takes place of pure bicarbonate of potassa, equal to half the weight of the carbonate employed. After the bicarbonate is separated, the saturation may be completed, and acetate of potassa obtained. (*Journ. de Pharm.*, 3e *sér.*, iv. 464.) A similar production of the bisalt takes place when the carbonate is treated with weak lemon-juice, in forming the citrate. (See *page* 1144.)

According to Berzelius, the cheapest method of obtaining the bicarbonate of potassa is to suspend a concentrated solution of the purified carbonate, contained in a stoneware dish, within a cask over a liquid undergoing the vinous fermentation. The alkali is thus surrounded by an atmosphere of carbonic acid, and, by absorbing it, crystallizes into bicarbonate in the course of five or six weeks. Distillers and brewers prepare this salt with great facility by suspending the alkaline solution in the fermenting tun. The salt in powder called *sal aëratus*, made principally in New England, is, we believe, prepared in this way. In composition it is between a carbonate and bicarbonate.

Properties, &c. Bicarbonate of potassa is in transparent, colourless, inodorous crystals, slightly alkaline to the taste and to test paper, permanent in the air, and having the shape of irregular eight-sided prisms with two-sided summits. It dissolves in four times its weight of cold water, and in five-sixths of its weight of boiling water, by which it is partially decomposed, and converted into *sesquicarbonate.* It is insoluble in alcohol. Exposed to a red heat, it loses 30·7 per cent., comprising half its carbonic acid and the whole of its water of crystallization, and returns to the state of carbonate, which, when thus obtained, is free from silica, and otherwise very pure. This method is now adopted in the U. S. Pharmacopœia for obtaining the pure carbonate, and forms the first process of the Edinburgh. Supersaturated with nitric acid, it should give a clear solution, the transparency of which is not disturbed by chloride of barium, and but slightly by nitrate of silver. When a perfect bicarbonate, its solution, unless heated, does not precipitate a solution of sulphate of magnesia. This negative indication, however, cannot be depended upon as showing the absence of carbonate; for, according to Dr. Christison, no precipitate will be occasioned, even when fifty per cent. of this impurity is present. Bicarbonate of potassa does not decompose calomel. When dissolved in 40 parts of water, it produces a white haze merely with a solution of corrosive sublimate; but if it contain so little as a hundredth part of carbonate, a brick-red precipitate is immediately produced. (*Christison.*) Another way of detecting the presence of carbonate is to add starch sugar to a heated solution of the suspected bicarbonate. If any carbonate be present, the mixture turns yellow or brown. (*Chevallier.*) Bicarbonate of potassa consists of two eqs. of carbonic acid 44, one of potassa 47·2, and one of water 9=100·2.

Medical Properties. The medical properties of this salt are the same as those of the carbonate, to which it is preferable from its milder taste, and greater acceptability to the stomach. The dose is from twenty grains to a drachm.

Off. Prep. Liquor Potassæ Citratis; Potassæ Aqua Effervescens; Potassæ Carbonas Purus; Potassæ Citras; Pulveres Effervescentes; Pulveres Effervescentes Citrati. B.

POTASSÆ AQUA EFFERVESCENS. *Ed. Effervescing Water of Potassa.*

"Take of Bicarbonate of Potash *one drachm;* Distilled Water *one pint* [Imp. meas.]. Dissolve the Salt in the Water, and transmit through the solution carbonic acid gas under strong pressure." *Ed.*

This preparation may be considered as the bicarbonate of potassa dissolved in carbonic acid water. It is, however, altogether superfluous in this country, in consequence of the general introduction into the shops of carbonic acid water (artificial Seltzer water), which may be readily employed for dissolving any desired proportion of the bicarbonate, with the result of forming a much brisker preparation. This solution has the general sparkling qualities and acidulous taste of carbonic acid water; the alkaline taste being covered in a great measure by the large excess of carbonic acid. The after-taste is more purely saline than that of the corresponding preparation made with soda. (See *Sodæ Aqua Effervescens.*) B.

POTASSÆ CITRAS. *U. S. Citrate of Potassa.*

"Take of Citric Acid *ten ounces;* Bicarbonate of Potassa *fourteen ounces;* Water *a sufficient quantity.* Dissolve the Citric Acid in two pints of Water, add the Bicarbonate gradually, and, when effervescence has ceased, strain, and evaporate to dryness, stirring constantly, after a pellicle has begun to form, until the salt granulates; then rub it in a mortar, pass it through a coarse sieve, and put it in bottles, which should be kept closely stopped." *U. S.*

Citrate of potassa has long been used habitually in this country for the preparation of the neutral mixture, but was first recognised as officinal in the U. S. Pharmacopœia of 1850. It was known formerly by the name of *salt of Riverius.* In the above formula, mutually saturating proportions of the acid and bicarbonate were intended to be employed; the latter ingredient being preferred to the carbonate on account of its greater purity. The potassa of the bicarbonate unites with the citric acid, to form the citrate of potassa, and the carbonic acid escapes, producing effervescence. The resulting solution is directed to be evaporated to dryness, as affording the most convenient form for use. The granulation ordered has a tendency to retard the deliquescence of the citrate.

Citrate of potassa is crystallizable; but, as procured by the above process, is in the form of a white granular powder. It is inodorous, of a saline, slightly bitterish, not unpleasant taste, deliquescent, very soluble in water without residue, and insoluble in alcohol. It is stated in the U. S. Pharmacopœia that its solution does not change the colour of litmus; but we have found a carefully prepared specimen slightly to redden the paper; and the acid used in the process is theoretically in slight excess. By a red heat with exposure to the air, the salt is decomposed, leaving a residue of pure carbonate of potassa. The presence of tartaric acid would be indicated by a precipitate of bitartrate of potassa on the addition of muriatic acid.

Medical Properties. This salt is a grateful refrigerant diaphoretic, and has long been much used in the fevers of this country, in the extemporaneous forms of neutral mixture and effervescing draught. (See *Liquor Potassæ Citratis.*) As these require time and a somewhat careful manipulation in their preparation, it has been found more convenient to keep the citrate of potassa ready made, and dissolve it in water when wanted for use. This solution will no doubt produce the essential diaphoretic and refrigerant effects of the neutral mixture or effervescing draught, but is less agreeable to the stomach and palate, because destitute of the carbonic acid contained in the latter. The dose of this solution is half a fluidounce, of the dry citrate from twenty to twenty-five grains. The preparation may be improved in flavour, and rendered more agreeable to the stomach, by rubbing a drop or two of oil of lemons with the six drachms of citrate before dissolving it, and substituting carbonic acid water for pure water as the menstruum. W.

LIQUOR POTASSÆ CITRATIS. *U. S. Solution of Citrate of Potassa. Neutral Mixture.*

"Take of fresh Lemon-juice *half a pint;* Bicarbonate of Potassa *a sufficient quantity.* Add the Bicarbonate gradually to the Lemon-juice till it is perfectly saturated; then filter. Or,

"Take of Citric Acid *half an ounce;* Oil of Lemons *two minims;* Water *half a pint;* Bicarbonate of Potassa *a sufficient quantity.* Rub the Citric Acid with the Oil of Lemons, and afterwards with the Water till it is dissolved; then add the Bicarbonate of Potassa gradually till the Acid is perfectly saturated; lastly, filter.

"Solution of Citrate of Potassa prepared according to these formulæ contains free carbonic acid, which is deemed a desirable ingredient. It may also be prepared by dissolving six drachms of Citrate of Potassa in half a pint of Water; but, made in this way, contains no carbonic acid." *U. S.*

The first two are equivalent preparations; the solution of citric acid flavoured with oil of lemons being intended as a substitute for fresh lemon-juice when this cannot be had. In both, the potassa of the bicarbonate unites with the citric acid, and the carbonic acid is liberated. A portion of the latter remains in the solution, and a portion escapes with effervescence. The result, therefore, is a solution of citrate of potassa in water impregnated with carbonic acid. When lemon-juice is employed, the solution has a greenish colour; but prepared with

the pure acid it is colourless. In the U. S. Pharmacopœia of 1850, bicarbonate of potassa has been substituted for the carbonate before used. As the preparation was formerly made, a flocculent precipitate was apt to exhibit itself in small quantity, owing to the silicate of potassa generally present as an impurity in the carbonate of potassa. This gave up its base to the citric acid, and the silica was deposited in the state of a hydrate. The bicarbonate is free from this impurity, and consequently hydrated silica is not thrown down; nevertheless, the solution is still directed to be filtered; a direction which may be useful, when fresh lemon-juice is used, by separating the undissolved matters of the juice, and in the other case is only surplusage. About 48 grains of the crystals of the bicarbonate, 33 grains of the pure and perfectly dry carbonate, or 45 grains of the hydrated carbonate found in the shops, are sufficient to saturate a fluidounce of good lemon-juice; but the strength of the juice is variable, and the carbonate is apt to absorb moisture from the air, so that precision as to quantities cannot be readily attained. Hence the propriety of the direction to add the alkaline carbonate to saturation. The point of saturation may be determined by the cessation of effervescence, the absence of either an acid or alkaline taste, and still more accurately by litmus paper, which should not be rendered bright-red by the solution, nor blue if previously reddened by an acid.

The inequality of strength in the lemon-juice renders the neutral mixture prepared with it more or less uncertain; though, if the apothecary select ripe and sound fruit, and express the juice himself, the preparation will be found to approach sufficiently near a uniform standard for all practical purposes. Nevertheless, if the physician wish absolute precision, he may order the neutral mixture to be made with crystallized citric acid as directed in the second officinal formula; or he may pursue the following plan suggested in former editions of this work. Dissolve two drachms of bicarbonate of potassa in two fluidounces of water; saturate the solution with good fresh lemon-juice, and strain; and lastly add enough water to make the mixture measure six fluidounces. A fluidounce of this solution may be given for a dose.

In relation to the preparation of the neutral mixture, by simply dissolving the citrate of potassa in water, as permitted in the third U. S. process above given, see the preceding article, *page* 1143.

Effervescing Draught. Under this name, the citrate of potassa is often prepared extemporaneously, and given in the state of effervescence. The most convenient mode of exhibition is to add to a fluidounce of a mixture consisting of equal parts of lemon-juice and water, half a fluidounce of a solution containing fifteen grains of carbonate of potassa, or twenty grains of the bicarbonate. Should effervescence not occur, as sometimes happens, when the carbonate is used, in consequence of the weakness of the lemon-juice, more of the juice should be added; as, unless sufficient acid is present to neutralize the potassa, part of the carbonate passes into the state of bicarbonate, and the gas is thus prevented from escaping. A solution of citric acid of the strength of that directed in the officinal formula may be substituted for lemon-juice, if this is not to be had. The fifteen grains of carbonate of potassa above mentioned are scarcely sufficient to saturate the lemon-juice, if of ordinary strength; but a little excess of the acid renders the preparation more agreeable to the taste. Some prefer the bicarbonate in the preparation of the effervescing draught, because it will always effervesce with lemon-juice, no matter what may be the strength of the latter. But this is an objection. The carbonate serves, by the absence of effervescence, to indicate when the lemon-juice is very weak in acid; and the defect may then be easily remedied by the addition of more juice. When the bicarbonate is used, if there should be a deficiency of acid, it is not discovered; and the patient takes a considerable portion of undecomposed bicarbonate, instead of the full quantity of citrate intended.

Medical Properties and Uses. The solution of citrate of potassa has long been used under the name of *neutral mixture*, *saline mixture*, or *effervescing draught*. It is an excellent refrigerant diaphoretic, adapted to almost all cases of fever with a hot dry skin, and especially to the paroxysms of our remittent and intermittent fevers. The *effervescing draught* is peculiarly useful. The carbonic acid serves to cover the taste of the citrate of potassa, and adds to the diaphoretic powers of the salt its own cordial influence over the stomach. No preparation with which we are acquainted is equally efficacious in allaying irritability of stomach, and producing diaphoresis, in our remittent fevers. It is usually also very grateful to the patient. In order to increase the sedative and diaphoretic properties of the neutral mixture, it is customary to add to it a portion of tartar emetic; and a little sweet spirit of nitre will be found an excellent adjuvant in fevers with nervous disturbance. Should the solution irritate the bowels, as occasionally happens, it may be combined with a little laudanum or solution of sulphate of morphia. Sugar may be added if desired by the patient.

The dose of the officinal solution is a tablespoonful or half a fluidounce, which should be somewhat diluted when taken. The whole of each effervescing draught, prepared as above stated, is to be taken at once. Each dose should be repeated every hour, two, or three hours, according to the urgency of the symptoms.

W.

POTASSÆ NITRAS PURUM. *Dub.* *Pure Nitrate of Potassa.*

"Take of Commercial Nitre *four pounds* [avoirdupois]; Distilled Water *five pints* [Imp. meas.], or *a sufficient quantity*. Having dissolved the Nitre in two pints of the Water at a boiling temperature, let the heat be withdrawn, and the solution be stirred constantly as it cools, in order that the salt may be obtained in very minute crystals. These, deprived as much as possible of the uncrystallized solution by decantation and draining, are to be washed in a glass or earthenware percolator with the remainder of the Water, or until the liquid which trickles through ceases to give a precipitate when dropped into a solution of nitrate of silver. The contents of the percolator should now be extracted, and dried in an oven." *Dub.*

The purified nitre of commerce is sufficiently pure for medicinal use; so that this formula of the Dublin College is entirely unnecessary. The properties of nitre, and the manner in which it is purified, have been fully explained under another head. (See *Potassæ Nitras.*)

B.

POTASSÆ SULPHAS CUM SULPHURE. *Ed.* *Sulphate of Potassa with Sulphur.*

"Take of Nitrate of Potash and Sulphur *equal parts*. Mix them thoroughly; throw the mixture in small successive portions into a red-hot crucible; and when the deflagration is over, and the salt has cooled, reduce it to powder, and preserve it in well-closed bottles." *Ed.*

When the mixture, indicated in this formula, is thrown into a red-hot crucible, each successive portion melts, and the sulphur floats on the surface with the appearance of a brown oil, burns vividly, and gives rise to a copious evolution of sulphurous acid gas. The product of the deflagration is a grayish-white friable mass, intermixed apparently with undecomposed sulphur.

The nature of this preparation has not been well determined. On the supposition that it is the sulphate of potassa, mixed with a portion of sulphur, as the Edinburgh name implies, its formation may be thus explained. By the combined influence of the sulphur and of the heat employed, the nitric acid of the nitre is totally decomposed, and is thus enabled to furnish sufficient oxygen to convert a portion of the sulphur into sulphuric acid, which, as soon as formed, combines with the base of the nitre, to form the sulphate of potassa. This is

left mixed with a portion of sulphur which has escaped combustion; but the greater part of the latter undergoes ordinary combustion, and is dissipated as sulphurous acid fumes.

Supposing the saline matter to be a sulphate containing a little free sulphur, this combustible is evidently used in great excess; but whether this excess is necessary to obtain the exact preparation desired by the Edinburgh College, it is not easy to determine. The late Dr. Duncan ascertained that the product amounted only to four-tenths of the materials employed. It is, therefore, smaller than it ought to be, even supposing that the residue consisted of nothing but sulphate of potassa.

Dr. Duncan was of opinion that the preparation under consideration cannot be viewed as a sulphuretted sulphate, and for the following satisfactory reasons. In the first place, it is more soluble in water than sulphate of potassa, and forms a yellowish solution, the water leaving undissolved only a small residue of a black colour, which is not sulphur. In the second place, it exhales during solution a sulphurous smell, and its taste is sulphurous. These facts seem to show that a small portion of sulphite of potassa is present in the preparation, or at least some sulphurous acid in loose combination. It does not yield sulphuretted hydrogen on the addition of an acid, and is not precipitated by the salts of lead. These characters are inconsistent with the opinion of Mr. John Mackay, of Edinburgh, that this preparation contains sulphuret of potassium. (See *Pharm. Journ. and Trans.* for Jan. 1842.)

Properties, &c. This salt has an acid and sulphurous taste, and an acid reaction with test paper. When pulverized, it yields a pale yellowish-white powder. It is soluble in eight times its weight of cold water. It is, however, not a uniform preparation; different specimens, apparently prepared with equal care, exhibiting some difference in properties. It was called by the earlier chemists *sal polychrestus Glaseri*, or *sal polychrest.* Its other properties coincide generally with those of sulphate of potassa, which may be considered as its basis.

Medical Properties and Uses. The medical effects of this preparation differ but little, if at all, from those of sulphate of potassa. Its action on the system is stated by Dr. Duncan to resemble that of the sulphurous mineral waters which contain a portion of neutral salt. The dose is from half a drachm to a drachm. B.

POTASSÆ BISULPHAS. *Ed., Dub. Bisulphate of Potassa.*

"Take of the residuum of the preparation of Pure Nitric Acid *two pounds;* Sulphuric Acid (commercial) *seven fluidounces and one fluidrachm* [Imp. meas.]; boiling Water *six pints* [Imp. meas.]. Dissolve the Salt in the Water, add the Acid, concentrate the solution, and set it aside to cool and form crystals." *Ed.*

"Take of Sulphate of Potash, in powder, *three ounces* [avoirdupois]; Pure Sulphuric Acid *one fluidounce* [Imp. meas.]. Place the Acid and Salt in a small porcelain capsule, and to this apply a heat capable of liquefying its contents, and which should be continued until acid vapours cease to be given off. The Bisulphate, which concretes as it cools, should be reduced to a fine powder, and preserved in a well stopped bottle." *Dub.*

In explaining the Edinburgh formula, it is only necessary to recall to the reader's attention a part of the explanations given under the head of *Nitric Acid.* (See *page* 40.) It was there stated that, for the decomposition of nitre on the small scale for the purpose of obtaining nitric acid, it is necessary to use two eqs. of sulphuric acid to one of the salt. Consequently, the salt which remains after the distillation of nitric acid is really a bisulphate, and would seem only to require to be dissolved, and the solution filtered and duly evaporated, in order to obtain the salt in crystals. But Mr. Phillips states that, when the bisulphate of potassa is dissolved in water, and the solution is allowed to crystallize, some

sulphate and much sesquisulphate are obtained instead of bisulphate, owing to the water retaining a part of the excess of acid in solution. This result is prevented by the sulphuric acid directed to be added, and, consequently, the real bisulphate is obtained in crystals. In the process of the *Dublin* College, which is a new one of its Pharmacopœia of 1850, sulphate of potassa is mixed with more sulphuric acid than is necessary to convert it into a bisulphate, and the mixture is exposed to a liquefying heat, which is continued so long as acid vapours continue to be given off. The portion of acid, more than sufficient to form a bisulphate, is thus driven off; so that the saline matter left is the salt under consideration, which, after concreting, is reduced to fine powder.

Properties, &c. Bisulphate of potassa is a white salt, having the form of a right rhombic prism, so flattened as to be tabular, and a bitter and extremely acid taste. It is soluble in twice its weight of cold water, and in less than its weight of boiling water. Alcohol does not dissolve it, but, when added to an aqueous solution, precipitates the neutral sulphate. Exposed to the air, it effloresces slightly on the surface, and when moderately heated readily melts, and runs like oil. At a red heat it loses water and the excess of acid, and is reduced to the state of neutral sulphate. From its excess of acid, it acts precisely as an acid on the carbonates, causing them to effervesce. It is incompatible with alkalies, earths, and their carbonates, with many of the metals, and most oxides. This salt was formerly called *sal enixum.* It consists of two eqs. of sulphuric acid 80, one of potassa 47·2, and two of water 18=145·2.

Medical Properties and Uses. Bisulphate of potassa unites the properties of an aperient with those of a tonic, and may be given in cases of constipation with languid appetite, such as often occur in convalescence from acute diseases. Dr. Paris states that it forms a grateful adjunct to rhubarb. It answers, also, according to Dr. Barker, for preparing an aperient effervescing draught at little expense. Equal weights, a drachm for instance, of the bisulphate and of carbonate of soda, may be dissolved separately, each in two fluidounces of water, then mixed, and taken in the state of effervescence. The dose of the bisulphate is one or two drachms. B.

POTASSÆ TARTRAS. *U. S., Lond., Ed., Dub. Tartrate of Potassa. Soluble Tartar.*

"Take of Carbonate of Potassa *sixteen ounces;* Bitartrate of Potassa [cream of tartar], in fine powder, *three pounds,* or *a sufficient quantity;* Boiling Water *a gallon.* Dissolve the Carbonate of Potassa in the Water; then gradually add the Bitartrate of Potassa to the solution till it is perfectly saturated, and boil. Filter the liquor, evaporate it until a pellicle forms, and set it aside to crystallize. Pour off the liquid, and, having dried the crystals on bibulous paper, keep them in closely stopped bottles." *U. S.*

In the *London Pharmacopœia* of 1851 this salt has been transferred from the Preparations to the catalogue of the Materia Medica.

"Take of Bitartrate of Potash *three pounds;* Carbonate of Potash *sixteen ounces,* or *a sufficiency;* boiling Water *six pints.* Dissolve the Carbonate in the Water, add the Bitartrate till the liquor is neutralized, boil and filter. Concentrate the liquor till a pellicle forms on its surface, and then set it aside to cool and crystallize. The residual liquor will yield more crystals by farther concentration and cooling." *Ed.*

"Take of Carbonate of Potash from Pearlash *eight ounces* [avoirdupois]; white Bitartrate of Potash, in fine powder, *one pound* [avoird.], or *a sufficient quantity;* Distilled Water *half a gallon* [Imp. meas.]. Dissolve the Carbonate of Potash in the Water, and to the solution, while boiling hot, gradually add the Bitartrate, until the liquid, after the ebullition has been continued for a couple of minutes, ceases to change the colour of blue or reddened litmus. Filter through calico,

and, having evaporated the clear liquor until a pellicle forms on its surface, set it by to crystallize. After twelve hours pour off the liquid, and, having dried the crystals on bibulous paper, preserve them in a well stopped bottle." *Dub.*

In these processes, the excess of acid in the bitartrate is saturated by the potassa of the carbonate, the carbonic acid is extricated with effervescence, and the neutral tartrate of potassa is formed. On account of the greater solubility of the carbonate than of the bitartrate, the former is first dissolved, and the latter added to the solution to full saturation. As the bitartrate is gradually added, the mutual action of the salts should be promoted by constant stirring; and the addition should be continued so long as effervescence takes place, which is a better mode of proceeding than to add any specified quantity of the bisalt; since, from its variable quality, it is impossible to adjust precisely the proportions applicable to all cases. It is necessary that the solution should be exactly neutral, or a little alkaline; and hence, if inadvertently too much bitartrate has been added, the proper state may be restored by adding a little of the alkaline carbonate. When the saturation has been completed, the solution is filtered in order to separate tartrate of lime, which appears in white flocks, and which is always present in cream of tartar as an impurity. The evaporated liquor should then be placed in *warm* earthenware vessels, to ensure a slow refrigeration; and, after remaining at rest for several days, the crystals begin to form. In order that the crystallization should proceed favourably, it is necessary, according to Baumé, that the solution should be somewhat alkaline. Iron vessels should not be used in any part of the process; as this metal is apt to discolour the salt.

Tartrate of potassa is sometimes made in the process for preparing tartaric acid. When thus obtained, the excess of acid of the bitartrate is neutralized by means of carbonate of lime. This generates an insoluble tartrate of lime, and leaves the neutral tartrate in solution, from which it may be obtained by evaporation and crystallization. (See *Acidum Tartaricum.*)

Properties, &c. Tartrate of potassa, prepared according to the officinal processes, is in white crystals, which are neutral to test paper, slightly deliquescent, and usually in the form of irregular six-sided prisms with dihedral summits. Its taste is saline and bitter. It dissolves in about twice its weight of cold water, and in much less boiling water, and is nearly insoluble in alcohol. Exposed to heat it undergoes fusion, swells up, blackens, and is decomposed; being converted into carbonate of potassa. For medicinal use it should always be crystallized; but, as it ordinarily occurs in the shops, it is in a white granular powder, obtained by evaporating the solution to dryness, while it is constantly stirred. In this state it is said to require four times its weight of water for solution. It is never purposely adulterated; but, if it be obtained by evaporation to dryness, it is liable to contain an excess of carbonate or of bitartrate of potassa, when it will have either an alkaline or acid reaction. It is decomposed by all the strong acids, and by many acidulous salts, which cause the precipitation of minute crystals of bitartrate of potassa, by abstracting one eq. of alkali from two of the salt. Chloride of barium or acetate of lead occasions a white precipitate of tartrate of baryta or lead, distinguishable from the sulphate of those bases by being wholly soluble in dilute nitric acid. Tartrate of potassa is composed of one eq. of tartaric acid 66, and one of potassa $47{\cdot}2=113{\cdot}2$. According to Berzelius, the crystals contain no water of crystallization.

Medical Properties. Tartrate of potassa is a mild cooling purgative, operating, like most of the neutral salts, without much pain, and producing watery stools. It is applicable to febrile diseases, and is occasionally combined with senna, the griping effects of which it has a tendency to obviate. The dose is from a drachm to an ounce, according to the degree of effect desired. B.

POTASSII BROMIDUM. *U. S. Bromide of Potassium.*

"Take of Bromine *two ounces;* Iron Filings *an ounce;* Carbonate of Potassa *two ounces and a drachm,* or *a sufficient quantity;* Distilled Water *four pints.* Add first the Iron Filings, and afterwards the Bromine, to a pint and a half of the Distilled Water, stirring the mixture frequently with a spatula for half an hour. Apply a gentle heat, and, when the liquor assumes a greenish colour, add gradually the Carbonate of Potassa, previously dissolved in a pint and a half of the Distilled Water, until it ceases to produce a precipitate. Continue the heat for half an hour, and then filter. Wash the precipitate with the remaining pint of Distilled Water, boiling hot, and filter. Mix the filtered liquors, and evaporate so that crystals may form. Lastly, pour off the liquid, and dry the crystals on bibulous paper." *U. S.*

In the first step of this process, a solution of bromide of iron is formed; and this, by the addition of the solution of carbonate of potassa, is decomposed so as to generate carbonate of the protoxide of iron which precipitates, and bromide of potassium in solution. By straining, the precipitated carbonate is separated, and from the strained liquor crystals of bromide of potassium are obtained by due evaporation.

Properties, &c. Bromide of potassium is a permanent, colourless, anhydrous salt, crystallizing in cubes or quadrangular prisms, and having a pungent, saline taste, similar to that of common salt, but more acrid. It is very soluble in cold water, more so in hot, and but slightly soluble in alcohol. When heated it decrepitates, and, at a red heat, fuses without decomposition. The following characters are given of the salt in the U. S. Pharmacopœia. "Its aqueous solution does not affect the colour of litmus or turmeric, and is not precipitated by chloride of barium. When mixed with starch, and treated with sulphuric acid, it becomes yellow. The salt, when subjected to heat, does not lose weight. Ten grains of it require, for complete precipitation, 14·28 grains of nitrate of silver, and the precipitate formed has a yellowish colour." The object of adding sulphuric acid along with the starch is to set the bromine free. If iodine be set free at the same time, the starch will give rise to a violet or feeble blue colour. To test for iodine in this salt, Lassaigne recommends to add to its solution a few drops of a weak solution of chlorine, and then to introduce a piece of starched white paper. If iodine be present, the starch will become violet, or faintly blue. If the salt decomposes more nitrate of silver than is above stated, its saturating power is greater than it should be, and the presence of a chloride, probably of potassium or sodium, may be suspected. Bromide of potassium consists of one eq. of bromine 78·4, and one of potassium 39·2=117·6.

Medical Properties. Bromide of potassium is deemed alterative and resolvent. In 1828, Pourché used it with benefit, both internally and in the form of ointment, in the treatment of bronchocele and scrofula. Favourable results were obtained by Dr. Williams, of London, from its use as an internal remedy in several cases of enlarged spleen. According to Ricord, it produces effects in secondary syphilis similar to those of iodide of potassium, but acts more slowly. (See *Potassii Iodidum.*) The same view is taken of its slow action in syphilis by Dr. John Egan. This surgeon, after experimenting with the bromide of potassium for a period of four years in the Westmoreland Lock Hospital, found its effects, in secondary and tertiary syphilis, slow and unsatisfactory, when compared with those of iodide of potassium. While the iodide generally increased the appetite and improved the powers of digestion, the bromide not unfrequently produced nausea and derangement of the digestive organs. (*Am. Journ. of Med. Sci.*, xiv. 206, from the *Dublin Med. Press.*) M. Huette, from extensive trials made with this remedy in the same stages of syphilis, found it inefficacious; exhibiting, in its effects, a marked contrast to those of iodide of potassium, which rapidly

relieved the cases in which the bromide had failed. (*Ann. de Thérap.*, 1851, p. 216.) When given in large doses (from two to five drachms daily), it produces headache, followed by a peculiar intoxication, attended with torpor and drowsiness, slowness of the pulse, temporary dulness of sight and hearing, and weakness of the intellectual faculties. In one case, observed by M. Rames, the insensibility was so complete that the puncture of the skin with a suture needle was not felt, and the titillation of the conjunctiva and fauces with a feather produced neither winking nor desire to vomit. (*Journ. de Pharm.*, Dec. 1849.) Anæsthesia of the fauces, produced by this bromide, was subsequently observed by M. Huette, who also noticed in it the power of inducing more or less torpidity of the genital organs.

Bromide of potassium may be given in the form of pill, or dissolved in water, in doses of from three to ten grains three times a day. The *ointment* may be made by mixing from a scruple to two drachms of the bromide with an ounce of lard. Of this from half a drachm to a drachm may be rubbed on a scrofulous tumour, or other part where its local action is desired, once in twenty-four hours. Sometimes bromine is added to this ointment in the proportion of thirty minims to the ounce of lard. B.

POTASSII CYANURETUM. *U. S.* *Cyanuret of Potassium.*

"Take of Ferrocyanuret of Potassium, dried, *eight ounces;* Carbonate of Potassa, dried, *three ounces.* Mix the salts intimately, and throw the mixture into a deep iron crucible previously heated to redness; maintain the temperature till effervescence ceases, and the fused mass concretes, of a pure white colour, upon a warm glass rod dipped into it; then pour out the liquid carefully into a shallow dish to solidify, stopping before the salt becomes contaminated with the precipitated iron. Break up the mass while yet warm, and preserve it in well stopped bottles." *U. S.*

The above process for obtaining this cyanuret is that of Liebig, modified by C. Clemm, and has been substituted, in the U. S. Pharmacopœia of 1850, for that in which the ferrocyanuret is ignited without addition. It furnishes a large product of cyanuret of potassium, contaminated, but not to an injurious extent, with cyanate of potassa. The reaction takes place between two eqs. of ferrocyanuret of potassium and two of carbonate of potassa. The iron is set free, the carbonic acid evolved, and a compound of five eqs. of cyanuret of potassium and one of cyanate of potassa is formed. The iron occupies the lower part of the fused liquid; and, if the latter be carefully poured out to solidify, the portion contaminated with the iron may be left behind. The reaction is explained by the following equation;—$2(FeCy,2KCy)$ and $2(KO,CO_2)=5KCy+KO,CyO$ and $2Fe$ and $2CO_2$. The cyanate of potassa may be readily detected by saturating the product with an acid, which will cause an effervescence of carbonic acid, and the generation of a salt of ammonia.

In the process in which the ferrocyanuret of potassium is ignited alone (former U. S. process), the salt is first deprived of its water of crystallization by exposure to a moderate heat, and then calcined at a red heat for two hours, in order to decompose the cyanuret of iron. The product of the calcination is a black, porous mass, consisting of cyanuret of potassium, mixed with carburet of iron and charcoal. As the cyanuret is very prone to absorb oxygen, especially when hot, whereby it is decomposed, atmospheric air is excluded from the retort, while it is cooling, by luting its orifice. When the whole is cold, the black mass is reduced to coarse powder, and exhausted by cold distilled water, which dissolves the cyanuret of potassium, and leaves the carburet of iron and charcoal behind. The filtered liquor, therefore, is an aqueous solution of cyanuret of potassium, which is obtained in a solid state by a rapid evaporation to dryness. During the evaporation, a small portion of the cyanuret is decomposed, attended with

the evolution of ammonia, and the production of formiate of potassa. A portion of this salt, therefore, contaminates the cyanuret, as obtained by this process; but the quantity is too small to interfere with its medicinal action. The decomposition here referred to takes place between one eq. of cyanuret of potassium and four of water, and is represented by the following equation, in which the cyanogen is expressed by its full symbol NC_2, and formic acid by C_2HO_3;—K,NC_2 and $4HO=NH_3$ and KO,C_2HO_3. This decomposition is avoided by exhausting the black mass with boiling alcohol of 60 per cent. (sp. gr. 0·896) instead of water. The alcoholic solution, by evaporation to a pellicle, lets fall the salt upon cooling, as a crystalline precipitate, perfectly white and pure.

According to the process of the French Codex, this cyanuret is obtained in the dry way, without the use of any solvent. The calcination is performed in a coated stoneware retort, half-filled with the ferrocyanuret, to which a tube is attached for collecting the gaseous products. When these cease to be disengaged, the heat is gradually raised to a very high temperature, at which it is kept for a quarter of an hour; after which the tube is closed with luting, and the whole left undisturbed until quite cold. When the calcination is thus conducted, the retort, upon being broken, will be found to contain a black matter, covered with a fused layer of pure cyanuret of potassium, resembling white enamel. This is detached by means of a knife, and immediately transferred to a bottle, with an accurately fitting stopper. The black matter, under the name of *black cyanuret of potassium*, is also kept for medicinal use; but the dose of this cannot be accurately fixed, on account of its containing, at different times, more or less impurity.

The French Codex process is commended by Mr. Donovan, of Dublin, as being the best for obtaining this salt. He has modified it by substituting for the stoneware retort, an iron mercury bottle, which, when cold, must be cut in two by a chisel and heavy hammer to get out the product. The details of his mode of proceeding are given by him in the *Pharm. Journ. and Trans.*, ii. 578.

Cyanuret of potassium may be formed by passing a current of nitrogen, previously strongly ignited, over charcoal, impregnated with carbonate of potassa, and heated to whiteness. (See *page* 593.) The same result is obtained, under similar circumstances, by a current of atmospheric air, mixed with watery vapour, according to the plan of M. Armengaud. (*Pharm. Journ. and Trans.*, Dec. 1853, p. 291.)

Properties. Cyanuret of potassium, as prepared by the U. S. formula, is in white, opaque, amorphous masses, having a sharp, somewhat alkaline and bitter-almond taste, and an alkaline reaction. If yellow it contains iron. It is deliquescent in moist air, very soluble in water when reduced to powder, and sparingly soluble in strong alcohol. The salt and its solution, when exposed to the air, exhale the odour of hydrocyanic acid, and become weaker; but the change takes place slowly. Orfila found that the salt, after fourteen days' exposure, by which it was almost entirely liquefied, still possessed energetic poisonous properties. He thinks, therefore, that the bad effects of opening the containing bottle, in dispensing the medicine, have been exaggerated. Unfortunately, the salt varies in quality, independently of the effects of time and exposure. Dr. David Stewart, of Baltimore, examined six samples of this cyanuret, on sale, and found them to vary considerably in purity. Besides water, the usual impurities are hydrate, carbonate, cyanate, and formiate of potassa. These sometimes amount to nearly half the weight of the cyanuret, consisting principally of the carbonate. From the extensive use at present made of cyanuret of potassium in electro-metallurgy and photography, it is of importance to have a reliable test of its purity. Such a test has been discovered by MM. Fordos and Gélis, founded on the fact that two eqs. of iodine rapidly react with one of the cyanuret, so as to form one eq.

of iodide of potassium, and one of iodide of cyanogen;—KCy and 2I=KI and CyI. Accordingly, a tincture of iodine of known strength is gradually added to an aqueous solution of a given weight of the cyanuret to be tested, until it assumes a permanent yellowish tinge; and the amount of iodine expended indicates the proportion of cyanuret in the specimen. A necessary preliminary step, before using the tincture, is to add sufficient carbonic acid water to the solution of the cyanuret, to convert any hydrate or carbonate of potassa present into bicarbonates, in which state these impurities have no action on the iodine. (*Chem. Gaz.*, Oct. 15, 1852, p. 387.) This test is applicable to other cyanogen compounds. (See *page* 809.) Cyanuret of potassium yields with nitrate of silver a precipitate of cyanuret of silver, which is wholly soluble in ammonia. It consists of one eq. of cyanogen 26, and one of potassium 39·2=65·2.

Medical Properties. Cyanuret of potassium is pre-eminently poisonous, acting precisely like hydrocyanic acid as a poison and as a medicine. (See *Acidum Hydrocyanicum.*) The grounds on which it was proposed as a substitute for that acid by Robiquet and Villermé, are its uniformity as a chemical product, and its less liability to undergo decomposition. The dose is the eighth of a grain, dissolved in half a fluidounce of distilled water, to which may be added half a fluidrachm of syrup of lemons, if the prescriber wishes to set free hydrocyanic acid. (*Donovan.*) The spurious cyanuret, formed by calcining dried muscular flesh with potash, consists principally of carbonate of potassa, and is but slightly poisonous. (*Orfila.*) A solution, made with from one to four grains to the fluidounce of water, has been recommended in neuralgic and other local pains, applied by means of pieces of linen. Mr. Guthrie found that a solution of from three to six grains to the fluidounce of distilled water, formed an admirable remedy, applied by drops every other day, for removing the olive-coloured stains of the conjunctiva, caused by nitrate of silver. B.

POTASSII IODIDUM. *U. S., Lond., Ed., Dub. Iodide of Potassium.*

"Take of Potassa *six ounces;* Iodine, in powder, *sixteen ounces;* Charcoal, in fine powder, *two ounces;* Boiling Water *three pints.* Dissolve the Potassa in the Water, add the Iodine gradually, stirring after each addition until the solution becomes colourless, and continue the additions until the liquid remains slightly coloured from excess of Iodine. Evaporate the solution to dryness, stirring in the Charcoal towards the close, so that it may be intimately mixed with the dried salt. Rub this to powder, and heat it to dull redness in an iron crucible, maintaining that temperature for fifteen minutes; then, after it has cooled, dissolve out the saline matter with pure water, filter the solution, evaporate, and set aside to crystallize. An additional quantity of crystals may be obtained from the residual liquid by evaporating and crystallizing as before." *U. S.*

In the *London Pharmacopœia* of 1851, iodide of potassium has been transferred from the preparations to the list of Materia Medica.

"Take of Iodine (dry) *five ounces;* fine Iron Wire *three ounces;* Water *four pints* [Imp. meas.]; Carbonate of Potash (dry) *two ounces and six drachms.* With the Water, Iodine, and Iron Wire prepare the solution of iodide of iron as directed [under Ferri Iodidi Syrupus]. Add immediately, while it is hot, the Carbonate of Potash previously dissolved in a few ounces of water, stir carefully, filter the product, and wash the powder on the filter with a little water. Concentrate the liquor at a temperature short of ebullition, till a dry salt be obtained, which is to be purified from a little red oxide of iron and other impurities, by dissolving it in less than its own weight of boiling water, or still better by boiling it in twice its weight of rectified spirit, filtering the solution, and setting it aside to crystallize. More crystals will be obtained by concentrating and cooling the residual liquor." *Ed.*

"Take of Pure Iodine, reduced to powder, *four ounces and a half* [avoirdupois]; filings, or thin turnings of wrought Iron, separated from impurities by a magnet, *two ounces* [avoird.]; Pure Carbonate of Potash *two ounces and a half* [avoird.], or *a sufficient quantity;* Distilled Water *three pints and a half* [Imp. meas.]. Heat gently five ounces of the Water with the Iron and three ounces of the Iodine, for twenty minutes, and then boil until the solution loses its red colour. Filter this through paper, washing the filter with five ounces of Water at a boiling temperature, and, in the solution thus obtained, dissolve, by digestion and shaking, the remainder of the Iodine. To the Carbonate of Potash, dissolved in a quart [two pints Imp. meas.] of the Water, and heated to 212° in a large porcelain capsule, add the solution of Iron and Iodine, and boil until effervescence ceases, adding, if necessary, a little more Carbonate of Potash, so that the liquor may be very slightly alkaline. Filter now, washing the precipitate with the remaining pint of water boiling hot, and, having evaporated the liquid till a pellicle begins to appear on its surface, let it be set by that crystals may form. These, when dried on blotting paper, should be preserved in a bottle furnished with a perfectly tight stopper. The liquor from which the crystals have separated will, by further evaporation and cooling, afford an additional quantity of the salt." *Dub.*

In the process newly adopted in the U. S. Pharmacopœia of 1850, an aqueous solution of potassa is treated with iodine in slight excess. The result of thus saturating potassa with iodine is the formation of two salts, iodide of potassium and iodate of potassa. Six eqs. of iodine react with six of potassa, and there are formed five eqs. of iodide of potassium, and one of iodate of potassa;—6I and 6KO=5KI and KO,IO_5. By evaporating the solution to dryness the mixed salts are obtained; and, if the dry mass be exposed to a red heat, the iodate will be converted into iodide of potassium, thus removing this impurity from the iodide. In the formula the mixed salts, towards the close of their evaporation to dryness, are directed to be mixed with powdered charcoal, according to the plan of Mr. Scanlan, which facilitates the deoxidation of the iodate. This being accomplished by a dull red heat, the iodide of potassium is dissolved out of the mass, and the solution set aside to crystallize.

The first step of the Edinburgh process is to form the iodide of iron in solution, precisely as is done in the formula for that compound; and the second to decompose it by carbonate of potassa, which gives rise to iodide of potassium in solution, and a precipitate of carbonate of protoxide of iron. The solution of iodide of potassium is separated by filtration and washing from the precipitated carbonate, and evaporated to dryness. The dry salt is then freed from iron and other impurities by solution in boiling water or alcohol, filtration and crystallization. Messrs. T. and H. Smith, of Edinburgh, instead of washing the precipitate, prefer the plan of pressing it strongly in a cloth, in order to extract the remains of the solution. The mass left is broken up in a portion of distilled water equal to about two-thirds of the weight of the iodine employed, and pressed a second time. Proceeding thus, less water is used, and less evaporation is necessary. The solution obtained by them is evaporated to dryness, and the dry salt is carefully fused in an iron pot, in order to free it from colour. It is then dissolved, and the solution, by filtration, concentration, and cooling, furnishes a perfectly pure iodide nearly to the last.

The Dublin process is similar to that of the Edinburgh College. Two-thirds of the iodine are gently heated with the iron mixed with a portion of water, and the filtered solution of the iodide of iron formed is shaken with the remaining third of the iodine until it is dissolved. There is thus formed what may be called a superiodide of iron, which is mixed in the usual way with the carbonate of potassa, and the mixture boiled until effervescence ceases. By this boiling

the salts are made fully to react on each other, and the filtered solution prevented from being contaminated with iron. The Dublin College very properly orders the use of the pure carbonate of potassa in this process, in accordance with the practice of the Messrs. Smith.

Properties, &c. Iodide of potassium, sometimes incorrectly called *hydriodate of potassa*, is in opaque, white or transparent crystals, permanent in a dry air, slightly deliquescent in a moist one, and having a sharp saline taste. It does not change the colour of litmus, and has little or no effect on turmeric. According to the Messrs. Smith, of Edinburgh, it is not at all deliquescent when perfectly pure. It generally crystallizes in cubes. It is soluble in about two-thirds of its weight of cold water, and in from six to eight parts of rectified spirit. Its solution is decomposed by sulphuric acid, which acts by generating hydriodic acid, which speedily undergoes decomposition, with evolution of iodine; and, if starch be added after the lapse of a few minutes, a blue colour is generated. The starch test will not give the characteristic blue colour immediately, if added simultaneously with the acid, unless the iodide of potassium contains iodate of potassa, which impurity causes an immediate liberation of iodine. The blue colour being produced by the starch and acid, simultaneously added, is, therefore, a sign of impurity. A very delicate test of iodide of potassium, and other soluble iodides, is that of M. Grange. It consists in pouring a little of the liquid to be examined into a test-tube, adding a few drops of solution of starch, and passing through the mixture a few bubbles of fuming nitrous acid. The liquid immediately assumes a pale-rose colour, inclining to violet, when containing 1-200,000th of its weight of the iodide, and a bright blue colour, if 1-100,000th is present. See *page* 408. (*Chem. Gaz.*, Jan. 1, 1852, p. 19.)

"When tartaric acid is freely added to a strong solution of the iodide, it occasions a white crystalline precipitate; and the supernatant liquid, if mixed with starch, becomes first purple, and finally blue. Chloride of platinum colours its solution reddish-brown, without causing a precipitate; chloride of barium but slightly affects it; and sulphate of iron occasions no change." (*U. S. Pharm.*)

The non-action of the last test shows the absence of carbonate of potassa. The aqueous solution is capable of taking up a large quantity of iodine, forming a liquid, containing the iodurettted iodide, of a deep-brown colour. Exposed to a dull red heat it fuses, and on cooling concretes into a crystalline pearly mass, without loss of weight; but at a full red heat it is slowly volatilized without decomposition. The most usual impurities contained in this salt are the chlorides of potassium and sodium, bromide of potassium, and iodate and carbonate of potassa. The presence of a chloride may be determined by the use of nitrate of silver. This test will throw down nothing from the pure salt but iodide of silver, which is scarcely soluble in ammonia; while chloride of silver is readily soluble in it. If then a solution of the iodide be precipitated by an excess of nitrate of silver, and agitated with ammonia, the latter will dissolve any chloride which may have been thrown down, and will yield it again as a white precipitate on being saturated with nitric acid. If, on the other hand, the iodide of potassium be pure, the ammonia will only take up a minute quantity of iodide of silver, and the addition of nitric acid will scarcely disturb the transparency of the solution. The iodide of silver thrown down from 10 grains of iodide of potassium weighs, when washed and dried, 14·1 grains. When acetate of lead is added to a solution of iodide of potassium, a yellow precipitate of iodide of lead is thrown down, soluble in boiling water. The low price of bromide of potassium, compared with that of the iodide, has caused the former to be used to adulterate the latter. When bromide of potassium is sold for the iodide, the fraud may be detected by the fact that the bromide produces no precipitate with bichloride of mercury. In order to detect bromine, M. Personne first precipi-

tates from an aqueous solution of the suspected iodide, the whole of the iodine as protiodide of copper, by successively adding, in excess, a solution of sulphate of copper, and aqueous sulphurous acid; and then treats the filtered liquid with ether and chlorine water, the whole being shaken together and left at rest. If bromine be present, the ether which rises to the surface, will be tinged of a reddish-yellow colour. The iodate and carbonate may be detected by their insolubility in alcohol. The iodate may be detected also by adding a solution of tartaric acid to a solution of the suspected iodide. Bitartrate of potassa will be precipitated, and, if the iodide be pure, a yellow colour is *soon* developed from the action of the air on the liberated hydriodic acid; but, if any iodate be present, the test will set free both iodic and hydriodic acid, which, by their reaction, will *instantly* develope free iodine. (*Pereira.*) Carbonate of potassa is generally present in the proportion of from one to ten per cent. Dr. Christison has detected 74½ per cent. and Dr. Pereira as high as 77 per cent. An adulteration by the carbonate under ten per cent. does not alter the crystalline appearance of the iodide, but gives it an increased tendency to deliquesce. When it is greater it renders the salt granular and highly deliquescent. This impurity may be detected by lime-water, which causes a milkiness (carbonate of lime), and by tincture of iodine, the colour of which is destroyed. Another impurity, found by A. Erdmann, is bicarbonate of soda. It was detected by adding to a small portion of the suspected sample, sufficient water to dissolve it if pure. This left the impurity in fragments of crystals, which required from thirteen to fourteen parts of water to dissolve them. Upon examination they effervesced with acids, and proved to be bicarbonate of soda. (J. M. Maisch, *Am. Journ. of Pharm.*, xxvi. p. 210.) Iodide of potassium consists of one eq. of iodine 126·3, and one of potassium, 39·2=165·5. It contains no water of crystallization.

Professor Procter has given a paper on the incompatibles of iodide of potassium, in relation to the mercurial preparations. He finds it incompatible with calomel, the black and red oxides of mercury, turpeth mineral, white precipitate, blue mass, and metallic mercury. These experiments serve to confirm the results of M. Melsens, that iodide of potassium, given in connexion with the insoluble preparations of mercury, renders them soluble and much more active. (See *Am. Journ. of Pharm.*, xxvi. p. 222.)

Medical Properties and Uses. This salt produces very marked effects on the secretions in general, which it increases, and into which it readily passes. It has a tendency to irritate the mucous membrane of the air-passages, as is shown by its sometimes occasioning an affection like cold in the head. Dr. D. P. Phillips, U.S. Navy, reports a case in which it appeared to produce trismus, which he attributed to the use of the medicine in too concentrated a solution. (*Med. Exam.*, May, 1853.) When long continued in large doses it sometimes produces a tender, enlarged, lobulated, and fissured tongue, constituting a true chronic glossitis. Mr. Langston Parker, of England, has reported several cases of this kind, in which the iodide had been taken for years. (See *Am. Journ. of Med. Sci.*, Oct. 1852, p. 495.) Its obvious effects on the system are very variable, arising probably either from peculiarities of constitution, or from the unequal quality of the medicine itself. Thus, in some cases it produces nausea, pain in the stomach, and diarrhœa, in moderate doses; and in others is borne in large doses without inconvenience. Sometimes it increases the appetite and the flesh. By some practitioners it is preferred for the purpose of producing the constitutional effects of iodine. Dr. De Renzy, of Carnew, used it with great success in hæmoptysis, and Dr. Graves, of Dublin, employed it with advantage in a very obstinate erythematic swelling of the hand. M. Oke praises its effects in chorea, after the preparations of iron have failed. Dr. Williams, of London, considers it applicable to the treatment of various forms of secondary syphilis. He used

it with success, in a majority of cases, in removing hard periosteal nodes, and found it beneficial in the treatment of tubercular forms of venereal eruptions. It is also considered as one of the best alterative remedies in mercurio-syphilitic sorethroat. Ricord bears testimony to its valuable powers in the treatment of secondary syphilis. According to the clinical observations of Dr. W. R. Basham, of London, iodide of potassium is well suited to the treatment of chronic periosteal rheumatism in subjects who have previously taken mercury to salivation; while it is not applicable to the disease when occurring in patients who have not undergone a mercurial course, but have suffered from syphilis, which has been neglected, or treated only locally. In the latter cases he conceives that corrosive sublimate and sarsaparilla are the proper remedies. (See *Am. Journ. of Med. Sci.*, Jan. 1854, p. 227.) It is probably useful in the former cases on the principle of eliminating mercury from the system, agreeably to the views of M. Melsens, given below. In 1843, MM. Guillot and Melsens gave iodide of potassium with advantage, in doses of from a drachm to a drachm and a half daily, in mercurial tremours and lead poison. In a memoir published in 1849, M. Melsens gives a full account of his experiments with it as a remedy for the affections caused by mercury and lead. He effected a number of cures of mercury tremours and lead palsy; and during the progress of the cure, these metals were found in the urine. The manner in which the remedy acts, according to M. Melsens, is by rendering the poisonous metal, which has become fixed in the tissues, soluble, first converting it into an iodide, and then dissolving the iodide formed. This view is supported by the fact that all the compounds of mercury and lead are soluble in iodide of potassium. (See the Memoir of M. Melsens, translated by Dr. Budd, of Bristol, England, in the *Brit. and For. Medico-Chir. Review*, Am. ed., for Jan. 1853, p. 157; also a paper by Dr. J. W. Corson, in the *N. Y. Journ. of Medicine*, for Sept. 1853.) An important fact observed by M. Melsens was that iodide of potassium, given at the same time with certain compounds of mercury, rendered them more active; and, when given after the latter, developed an activity not previously manifested, and sometimes to such an extent as to occasion serious accidents. This fact he attributed to the power of the iodide to render the mercurial compounds soluble, in which state only are they capable of being eliminated with the urine. During the use of iodide of potassium, ptyalism sometimes occurs. This has been usually considered a primary effect of the remedy; but the light shed on the subject by M. Melsens, leads to the belief that it may be a secondary effect, resulting from the liberation from the tissues of mercury previously taken, which is thereby enabled, by becoming soluble, to produce its constitutional effects. Dr. Budd relates several cases, in which mercurial ptyalism came on, during the use of iodide of potassium, in persons who had not taken mercury for weeks or months before. These facts render it probable that the different cases of ptyalism, reported as the result of iodide of potassium, were in fact produced by mercury, previously fixed in the system, being rendered soluble and active by the iodide.

The late Dr. Isaac Parrish, of this city, employed iodide of potassium successfully in strumous inflammation of the eye, given in the compound syrup of sarsaparilla. It appeared promptly to relieve the severe neuralgic, circumorbital pain. Dr. G. L. Upshur, of Virginia, recommends its use in the suppurative stage of pneumonia. The dose is from two to ten grains or more, three times a day, given in solution. Ricord rarely exceeded three scruples a day. Some practitioners have reported the exhibition of enormous doses, such as two, four, and even six drachms daily without inconvenience. Dr. Buchanan, of Glasgow, assures us that he has given the pure salt in doses of half an ounce, without any precaution being observed by the patient, except to drink freely of diluents. Notwithstanding this testimony, Dr. Lawrie, of the same city, reports several

cases of dryness and irritation of the throat, ending in severe spasmodic croup, and one case of death following the sudden occurrence of dyspnœa, caused by the use of small doses of this iodide.

Prof. Brainard, of Chicago, has proposed as a remedy for the bite of the rattlesnake, the infiltration of the tissues, where the bite has been inflicted, with from half a drachm to a drachm and a half of a solution of fifteen grains of iodide of potassium and five of iodine in a fluidounce of distilled water. A cupping glass is applied over the wound as soon as possible, and the infiltration effected by passing beneath the skin, under the edge of the cup, a small trocar, through the cannula of which the solution is injected. Forty experiments were tried with this treatment on pigeons, kittens, and dogs, with generally successful results. Prof. Brainard proposes to extend it to dissection wounds, and all poisoned wounds of a dangerous character. (*N. Y. Med. Times*, iii. 210.)

Iodide of potassium passes quickly into the urine, in which it may be detected by first adding to the cold secretion a portion of starch, and then a few drops of nitric acid, when a blue colour will be produced. It has been detected in six minutes after having been swallowed.

According to Ricord, this salt produces in some constitutions peculiar effects, such as various eruptions of the skin, excessive diuresis, vascular injection of the conjunctiva and tumefaction of the eyelids, cerebral excitement like that produced by alcoholic drinks, and discharges from the urethra and vagina, resembling blennorrhœa. Eruptions of the skin were also observed by Dr. A. Van Buren, as a very common effect of large and long continued doses of iodide of potassium, given to patients in the Bellevue Hospital. (*N. Y. Journ. of Med.*, viii. 208.) Dr. John O'Rielly, of New York, reports several cases, in which, after the use of this iodide, spots like purpura were produced, invading first the face, and then the trunk and extremities. These became bullæ, sometimes an inch in diameter, filled with a purple liquid, and finally sphacelated spots ending in ulcers. Great constitutional disturbance coexisted, with swollen tongue, fetor, and salivation. The remedies found successful were nutritious diet, tonics, and stimulants. (*N. Y. Med. Gaz.*, v. 7.) From the facts mentioned above, showing the power of iodide of potassium to render latent mercury in the system active, it is not improbable that the cases of Dr. O'Rielly were mercurial salivation, modified by a cachectic condition of the system, which caused the coincident eruption.

Iodide of potassium is employed as an external application in the form of ointment, either alone or mixed with iodine. (See *Unguentum Potassii Iodidi* and *Unguentum Iodinii Compositum.*)

Off. Prep. Emplastrum Potassii Iodidi; Hydrargyri Iodidum Rubrum; Liquor Iodinii Compositus; Liquor Potassii Iodidi Compositus; Pilulæ Ferri Iodidi; Plumbi Iodidum; Tinctura Iodinii Composita; Unguentum Iodinii; Unguentum Iodinii Compositum; Unguentum Potassii Iodidi. B.

LIQUOR POTASSII IODIDI COMPOSITUS. *Lond.* POTASSII IODIDI LIQUOR COMPOSITUS. *Dub.* *Compound Solution of Iodide of Potassium.*

"Take of Iodide of Potassium *ten grains;* Iodine *five grains;* Distilled Water *a pint* [Imp. meas.]. Mix, that they may dissolve." *Lond.*

The *Dublin* formula is the same as the above, with the exception that the College directs its pure iodine.

This, like the compound solution of iodine, described at *page* 1064, is an aqueous solution of iodine and iodide of potassium; but, while the compound solution of iodine is so concentrated as to be given in drops, the compound solution of iodide of potassium is so dilute as to be administered in tablespoonfuls.

Compound solution of iodide of potassium is twice as strong as Lugol's iodu-

retted mineral water of *medium* strength, assuming the Imperial fluidounce to be the same as the French ounce. (See *page* 411.) The dose is a fluidounce, containing a quarter of a grain of iodine, gradually increased to two fluidounces or more. The dose should be diluted with an equal bulk of water at the time it is taken. B.

POTASSII SULPHURETUM. *U. S., Lond., Ed.* HEPAR SULPHURIS. *Dub. Sulphuret of Potassium. Liver of Sulphur.*

"Take of Sulphur *an ounce;* Carbonate of Potassa *two ounces.* Rub the Carbonate of Potassa, previously dried, with the Sulphur; melt the mixture in a covered crucible over the fire; then pour it out, and, when it is cold, put it into a bottle, which is to be well stopped." *U. S.*

"Take of Sulphur *one ounce;* Carbonate of Potash *four ounces.* Triturate them well together, and heat them in a covered crucible till they form a uniform fused mass; which, when cold, is to be broken up into fragments, and kept in well closed vessels." *Ed.*

"Take of Sublimed Sulphur *four ounces;* Carbonate of Potash from Pearlash, first dried, and then reduced to powder, *seven ounces.* Mix the ingredients in a warm mortar, and, having introduced them into a Hessian crucible, let this be heated, first gradually, until effervescence has ceased, and finally to low redness, so as to produce perfect fusion; and let its liquid contents be then poured into an iron cup, over which a second vessel should be immediately inverted, so as to exclude the air as completely as possible, while solidification is taking place. The solid product thus obtained should, when cold, be broken into fragments, and immediately enclosed in a green glass bottle, furnished with an air-tight stopper." *Dub.*

The *London College* has transferred this sulphuret to its Materia Medica list.

When carbonate of potassa is melted with half its weight of sulphur, as in the U. S. process, the carbonic acid is expelled. Four eqs. of potassa and ten of sulphur may be supposed to react on each other. Three eqs. of potassa are decomposed into three eqs. of potassium and three of oxygen. The three eqs. of potassium unite with nine eqs. of sulphur to form three eqs. of tersulphuret of potassium. The three eqs. of oxygen, by uniting with the remaining eq. of sulphur, form sulphuric acid, which combines with the undecomposed eq. of potassa to form sulphate of potassa. Thus the U. S. preparation may be considered to be a mixture of tersulphuret of potassium with sulphate of potassa; and the French Codex sulphuret, made from the same proportion of carbonate and sulphur, is stated in that work to have the same composition. In the Dublin formula a less proportion of carbonate of potassa is taken than in the U. S. process, but the product is probably very similar. The product of the Edinburgh formula may be assumed to have the same constituents, *plus* a certain proportion of undecomposed carbonate of potassa, on account of the large excess of alkali taken. In performing the process, the fused liquid is usually poured out on a marble slab, and, as soon as it concretes, the mass should be broken into pieces, and immediately transferred to a well-stopped bottle.

The Pharmacopœias use the carbonate of potassa from pearlash; but in the process of M. Henry, which is stated to be the best yet devised, the pure carbonate of potassa is employed. His formula is as follows. Mix two parts of real salt of tartar with one of roll sulphur reduced to powder, and put the mixture into flat-bottomed matrasses, which should be only two-thirds filled. These are placed on a sand-bath, and the fire is applied, so as, at first, to produce only a gentle heat, which is afterwards increased. Care must be taken that the necks of the matrasses do not become obstructed. The heat is continued until the matter is brought to the state of tranquil fusion, when it is allowed to cool. The

mass obtained, which is compact, smooth, and of a fine yellow colour, is broken into pieces, and preserved in well-stopped bottles.

Properties, &c. Sulphuret of potassium, when properly prepared, is a hard brittle substance, having a nauseous, alkaline, and bitter taste. Its colour is liver-brown, and hence its name of *hepar sulphuris* or *liver of sulphur*. The colour of the surface of a fresh fracture is brownish-yellow. It is inodorous when dry, but emits a slightly fetid smell when moist, owing to the extrication of a little sulphuretted hydrogen gas. It is completely soluble in water, forming an orange-yellow liquid, and exhaling the smell of sulphuretted hydrogen. By exposure to the air it attracts oxygen, and the sulphuret of potassium is gradually converted into sulphate of potassa, when the preparation becomes inodorous, and white on the surface. The solution is decomposed by the mineral acids, which extricate sulphuretted hydrogen, and precipitate the excess of sulphur. It is also incompatible with solutions of most of the metals, which are precipitated as sulphurets. When boiled with an excess of muriatic acid and filtered, it gives a yellow precipitate with chloride of platinum. B.

Medical Properties and Uses. Sulphuret of potassium is a local irritant, and, in small and repeated doses, is said to increase the frequency of the pulse, the heat of the skin, and the different secretions, especially the mucous. Occasionally it vomits and purges. It acts, moreover, as an antacid, and produces the alterative effects of sulphur. By some it is maintained to be sedative, and directly to reduce the action of the heart. It probably does so, when taken in considerable quantities, by the development of sulphuretted hydrogen. In overdoses it acts, according to Orfila, as a violent poison, corroding the stomach, and depressing the powers of the nervous system. Acetate of lead, or acetate of zinc may be used as an antidote; but the latter is preferable, as less likely to act injuriously in an overdose, and having besides emetic properties. The complaints in which it has been most advantageously employed are chronic rheumatism and gout, and various cutaneous affections. It has been given also in painters' colic, asthma, and chronic catarrh, and acquired a short-lived reputation as a remedy in croup, after the publication of the essay to which the prize offered by Napoleon for the best dissertation on that disease was awarded. It is said, in some cases of cancer, to have assisted the palliative operation of hemlock. In consequence of forming insoluble sulphurets with the metallic salts, it has been proposed as an antidote for some of the mineral poisons; but Orfila has proved that it does not prevent their effects. Dissolved in water it has proved very efficacious as an external application in cutaneous diseases, and in scabies is an almost certain remedy. It may be used for this purpose in the form of lotion, bath, or ointment. For a lotion it may be dissolved in water in the proportion of from fifteen to thirty grains to the fluidounce, and for a bath, the same quantity or rather more may be added to a gallon of water. A very small proportion of muriatic or sulphuric acid may in either case be added to the solution. The ointment is made by mixing half a drachm of the sulphuret with an ounce of lard. The dose of sulphuret of potassium is from two to ten grains, repeated several times a day, and given in pill with liquorice, or in solution with syrup. In infantile cases of croup, from one to four grains were given every three or four hours. W.

PULPÆ.

Pulps.

These are soft uniform solid bodies, of a consistence fit for the formation of confections or electuaries, and prepared from fruits by comminuting them when

requisite, softening them when dry with a small quantity of hot water, then passing them through a sieve to separate hard solid matters, and evaporating if necessary. But few of them are officinal. W.

CASSIÆ FISTULÆ PULPA. *U.S.* CASSIA PRÆPARATA. *Lond.* CASSIÆ PULPA. *Ed.* *Pulp of Purging Cassia.*

"Take of Purging Cassia, bruised, a *convenient quantity*. Pour boiling water on the pods so that the pulp may be softened; then strain, first through a coarse sieve, and afterwards through a hair one, and evaporate by means of a water-bath to the proper consistence." *U. S.*

"Take of Cassia [pods of Cassia Fistula] broken longitudinally *a pound;* Distilled Water sufficient to cover the Cassia. Macerate for six hours, occasionally stirring. Strain the softened pulp through a hair sieve, and evaporate by means of a water bath to the consistence of a confection." *Lond.*

The *Edinburgh College* places cassia pulp in its catalogue of Materia Medica.

In consequence of the presence of the fragments of the pods, it is inconvenient to pass this pulp in the ordinary way through a hair sieve. The larger fragments may be picked out, and the remainder of the cassia pressed by the hand through a very coarse kind of muslin, such as that used by the bonnet-makers, in which it has been previously enclosed. A pound of the pods will yield between four and five ounces of pulp.

Cassia pulp has a blackish colour, a slight rather sickly odour, and a sweet mucilaginous taste. It is apt to become sour by exposure. For its composition and effects, see *Cassia Fistula.*

Off. Prep. Confectio Cassiæ; Confectio Sennæ. W.

PRUNI PULPA. *U.S.* PRUNUM PRÆPARATUM. *Lond.* *Pulp of Prunes.*

"Take of Prunes *a convenient quantity*. Soften the Prunes in the vapour of boiling water, and, having separated the stones, beat the remainder in a marble mortar, and press it through a hair sieve." *U. S.*

"Take of Prunes *a pound;* Water sufficient to cover the Prunes. Boil slowly for four hours. Express the softened pulp, first through a coarse cane sieve, afterwards through a fine one of hair. Lastly, evaporate by means of a water-bath to the consistence of a confection." *Lond.*

The prunes may be softened by placing them on a perforated plate or diaphragm, or a wire sieve, or suspending them in a net, over boiling water. A pound of prunes of good quality yields about ten ounces of pulp.

Off. Prep. Confectio Sennæ. W.

TAMARINDI PULPA. *U.S.* TAMARINDUS PRÆPARATUS. *Lond.* TAMARINDUS. *Ed.* PULP OF TAMARINDS. *Dub.* *Pulp of Tamarinds.*

"Take of Tamarinds *a convenient quantity*. Digest them with a small quantity of water until they become of a uniform consistence; then separate the seeds and filaments by pressing the pulp through a hair sieve." *U. S.*

"Take of Tamarinds *a pound;* Water sufficient to cover the Tamarinds. Macerate with a gentle heat for four hours, and complete the process in the manner directed for Prepared Prunes." *Lond.* (See *Pruni Pulpa.*)

The *Edinburgh* and *Dublin Colleges* place this pulp in their catalogue of Materia Medica.

The tamarinds should be digested in an unglazed earthenware vessel over hot ashes, or by means of a sand-bath. The operator should be specially cautious not to employ iron vessels or iron spatulas in making this preparation. A pound of good tamarinds will yield a little more than seven ounces of pulp.

Off. Prep. Confectio Cassiæ; Confectio Sennæ. W.

PULVERES.

Powders.

The form of powder is convenient for the exhibition of substances which are not given in very large doses, are not very disagreeable to the taste, have no corrosive property, and do not deliquesce rapidly on exposure. As the effect of pulverization is to expose a more extended surface to the action of the air, care should be taken to keep substances which are liable to be injured by such exposure in closely stopped bottles. In many instances it is also important to exclude the light, which exercises a deleterious influence over numerous medicines when minutely divided. This may be done by coating the bottles with black varnish. In relation to substances most liable to injury from these causes, the best plan is to powder them in small quantities as wanted for use.

Powders may be divided into the *simple*, consisting of a single substance, and the *compound*, of two or more mixed together. The latter only are embraced under the present head. In the preparation of the compound powders, the ingredients, if of different degrees of cohesion or solidity, should be pulverized separately and then mixed. An exception, however, to this rule is the employment of one substance to facilitate by its hardness the minute division of another, as in the *powder of ipecacuanha and opium*. Deliquescent substances, and those containing fixed oil in large proportion, should not enter into the composition of powders intended to be kept; the former, because they render the preparation damp and liable to spoil; the latter, because they are apt to become rancid, and impart an unpleasant odour and taste. When deliquescent substances are extemporaneously prescribed, the apothecary should enclose them before delivery in tin foil or other impervious covering; and the same remark is applicable to volatile powders, as carbonate of ammonia and camphor.

The lighter powders may in general be administered in water or other thin liquid; the heavier, such as those of metallic substances, require a more consistent vehicle, as syrup, molasses, honey, or one of the confections. Resinous powders, if given in water, require the intervention of mucilage or sugar.

The *London College* gives the following general directions for the preparation of powders. "It is necessary that whatever we direct to be reduced to powder should be so passed through a fine sieve that the impurities and thicker parts may be separated. It is proper that most powders should be recently prepared, and not kept long." The whole substance in the mortar should not be beaten till completely pulverized; as the portion already powdered interferes with the action of the pestle upon the remainder, while the finer matter is apt to be dissipated; so that there is a loss both of time and material. The proper plan is to sift off the fine powder after a short trituration, then to return the coarser parts to the mortar, and to repeat several times this alternate pulverization and sifting, until the process is completed. W.

PULVIS ALOËS COMPOSITUS. *Lond. Compound Powder of Aloes.*

"Take of Socotrine or Hepatic Aloes *an ounce and a half;* Guaiacum [Resin] *an ounce;* Compound Powder of Cinnamon *half an ounce.* Rub the Aloes and Guaiacum, separately, into powder; then mix them with the Compound Powder of Cinnamon." *Lond.*

The tendency of pulverized guaiac to concrete, and the excessively bitter taste of aloes, which is but imperfectly concealed by the aromatic addition, render the form of powder ineligible for the exhibition of these medicines. The preparation

is a warm stimulant cathartic, but is little used. The dose is from fifteen to thirty grains. W.

PULVIS ALOËS ET CANELLÆ. *U.S.* *Powder of Aloes and Canella.* *Hiera Picra.*

"Take of Aloes *a pound;* Canella *three ounces.* Rub them separately into a very fine powder, and mix them." *U. S.*

This preparation has long been known under the name of *hiera picra.* The canella serves to correct the griping property, and imperfectly to cover the taste of the aloes; but the bitterness of the latter is still very obvious in the mixture, which would be better given in the form of pill. It is a popular remedy in amenorrhœa, and may be used for all the purposes to which aloes is applied. It is sometimes administered in domestic practice, infused in wine or spirit. The dose is from ten to twenty grains. W.

PULVIS ALUMINIS COMPOSITUS. *Ed.* *Compound Powder of Alum.*

"Take of Alum *four ounces;* Kino *one ounce.* Mix them, and reduce them to fine powder." *Ed.*

A solution of alum is decomposed by a solution of kino, and it is probable that the same effect takes place when the two substances, mixed in the state of powder, are introduced into the stomach; but whether their astringency is materially affected by the change is uncertain. The preparation may be employed in diarrhœa, menorrhagia, and hemorrhage from the stomach or bowels, and externally to suppress hemorrhage, or as an astringent application to flabby ulcers. The dose is from five to twenty grains. W.

PULVIS AROMATICUS. *U.S.*, *Ed.*, *Dub.* PULVIS CINNAMOMI COMPOSITUS. *Lond.* *Aromatic Powder.*

"Take of Cinnamon, Ginger, each, *two ounces;* Cardamom, deprived of the capsules, Nutmeg, grated, each, *an ounce.* Rub them together into a very fine powder." *U. S.*

The *London College* directs *two ounces* of cinnamon, *an ounce and a half* of cardamom, *an ounce* of ginger, and *half an ounce* of long pepper; the *Edinburgh, equal parts* of cinnamon, cardamom, and ginger; the *Dublin, two ounces,* each, of cinnamon and ginger, and *an ounce,* each, of cardamom seeds freed from their capsules, and of nutmeg.

The cardamom seeds should always be separated from their capsules before pulverization; and the powder, when prepared, should be kept in well stopped bottles. The London preparation is more pungent than the others, in consequence of the long pepper which it contains. These powders are stimulant and carminative, and may be given in the dose of from ten to thirty grains, in cases of enfeebled digestion accompanied with flatulence; but they are chiefly used as corrigents and adjuvants of other medicines. A mixture of aromatic powders in the form of a cataplasm is much used as a mild rubefacient, especially in nausea and vomiting, being applied over the epigastrium. Such mixtures are commonly called *spiced plasters.* The following is a good formula. Take of ginger, cloves, cinnamon, and black pepper, each, in powder, an ounce; tincture of ginger half a fluidounce; honey a sufficient quantity. Mix the powders, and then add the tincture and honey, so as to form a stiff cataplasm.

Off. Prep. Confectio Aromatica; Confectio Opii; Pilulæ Aloës et Ferri; Pilulæ Cambogiæ; Pulvis Aloës Compositus. W.

PULVIS CATECHU COMPOSITUS. *Dub.* *Compound Powder of Catechu.*

"Take of Catechu, Kino, of each, *two ounces;* Cinnamon, Nutmeg, of each,

half an ounce. Reduce each to powder, mix, and pass through a fine sieve. When prepared, the powder should be kept in well stopped bottles." *Dub.*

This is an agreeable form for the administration of kino or catechu; but we do not see the propriety of mixing two substances so similar in their properties, at least in relation to taste and medicinal effect, that they may be considered identical. The dose is from fifteen to thirty grains.

Off. Prep. Confectio Catechu Composita. W.

PULVIS CRETÆ COMPOSITUS. *Lond., Ed., Dub. Compound Powder of Chalk.*

"Take of Prepared Chalk *half a pound;* Cinnamon *four ounces;* Tormentil, Gum Arabic, each, *three ounces;* Long Pepper *half an ounce.* Rub them separately into very fine powder, and then mix them." *Lond.*

"Take of Prepared Chalk *four ounces;* Cinnamon, in fine powder, *one drachm and a half;* Nutmeg, in fine powder, *a drachm.* Triturate them well together." *Ed.*

"Take of Prepared Chalk *five ounces;* Cinnamon *two ounces and a half;* Gum Arabic *two ounces;* Nutmeg *half an ounce.* Rub the ingredients separately to powder, then mix, and pass through a fine sieve." *Dub.*

In the Edinburgh preparation, the aromatics are in too small a quantity to serve any other purpose than to give an agreeable flavour to the chalk, which is the only active ingredient. The powder of the London and Dublin Colleges is, on the contrary, warm, stimulant, and astringent, as well as antacid; and is well calculated for diarrhœa, connected with acidity and without inflammatory symptoms. In such a combination, however, the proper proportion, and even the choice of the ingredients, vary so much with the symptoms, that they might with propriety be left to extemporaneous prescription. The dose is from ten to twenty grains, given in mucilage or sweetened water, and frequently repeated.

Off. Prep. Pulvis Cretæ Compositus cum Opio. W.

PULVIS CRETÆ COMPOSITUS CUM OPIO. *Lond.* PULVIS CRETÆ OPIATUS. *Ed., Dub. Compound Powder of Chalk with Opium.*

"Take of Compound Powder of Chalk *six ounces and a half;* Opium, in powder, *four scruples.* Mix them." *Lond.*

The *Dublin* process, though differently expressed, is identical in its results with the London.

"Take of Compound Chalk Powder *six ounces;* Powder of Opium *four scruples.* Triturate them together thoroughly." *Ed.*

The addition of the opium greatly increases the efficacy of the compound powder of chalk in diarrhœa; and its equal diffusion through the powder presents this advantage, that it may be conveniently given in minute doses applicable to infantile cases. Two scruples of the London or Dublin powder, and thirty-seven grains of the Edinburgh, contain a grain of opium. In the diarrhœa of adults from ten to twenty grains may be given for a dose, and repeated several times a day, or after each evacuation. W.

PULVERES EFFERVESCENTES. *Ed.* PULVERES EFFERVESCENTES TARTARIZATI. *Dub. Effervescing Powders.*

"Take of Tartaric Acid *one ounce;* Bicarbonate of Soda *one ounce and* 54 *grains,* or Bicarbonate of Potassa *one ounce and* 160 *grains.* Reduce the Acid and either Bicarbonate separately to fine powder, and divide each into sixteen powders. Preserve the acid and alkaline powders in separate papers of different colours." *Ed.*

The *Dublin College* takes *ten drachms* of the crystals of tartaric acid, and *eleven drachms* of bicarbonate of soda or *thirteen drachms* of bicarbonate of potassa, reduces them separately to powder, divides each into eighteen parts, and keeps the acid and alkaline powders in papers of different colours.

This is a formula, introduced into the last editions of the Edinburgh and Dublin Pharmacopœias, for a preparation which has been long in use under the name of *soda powders*. The common soda powders contain the ingredients in somewhat different proportions; consisting of twenty-five grains of the acid in one paper, and thirty of the bicarbonate in the other. They are always prepared with bicarbonate of soda; while the Pharmacopœias allow a choice between that and the bicarbonate of potassa. This want of precision is highly objectionable in officinal formulæ. If it was thought advisable that the practitioner should have the opportunity of prescribing either of these preparations at his option, they should have had different names.

The powders are administered in solution. An acid and an alkaline powder may be dissolved in separate portions of water and then mixed; or they may be thrown together, or successively into the same portion of water. The whole draught should be half a pint or somewhat less. It may be rendered more agreeable by adding two or three fluidrachms of syrup of ginger or orange peel to the water, before dissolving the powders. The rationale is simple. The tartaric acid seizes the alkali of the bicarbonate, forming a tartrate of soda or of potassa as the case may be, while the carbonic acid escapes with effervescence. The effervescing powders are refrigerant and very slightly laxative; and afford an agreeable and refreshing drink, suitable to febrile complaints. W.

PULVERES EFFERVESCENTES CITRATI. *Dub. Citrated Effervescing Powders.*

"Take of Crystals of Citric Acid *nine drachms;* Bicarbonate of Soda *eleven drachms*, or Bicarbonate of Potash *thirteen drachms*. Reduce the Acid and alkaline Bicarbonates, separately, to a fine powder, and divide each into *eighteen* parts. The acid and alkaline powders should be kept in papers of different colours." *Dub.*

The same remarks are applicable to these as to the preceding powders, and the same objection to the want of precision in the name. These powders, at least those made with the bicarbonate of potassa, are excellent diaphoretics, being identical in composition with the neutral mixture and effervescing draught. (See *Liquor Potassæ Citratis.*) W.

PULVIS IPECACUANHÆ ET OPII. *U. S.* PULVIS IPECACUANHÆ COMPOSITUS. *Lond., Ed., Dub. Powder of Ipecacuanha and Opium. Compound Powder of Ipecacuanha. Dover's Powder.*

"Take of Ipecacuanha, in powder, Opium, in powder, each, *a drachm;* Sulphate of Potassa *an ounce*. Rub them together into a very fine powder." *U. S.*

All the British Colleges employ the same ingredients as above, and in the same proportions. The *London*, having ordered them in the state of powder, simply directs them to be mixed together. The *Edinburgh* orders eight times the amount of the materials, and directs them to be triturated thoroughly together. The *Dublin* takes the opium and ipecacuanha in fine powder, mixes them thoroughly with the sulphate by trituration, and sifts them.

The sulphate of potassa in this preparation serves, by the hardness of its particles, to promote that minute division and consequent thorough intermixture of the opium and ipecacuanha, upon which the peculiar virtues of the compound depend. It also serves to dilute the active ingredients, and thus allow of their division into minute doses adapted to the complaints of children. This composition, though usually called Dover's powder, does not precisely correspond

with that originally recommended by Dr. Dover, which was prepared as follows. Four ounces of nitrate of potassa and the same quantity of sulphate of potassa were mixed in a red-hot crucible, and afterwards very finely powdered; one ounce of opium, sliced, was then added, and ground to powder with the saline mixture; lastly, an ounce of ipecacuanha and an ounce of liquorice root, in powder, were mixed with the other ingredients. This process was adopted in the former French Codex, and has been retained with little change in the present.

This powder is an admirable anodyne diaphoretic, not surpassed, perhaps, by any other combination in its power of promoting perspiration. Opium itself has a strong tendency to the skin, evinced both by the occasional diaphoresis, and by the itching and tingling sensation which it excites. While the vessels of the skin are stimulated by this ingredient, the secreting pores are relaxed by the ipecacuanha, and the combined effect is much greater than that which results from either separately. At the same time, the general stimulating influence of the opium, and its tendency to operate injuriously on the brain, are counteracted, so that the mixture may be given with safety in cases which might not admit of the use of opium alone. The preparation is applicable to all cases not attended with much fever or cerebral disease, or sick stomach, in which there is an indication for profuse diaphoresis, especially in painful affections, or those connected with unhealthy discharges. It is admirably adapted to the phlegmasiæ, particularly rheumatism and pneumonia, when complicated with a typhoid tendency, or after sufficient depletion. Under similar circumstances, it is useful in dysentery, diarrhœa, and the various hemorrhages, especially that from the uterus. It is sometimes also given in dropsy. In bowel affections, and whenever the hepatic secretion is deranged, it is frequently combined with small doses of calomel.

Ten grains of the powder contain one grain of opium. The dose is from five to fifteen grains, given diffused in water, or mixed with syrup, or in the form of bolus, and repeated at intervals of four, six, or eight hours, when it is desirable to maintain a continued diaphoresis. Its action may be materially promoted by warm drinks, such as lemonade, or balm tea, which, however, should not be given immediately after the powder, as they might provoke vomiting.

Off. Prep. Pilula Ipecacuanhæ cum Scillâ; Pilulæ Ipecacuanhæ et Opii.

W.

PULVIS JALAPÆ COMPOSITUS. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Compound Powder of Jalap.*

"Take of Jalap, in powder, *an ounce;* Bitartrate of Potassa, in powder, *two ounces.* Mix them." *U. S.*

The *London College* takes *three ounces* of jalap, *six ounces* of bitartrate of potassa, and *two drachms* of ginger; the *Dublin*, *two ounces* of jalap, *three ounces and a half* of bitartrate of potassa, and *half an ounce* of ginger. The *Edinburgh College* takes the same ingredients in the same proportion as the U. S. Pharmacopœia, and directs them to be rubbed together to a very fine powder.

The bitartrate, by being rubbed with the jalap, is thought to favour its more minute division, while it increases its hydragogue effect. A combination of these two ingredients, though with a larger proportion of cream of tartar (see *Jalapa*), forms a good cathartic in dropsy, and in scrofulous affections of the joints and glands. The dose of the officinal powder is from thirty grains to a drachm.

Off. Prep. Pulvis Scammonii Compositus. W.

PULVIS KINO COMPOSITUS. *Lond.* *Compound Powder of Kino.*

"Take of Kino *fifteen drachms;* Cinnamon *half an ounce;* dried Opium *a drachm.* Rub them separately to a very fine powder, and then mix them." *Lond.*

This is an anodyne astringent powder, useful in some forms of diarrhœa, but of which the composition would be better left to extemporaneous prescription, as the proportion of the ingredients should vary with the circumstances of the case. Twenty grains contain one grain of opium. The dose is from five grains to a scruple. W.

PULVIS RHEI COMPOSITUS, *Ed.*, *Dub.* *Compound Powder of Rhubarb.*

"Take of Magnesia *one pound;* Ginger, in fine powder, *two ounces;* Rhubarb in fine powder, *four ounces.* Mix them thoroughly, and preserve the powder in well closed bottles." *Ed.*

The *Dublin College* uses the same ingredients in the same proportions.

This is a good laxative antacid, well adapted to bowel complaints, especially in children. The dose for an adult is from half a drachm to a drachm; for a child two or three years old, from five to ten grains. W.

PULVIS SALINUS COMPOSITUS. *Ed.* *Compound Saline Powder.*

"Take of Pure Muriate of Soda, Sulphate of Magnesia, each, *four ounces;* Sulphate of Potassa *three ounces.* Dry the salts separately with a gentle heat, and pulverize each; then triturate them well together, and preserve the mixture in well closed vessels." *Ed.*

This is an aperient powder, and may be given with advantage in costive habits, in the dose of two or three drachms, dissolved in half a pint of water or carbonic acid water, before breakfast. W.

PULVIS SCAMMONII COMPOSITUS. *Lond.*, *Ed.*, *Dub.* *Compound Powder of Scammony.*

"Take of Scammony, hard Extract of Jalap, each, *two ounces;* Ginger *half an ounce.* Rub them separately to a very fine powder; and then mix them." *Lond.*

The *Edinburgh College* takes *equal parts* of scammony and bitartrate of potassa; the *Dublin, an ounce* of scammony, and *three ounces* of compound powder of jalap.

It should be observed that the Edinburgh compound is essentially different from that of the London College; but we do not think that either of them is an eligible preparation. The cream of tartar in the former can serve little other purpose than to aid in the pulverization of the scammony, which requires no peculiar care in this respect. In the latter, though the ginger may tend to correct the griping property of the purgative ingredients, the extract of jalap too closely resembles the scammony in its operation to exert any important modifying influence upon it. The dose of the London powder is from ten to twenty grains, of the Edinburgh from fifteen to thirty. The Dublin powder is analogous in power to the Edinburgh, though somewhat weaker. W.

PULVIS TRAGACANTHÆ COMPOSITUS. *Lond.*, *Ed.* *Compound Powder of Tragacanth.*

"Take of Tragacanth, in powder, Gum Arabic, in powder, Starch, each, *an ounce and a half;* Sugar [refined] *three ounces.* Rub the Starch and Sugar together to powder, then add the Tragacanth and Gum Arabic, and mix them all." *Lond.*

The *Edinburgh* process corresponds with the above.

This is applicable to the general purposes of the demulcents; but is chiefly employed in Great Britain as a vehicle for heavy insoluble powders. The dose is from thirty grains to a drachm. W.

QUININA.

Preparations of Quinia.

QUINIÆ SULPHAS. *U. S.* QUINÆ DISULPHAS. *Lond.* QUINÆ SULPHAS. *Ed., Dub. Sulphate of Quinia.*

"Take of Yellow Bark, in coarse powder, *four pounds;* Muriatic Acid *three fluidounces;* Lime, in powder, *five ounces;* Water *five gallons;* Sulphuric Acid, Alcohol, Animal Charcoal, each, *a sufficient quantity.* Boil the Bark in one-third of the Water mixed with one-third of the Muriatic Acid, and strain through linen. Boil the residue twice successively with the same quantity of Water and Acid as before, and strain. Mix the decoctions, and, while the liquor is hot, gradually add the Lime, previously mixed with two pints of water, stirring constantly until the Quinia is completely precipitated. Wash the precipitate with Distilled Water, and, having pressed, dried, and powdered it, digest it in boiling Alcohol. Pour off the liquor, and repeat the digestion several times, until the Alcohol is no longer rendered bitter. Mix the liquors, and distil off the Alcohol, until a brown viscid mass remains. Upon this substance, removed from the vessel, pour about half a gallon of Distilled Water, and, having heated the mixture to the boiling point, add as much Sulphuric Acid as may be necessary to dissolve the impure alkali. Then add an ounce and a half of Animal Charcoal, boil for two minutes, filter the liquor while hot, and set it aside to crystallize. Should the liquor, before filtration, be entirely neutral, acidulate it very slightly with Sulphuric Acid; should it, on the contrary, change the colour of litmus paper to a bright red, add more Animal Charcoal. Separate the crystals from the liquor, dissolve them in boiling water slightly acidulated with Sulphuric Acid, add a little Animal Charcoal, filter, and set aside to crystallize. Wrap the crystals in bibulous paper, and dry them with a gentle heat. The mother waters may be made to yield an additional quantity of Sulphate of Quinia by precipitating the Quinia with Solution of Ammonia, and treating the precipitated alkali with distilled water, Sulphuric Acid, and Animal Charcoal, as before." *U. S.*

The *London College* has transferred this salt to its Materia Medica list.

"Take of Yellow Bark, in coarse powder, *one pound;* Carbonate of Soda *eight ounces;* Sulphuric Acid *half a fluidounce;* Purified Animal Charcoal *two drachms.* Boil the bark for an hour in four pints [Imperial measure] of water, in which half the Carbonate of Soda has been dissolved; strain, and express strongly through linen or calico; moisten the residuum with water and express again; and repeat this twice. Boil the residuum for half an hour with four pints of water and half the Sulphuric Acid; strain, express strongly, moisten with water, and express again. Boil the residuum with three pints of water and a fourth part of the Acid; strain and squeeze as before. Boil again the residuum with the same quantity of water and Acid, strain and squeeze as formerly. Concentrate the whole acid liquids to about a pint; let the product cool; filter it, and dissolve in it the remainder of the Carbonate of Soda. Collect the impure quinia on a cloth, wash it slightly, and squeeze out the liquor with the hand. Break down the moist precipitate in a pint of distilled water, add one fluidscruple of Sulphuric Acid, heat it to 212°, and stir occasionally. Should any precipitate retain its gray colour, and the liquid be neutral, add Sulphuric Acid drop by drop, stirring constantly, till the gray colour disappears. Should the liquid redden litmus, neutralize it with a little carbonate of soda. Should crystals form on the surface, add boiling distilled water to dissolve them. Filter through paper, preserving the funnel hot; set the liquid aside to crystallize; collect and squeeze the crystals; dissolve them in a pint of distilled water heated to 212°;

digest the solution for fifteen minutes with the Animal Charcoal; filter and crystallize as before. Dry the crystals with a heat not exceeding 140°. The mother liquors of each crystallization will yield a little more salt by concentration and cooling." *Ed.* The Imperial measure is employed in the above process.

The *Dublin College* exhausts the bark by maceration and decoction with water acidulated with sulphuric acid, concentrates the liquor, adds lime in excess, dries the precipitate partially on porous bricks and subjects it to powerful pressure in blotting paper, boils it repeatedly with rectified spirit, expresses, filters, distils off all the spirit, dilutes the brown viscid mass which remains, heats it to the boiling point, adds diluted sulphuric acid to neutralization or in slight excess, and finally, after treating the liquor with animal charcoal, sets it aside to cool and crystallize.

The present U. S. process, which is essentially that of the French Codex, differs from the one given in the Pharmacopœia of 1830, in the use of muriatic instead of sulphuric acid for acidulating the water first employed, and in the greater minuteness of the details. Both this and the French Codex process, as well as that of the Dublin College, are modifications of the plan originally proposed by M. Henry, jun., of Paris, for which he received a prize from the French Academy of Sciences, and which has been almost universally employed where alcohol is not too expensive. Henry's process, with all its details, may be found in previous editions of this work. An explanation of the several directions given in the U. S. Pharmacopœia will be useful to the student, by enabling him to comprehend each step of the process.

The yellow bark (Calisaya, or royal yellow) is the variety selected, because this contains quinia in the largest proportion, and most free from admixture with cinchonia. The alkali exists in the bark combined with kinic acid, and probably also with one or more of the colouring principles, as suggested by M. Henry. As in this latter state it is of difficult solubility, if it be not insoluble in water, the whole of the quinia cannot be extracted from the bark by means of that liquid alone. Berzelius, however, attributes the difficulty of exhausting the bark to the circumstance, that water converts the native neutral kinates into soluble superkinates which are dissolved, and insoluble subkinates which remain. By adding muriatic or sulphuric acid to the water in such quantities as to be in excess in relation to the quinia, the whole of the alkali combines with the acid to form a very soluble muriate or sulphate, in which state it exists, together with various impurities, in the decoctions procured by the first steps of the process. By the addition of lime to the filtered and mixed decoctions, the salt of quinia is decomposed, giving up its acid to the lime, while the quinia is liberated, and, being insoluble in water, is precipitated; the water retaining most of the impurities. If sulphuric acid was employed in the commencement of the process, sulphate of lime is deposited along with the quinia; but if muriatic acid was employed, the resulting chloride of calcium is retained in solution; and a reason is thus afforded for the preference of the latter acid. But, in either case, the excess of lime, and a compound formed of the lime and colouring matter, which is insoluble both in water and alcohol, are thrown down with the alkali. The precipitate having been washed in order to remove from it everything soluble in water, then pressed, dried, and powdered, the next step is to separate the quinia from the insoluble impurities. This is accomplished by the repeated action of alcohol, which dissolves the former, and leaves most of the latter behind. The whole of the alkali having been abstracted, the alcoholic solution of quinia is then concentrated so as to afford a brown viscid mass, which is impure quinia. Portions of this may be reserved, if thought advisable, for the preparation of other salts of quinia. The mass is treated with boiling distilled water acidulated with sulphuric acid, which forms a disulphate (the officinal sulphate)

with the quinia, and, being somewhat in excess, enables the salt to be readily dissolved. The animal charcoal now added should be the *unpurified* bone-black, the carbonate of lime contained in which neutralizes a portion of the sulphuric acid, and thus facilitates the crystallization of the sulphate of quinia when the solution cools. Should the quantity of the bone-black added be sufficient to render the solution quite neutral, so as in no degree to affect litmus paper, as much sulphuric acid should be added as will give the paper a slightly vinous tint; for otherwise the crystallization may commence before the liquor is completely filtered. If, on the contrary, the bone-black has been deficient, and the solution colours litmus paper cherry-red, more of that substance is to be added. This, however, is merely an incidental advantage of the animal charcoal; its chief use being to decolorize the liquid. The second crystallization is necessary to obtain the salt of quinia free from colour; and sometimes it cannot be rendered perfectly white without a third. It is essential that the heat employed in drying the crystals should be gentle, in order to prevent their efflorescence. The small quantity of cinchonia contained in Calisaya bark is extracted along with the quinia; but, as the sulphate of the former is more soluble than that of the latter, it remains in the mother liquors.*

According to M. Calvert, the proportion of sulphate of quinia obtained from bark is never certain when muriatic acid is employed as the solvent, and lime as the precipitant; for quinia is dissolved by a solution of chloride of calcium, and by lime-water; and a portion, therefore, remains in the liquid unprecipitated, which is greater when the lime employed is in excess. Having ascertained by trial that quinia is not dissolved by a solution of soda, and in scarcely appreciable proportion by chloride of sodium, he proposes to substitute this alkali for lime; first neutralizing the excess of acid by the carbonate, and then precipitating the quinia by caustic soda. (*Journ. de Pharm.*, 3*e sér.*, ii. 388.)

The Edinburgh process was contrived so as to avoid the use of alcohol, which is so costly in Great Britain as materially to affect the economy of the operation. The object of the first boiling with water and carbonate of soda is to get rid of the colouring principles, resin, and kinic acid, while the quinia is left behind. The residuum is next exhausted by means of water acidulated with sulphuric acid, which affords an impure solution of sulphate of quinia. This, after being sufficiently concentrated, is decomposed by carbonate of soda, which seizes the acid and precipitates the quinia with some colouring matter. The remaining steps of the operation are similar to those of the U. S. process, except that animal charcoal is employed only previous to the last crystallization; and the advantage incidentally obtained from it, of neutralizing the acid when in excess, is gained in the Edinburgh process by the use of carbonate of soda. Both Pereira and Christison speak favourably of this process.

Pelletier proposed to substitute oil of turpentine for alcohol in the ordinary process of procuring sulphate of quinia. The impure quinia, precipitated by lime from the acidulous decoctions, after being washed, pressed, and dried, is digested with the oil, which dissolves the quinia. The solution thus obtained is

* Mr. Weightman, of the firm of Powers and Weightman, manufacturing chemists of this city, informs us that the following modification of the above process has been found practically advantageous in their laboratory. The tincture obtained by acting with alcohol on the impure precipitated quinia, is neutralized with sulphuric acid in the distilling vessel; and the alcohol is then distilled off, leaving a viscid mass of impure sulphate, which is drawn off, and crystallizes on cooling. The mass thus obtained having been expressed, is dissolved in boiling water, to which purified animal charcoal has been added. The solution is filtered while hot, and then allowed to cool and crystallize. Another solution and crystallization is required to get the sulphate of quinia quite pure and white.—*Note to the tenth edition.*

agitated with water acidulated with sulphuric acid, by which the sulphate of quinia is formed. The oil separating, rises to the top, and is removed for future use; and the watery solution of the salt is evaporated, and treated as in the original process. A disadvantage, however, of this method is said to be that the oil does not completely exhaust the precipitate of its quinia.

According to the French Codex, 1000 parts of yellow bark ought to yield from 29 to 30 parts of sulphate of quinia, when treated by the process first described. Messrs. Powers & Weightman, who are probably among the largest manufacturers of sulphate of quinia in the world, inform us that they have usually obtained from 2·5 to 3 per cent. as an average product.

Sulphate of quinia may be obtained from other varieties of Peruvian bark by the above processes; and from some in considerable quantity; but most of them yield a much larger proportion of sulphate of cinchonia than the Calisaya; and this, being much more soluble than the sulphate of quinia, will remain dissolved in the residuary liquor after the crystallization of the latter. To obtain the *cinchonia* separate, the following method, originally suggested by Pelletier and Caventou, may be employed. Magnesia, lime, or a solution of potassa is added to the mother waters in excess.* The cinchonia is precipitated together with a portion of quinia which has remained in the solution, and with the excess of magnesia or lime, if one of these earths has been employed. The precipitate is collected on a filter, washed with hot water, then dried, and treated with boiling alcohol, which dissolves the organic alkalies. The alcoholic solution is filtered while hot, and the residue afterwards treated in the same manner with successive portions of alcohol, till quite exhausted. The solutions having been mixed, are concentrated by the distillation of the alcohol, and allowed to cool, when they deposit cinchonia in the crystalline state. Successive evaporations and refrigerations afford new crops of crystals, and the process should be continued till no more can be obtained. The cinchonia thus procured, if impure, should be reconverted into a sulphate and treated as before, animal charcoal being employed to free it from colour. The quinia remaining in the mother liquors, as it will not crystallize from alcohol, may be obtained by evaporation to dryness. To obtain the *sulphate of cinchonia*, mix the alkali with a small quantity of water, heat the mixture, and add gradually dilute sulphuric acid sufficient to saturate it; then boil with animal charcoal previously washed with muriatic acid, and filter the liquor while hot. Upon cooling it will deposit crystals of the sulphate, and, by repeated evaporation and crystallization, will yield all the salt which it holds in solution.†

When barks containing the newly discovered alkaloid *quinidia*, are used, as the sulphate of this base is much more soluble than that of quinia, it follows that, in the mother waters left after the crystallization of sulphate of quinia, there will be found a portion of sulphate of quinidia. In fact, there is generally, under these circumstances, more or less of the sulphates of the three

* Soda is probably a better precipitant, as it appears to be incapable of dissolving any quinia when employed in excess. (See *page* 1169.)

† A new mode of extracting quinia and other active vegetable principles has been proposed, which, if found as successful on trial as it is said to have been in the hands of its proposer, promises to supersede many of the processes now in use. From the experiments of M. Lebourdais, it would appear that purified animal charcoal has the property of abstracting from many vegetable products not only their colouring, but their sapid principles also, and afterwards of yielding the active matter uncombined to boiling alcohol, from which it is obtained by evaporation. M. Lebourdais deprived Peruvian bark of all its soluble principles by repeated maceration in alcohol of 0·923, filtered the resulting liquors, removed the alcohol by distillation, and mixed the liquid residue with a decoction made by boiling the same bark twice in distilled water. Acetate of lead was added to precipitate the resinous matter; and the liquor, having been filtered, was made to pass slowly through

alkaloids, quinia, cinchonia, and quinidia, all of which are contained in many barks; and, besides these, a portion of amorphous alkaloid, incapable of crys-

purified animal charcoal by which it was deprived of colour and taste. The charcoal was then washed, dried, and treated with alcohol of 0·848. The alcoholic solution thus obtained, upon being evaporated, yielded the quinia perfectly pure. (*Am. Journ. of Pharm.*, xxi. 92, from *Ann. de Chim. et de Phys.*) A chemist, however, who has tried this process, informs us, that he has not found it to answer well in practice.

We have been told that considerable quantities of a preparation have been imported from South America, consisting of a mixture of the alkaloids of bark in an impure state, obtained by forming acidulated decoctions of bark, precipitating with lime, treating the precipitate with alcohol, and evaporating the alcoholic solution. From this material the sulphates of quinia and cinchonia have been prepared on a large scale. It has sometimes yielded 25 per cent. of quinia converted into sulphate, and more than an equal quantity of cinchonia.—*Note to the eighth and tenth edition.*

Quinoidine. Precipitated Extract of Bark. Amorphous Quinia. Upon the evaporation of the mother liquor left after the crystallization of sulphate of quinia in the preparation of that salt, a dark-coloured substance is obtained, having the appearance of an extract. This was habitually employed by the late Dr. Emlen and one of the authors of this work, so early as about the year 1824, in the cure of intermittent fever, in which it proved equally effectual with the pure sulphate, though only about half as strong. It was adopted in the edition of the U. S. Pharmacopœia for 1830, under the name of "*impure sulphate of quinia*," but was abandoned in the edition of 1840, on account of the difficulty of ascertaining its purity. Sertürner supposed that he had discovered a new alkaline principle in this product; but his conclusions were invalidated by the experiments of MM. Henry and Delondre, which went to prove that the alkaline matter contained in it consisted of quinia and cinchonia, obscured by admixture with a yellowish substance that interfered with their crystallization. Nevertheless, under the name of *quinoidine* or *chinoidine*, given to the supposed new alkali by Sertürner, there has been long employed in Europe a substance precipitated from the mother liquor of sulphate of quinia by means of an alkaline carbonate, having a yellowish-white or brownish colour, and, when moderately heated, agglutinating into a mass of a resinous appearance. This substance was found by Dr. F. L. Winckler to contain an uncrystallizable alkaline principle, having the same combining weight as quinia, and differing from that alkali only in the want of the property of crystallization, and in forming uncrystallizable salts with the acids. (*Pharm. Cent. Blatt.* May, 1847, p. 310.) Liebig afterwards proved it to be identical in composition with ordinary quinia, to which he considers it as bearing the same relation that uncrystallizable sugar bears to the crystallizable. This substance has been found equally effectual with quinia in the cure of intermittents. In an economical point of view, it is highly important that it should be employed. It is sometimes sold under the name of *precipitated extract of bark*, and there can be little doubt that it enters into other preparations, which, under the name of extract of bark, have been put forth as peculiarly valuable for the cure of intermittents. It must not be confounded with the substance obtained by evaporating the mother liquors, which is of uncertain composition and strength. The chief objection to it is its liability to adulteration. The *amorphous quinia*, as Liebig calls it, is entirely soluble in dilute sulphuric acid and in alcohol; and, if its solution in a dilute acid yield upon the addition of ammonia exactly as much precipitate as there was of the original substance dissolved, it may be considered pure. (See *Am. Journ. of Pharm.*, xviii. 181.) We have been told that, in an extensive chemical manufacturing establishment in Philadelphia, since the introduction of steam heat, the loss by quinoidine in the preparation of sulphate of quinia has much diminished, showing the agency of heat in converting the crystallizable into the uncrystallizable salt.

M. Roder supposed that he had succeeded by the following process in converting amorphous quinia into the crystallizable. One part of commercial quinoidine, not previously precipitated by an alkali, was dissolved in four parts of alcohol of 0·865, and a solution of half a part of protochloride of tin in two parts of water added. The liquid was separated from the dark resinous deposit which formed, and was precipitated by ammonia. The precipitate was well washed, dried, and exhausted by alcohol; half the original quantity of protochloride of tin was added to the resulting liquid, which was again precipitated by ammonia; and the precipitate, well washed and dried, was exhausted by alcohol. A solution of pure quinia was thus obtained, which, saturated with sulphuric acid, yielded crystals of sulphate of quinia. M. Roder obtained from two different samples of quinoidine 40 and 43 per cent. of quinia, 10 and 9 per cent. of cinchonia, 30 and 28 per cent. of resin, and 20 per cent. of water; so that this product is somewhat more than half as strong as

tallization, probably resulting, in part at least, from the heat employed in the process. These may in a great degree be separated through their different solubilities in water. Sulphate of quinia being least soluble will first crystallize, afterwards the salt of quinidia, and finally that of cinchonia, which is the most soluble of the three; while the uncrystallizable salt will remain in solution, and may be obtained in the amorphous state by evaporation to dryness.

Properties. Sulphate of quinia is in fine silky, slightly flexible, needle-shaped crystals, interlaced among each other, or grouped in small star-like tufts. Its taste is intensely bitter, resembling that of the yellow bark. It effloresces slightly on exposure to the air, and, at a moderate heat, loses its crystalline form in consequence of the escape of its water of crystallization. At the temperature of 212° it becomes luminous, especially when rubbed. At about 240° it melts, assuming the appearance of wax. It is very slightly soluble in cold water, requiring, according to M. Baup, 740 parts at 54° F. for solution; while at the boiling point it is dissolved in thirty parts of water, which deposits it upon cooling. Its cold solution is opalescent. It is soluble in about 60 parts of cold alcohol of 0·835, but only to a very small extent in ether. The diluted acids, even tartaric and oxalic acids in excess, dissolve it with great facility. With an additional equivalent of sulphuric acid it forms another sulphate, which is more soluble in water than the officinal salt, and crystallizes from its solution with much greater difficulty. This is now generally believed to be strictly neutral, and therefore entitled to the name of sulphate of quinia; while the officinal salt is thought to contain two equivalents of base to one of acid, and is therefore properly a *subsulphate* or *disulphate of quinia*. The latter name has been adopted by the London College. In the U. S., Dublin, and Edinburgh Pharmacopœias, as well as in the French Codex, the name of sulphate of quinia, originally given to the officinal salt, under the impression that it was neutral, is still applied to it. Hence has arisen a confusion of nomenclature which must be embarrassing to the student. According to M. Baup, the proper sulphate, formerly called *supersulphate*, is soluble in 11 parts of water at 54° F., and in its own water of crystallization at the boiling point. It is very soluble in diluted, and somewhat less so in absolute alcohol. It may be obtained by adding to a boiling concentrated solution of the ordinary sulphate, as much sulphuric acid as already exists in the salt, and then evaporating the solution.

Composition. The officinal sulphate of quinia, the disulphate of chemists, is the only one used in medicine, and to this we have allusion in the present work, whenever sulphate of quinia is mentioned without any distinguishing epithet. In the crystalline form it is stated to consist of one equivalent of sulphuric acid 40, two eqs. of quinia 324, and eight eqs. of water 72=436. On exposure to the air, or to a heat of 212°, it effloresces, losing one-half of its water of crystallization (according to Soubeiran, six eqs.); and at 240° it loses one-half of the remainder, retaining two eqs. or about 4 per cent. of water, of which it cannot be deprived without decomposition. (*Phillips.*)*

pure quinia. (*Am. Journ. of Pharm.*, xxi. 49.) But we have been assured by Mr. Weightman, in relation to this process of M. Roder, that, if all the crystallizable matter has been previously separated from the mother waters, no crystals can afterwards be obtained by his method, though much uncrystallizable alkaline matter remains; showing that M. Roder had merely succeeded in more thoroughly separating the crystallizable portion, not in changing one form into the other.—*Note to the seventh, eighth, and tenth editions.*

* *Iodide of Sulphate (Disulphate) of Quinia.* This remarkable compound of officinal sulphate of quinia was discovered by Dr. Wm. Bird Herapath, of Bristol, England, who also investigated its singular optical properties. If to a solution of sulphate of quinia in a mixture of acetic acid and diluted alcohol, tincture of iodine be added by drops, and the mixture kept at 130° F. until perfect solution takes place, upon the cooling of the liquid, crystals will gradually form, which Dr. Herapath has found to consist of iodine,

Incompatibles and Tests. Sulphate of quinia is decomposed by the alkalies, their carbonates, and the alkaline earths. In solution, it affords white precipitates with potassa, soda, and ammonia, which are partly soluble in an excess of alkali. It is also precipitated by astringent infusions, the tannic acid of which forms a white insoluble compound with quinia. The soluble salts of lead and of baryta occasion precipitates; and that produced by the salts of baryta is insoluble in the acids. A freshly prepared solution of chlorine, added to a solution of the sulphate of quinia, and followed by the addition of water of ammonia, occasions an emerald-green colour, and, in certain proportions, the deposition of a green precipitate. If, instead of ammonia, a concentrated solution of ferrocyanuret of potassium be added, a dark-red colour is produced, which persists for several hours, but ultimately passes into green. This does not take place with cinchonia.

Adulterations. Sulphate of quinia has often been adulterated. Sulphate of lime, and other alkaline or earthy salts, gum, sugar, mannite, starch, stearin or margarin, caffein, salicin, and sulphate of cinchonia, are among the substances which are said to have been fraudulently added. By attending to the degree of solubility of the sulphate in different menstrua, and to its chemical relations with other substances already described, there can be little difficulty in detecting these adulterations. The presence of any mineral substance not readily volatilizable, may be at once ascertained by exposing the salt to a red heat, which will completely dissipate the sulphate of quinia, leaving the mineral behind. A volatile ammoniacal salt may be detected by the smell of ammonia emitted upon the addition of potassa. The absence of organic substances may be inferred, if pure cold concentrated sulphuric acid forms a colourless solution. Gum and starch are left behind by alcohol, and fatty matters by water acidulated with sulphuric acid. Sugar and mannite cause a solution of the salt in acidulated water to have a sweet taste, after the precipitation of the quinia by an alkaline carbonate. Salicin imparts the property of becoming red upon the contact of sulphuric acid; but, according to Pelletier, this change of colour does not take place unless the proportion of salicin exceeds one-tenth. If only in this proportion, the salicin must be isolated. To 1 part of the suspected salt, 6 parts of concentrated sulphuric acid may be added, and to the brown liquid which results, 125 parts of water. The salicin is thus separated, and may be obtained by filtration, in the form of a bitter white powder, becoming bright red with sulphuric acid. (See *Am. Journ. of Pharm.*, xvii. 156.) Caffein alters the solubility of the medicine in different menstrua. According to M. Calvert, a saturated solution of sulphate of quinia in cold water gives, with a solution of chloride of lime, a precipitate soluble in an excess of the latter; while a solution of sulphate of cinchonia of the same strength, treated in the same manner, gives a precipitate which is insoluble in a great excess of the reagent. The same effect is produced with lime-water, and solution of ammonia; and solution of chloride of calcium, while it

quinia, and sulphuric acid, probably combined in the state of iodide of sulphate of quinia. To obtain fine crystals various precautions are necessary, for which the reader is referred to the paper of Dr. Herapath. The crystals are of a brilliant emerald-green when viewed by reflected light; but almost colourless by transmitted light; and present a curious play of colours under varying circumstances of position. Their shape is very diversified, but traceable to the rhombic prism. They are dissolved by heated acetic acid and heated alcohol, and deposited on cooling. Their most remarkable property is that of polarizing light, in which they are equal if not superior to the tourmaline, for which they may be substituted with advantage in experiments in this branch of optics. As quinia is the only organic alkali which acts in this way, it is evident that the property may be resorted to as a means of detecting it, and especially of distinguishing it from cinchonia and quinidia. (*Pharm. Journ. and Trans.*, xi. 448 and 449, and xiii. 378. See also *Am. Journ. of Pharm.*, xxvi. 18.)—*Note to the tenth edition.*

furnishes a precipitate with a solution of sulphate of cinchonia, yields none with a solution of sulphate of quinia. (*Journ. de Pharm.*, 3e sér., ii. 394.)* The Edinburgh College gives the following mode of testing the purity of sulphate of quinia. "A solution of ten grains in a fluidounce of distilled water and two or three drops of sulphuric acid, if decomposed by a solution of half an ounce of carbonate of soda in two waters [twice its weight of water], and heated till the precipitate shrinks and fuses, yields on cooling a solid mass, which when dry weighs 7·4 grains, and in powder dissolves entirely in solution of oxalic acid." According to the London College, "100 grains dissolved in diluted hydrochloric acid, yield, on the addition of chloride of barium, 26·6 grains of sulphate of baryta, dried at a red heat."

Medical Properties and Uses. Sulphate of quinia produces upon the system, so far as we are enabled to judge by observation, the same effects with Peruvian bark, without being so apt to nauseate and oppress the stomach. (See *Cinchona.*) Its effects upon the brain are even more striking than those of cinchona, probably because it is given in larger proportional doses. Even in ordinary doses, it often produces considerable cerebral disturbance, evinced by a feeling of tightness or distension in the head, ringing, buzzing, or roaring in the ears, hardness of hearing, &c. Some individuals are more liable to these effects than others, and in some even small doses produce them. A certain degree of this observable action on the brain is rather desirable than otherwise, as the evidence that the medicine is affecting the system. In very large quantities, as from a scruple to a drachm or more, besides the phenomena mentioned, it has been observed to occasion severe headache, vertigo, deafness, diminution or loss of sight, dilated and immovable pupil, loss of speech, general tremblings, intoxication or delirium, coma, and great prostration. In some instances the pulse has been remarkably diminished in frequency, down to fifty or even less in the minute. In an instance recorded by Giacomini, in which a man took by mistake about three drachms, the patient became insensible, and some hours afterwards was found by the physician in a state of general prostration, from which he recovered under the use of laudanum and aromatic waters. (*Ann. de Thérap.*, A. D. 1843, p. 176.) Besides its effects on the brain, sulphate of quinia sometimes occasions great gastric and intestinal irritation, marked by oppression at stomach, nausea, abdominal pains, vomiting, and purging. In general these effects of excessive doses gradually pass off, although partial deafness often continues for several days, and sometimes much longer. It is even said that permanent deafness has resulted. Though sulphate of quinia has been proved by the experiments of Dr. Baldwin, of Montgomery, Alabama, to be fatal to dogs, if prevented from being vomited by a ligature round the œsophagus, in quantities varying from fifteen or twenty grains to two drachms, with the symptoms of narcotic poisoning; yet we have seen no well authenticated case of death from its direct action on the healthy human subject. Given largely in disease, it has repeatedly

* Liebig's test of the presence of cinchonia is perhaps the simplest. Rub together fifteen grains of the suspected salt and two ounces of solution of ammonia, put the mixture into a flask, add two ounces of ether, and shake frequently. The quinia liberated by the ammonia is dissolved by the ether, while any cinchonia that may be present remains undissolved, floating between the ethereal solution above and the ammoniacal beneath. But M. O. Henry has shown that cinchonia is slightly soluble in ammonia, so that a small portion might escape detection. It has, therefore, been proposed to modify the test by heating the mixture of the suspected salt and ammonia, so as almost entirely to drive off the excess of this alkali, and then to add the ether. If the liquid now remain quite transparent, without any turbid layer between the upper and lower stratum, it may be inferred that no cinchonia is present. For papers on this subject, see the *Journ. de Pharm.* (3e sér. xiii. 102, xvi. 327, and xxi. 284), and *Am. Journ. of Pharm.* (xx. 231, and xxiv. 166). For a method of detecting the presence of *quinidia* also in sulphate of quinia, the reader is referred to a note in the first part of this work, *page* 258.

caused fatal results, not so much however by its peculiar action, as by co-operating with the disease in establishing intense local irritation or inflammation, especially in the brain. Though capable, therefore, of doing mischief if improperly used, sulphate of quinia can scarcely be ranked among the poisons.

From its occasional effect in diminishing the frequency of the pulse and the general strength, it has been supposed to be essentially sedative in large doses. Such an opinion, unless well founded, might lead to hazardous practice. The probability is that the apparently sedative effect upon the circulation arises from an overwhelming stimulant influence upon the cerebral centres, whereby the system is deprived of the support of these centres, and the heart's action is depressed with other organic functions. Similar effects may be obtained from excessive doses of most of the cerebral stimulants. Examination of the brain in the lower animals, after death from quinia, has shown great congestion of that organ and its membranes, and even meningitis. (See *Am. Journ. of Med. Sci.*, xix. 197.) In the present state of our knowledge, therefore, it is safest to consider sulphate of quinia as a direct and powerful stimulant to the brain. It probably operates through the circulation, as there is no doubt that it is absorbed, the alkaloid having been found unchanged in the urine.

Sulphate of quinia may be substituted for cinchona in all diseases to which the latter is applicable; and, in the treatment of intermittents, has almost entirely superseded the bark. It has the advantage over that remedy, not only that it is more easily administered in large doses, and more readily retained by the stomach, but that, in cases which require an impression to be made through the rectum or the skin, it is much more effectual; because, from the smallness of its bulk, it is more readily retained in the former case, and more speedily absorbed in the latter. Still we cannot be certain that there are not other active principles in bark besides the quinia and cinchonia, the latter of which possesses properties analogous to those of the former; nor that the mode of combination in which these principles exist, may not in some measure modify their therapeutic effects. The question can be solved only by careful and long-continued observation. In the mean time, we may resort to the bark if the sulphate of quinia should not answer the ends in view; and instances have occurred, under our own notice, in which it has proved successful in intermittents after the salt has failed.

Sulphate of quinia may be given in pill or solution, or suspended in water by the intervention of syrup and mucilage. The form of pill is usually preferred. (See *Pilulæ Quiniæ Sulphatis.*) The solution may be readily effected by the addition of a little acid of almost any kind to the water. Eight grains of the sulphate will dissolve in a fluidounce of water, acidulated with about twelve minims of the diluted sulphuric acid, or aromatic sulphuric acid of the Pharmacopœias; and this is the most eligible mode of exhibiting the medicine in the liquid form. The addition of a small proportion of sulphate of morphia or of laudanum will often be found advantageous, when the stomach is disposed to be sickened, or the bowels to be disturbed by the quinia. Dr. R. H. Thomas, of Baltimore, has found that one part of tannic acid will deprive five parts of sulphate of quinia of bitterness, without impairing its medicinal efficacy. (*Am. Journ. of Med. Sci.*, N. S., xix. 541.) It is obvious that tannate of quinia is thus formed; and as this, though insoluble in water, is readily dissolved in dilute acids, and consequently in the gastric liquor when acid, there can be no doubt that it will generally prove efficacious. It may, however, happen that the stomach may be quite free from acid, and that the operation of this salt may prove less certain than that of the sulphate; and such is asserted to have been the case in some instances. But a little lemonade taken after the medicine would probably obviate the difficulty.

Twelve grains of sulphate of quinia are equivalent to about an ounce of good bark. The dose varies exceedingly, according to the circumstances of the

patient and the object to be accomplished. As a tonic simply, a grain may be given three or four times a day, or more frequently in acute cases. In intermittents, from twelve to twenty-four grains should be given between the paroxysms, divided into smaller or larger doses according to the condition of the stomach, or the length of the intermission. From one to four grains may be given at once, and some even advise the whole amount. In malignant intermittents and remittents, the quantity may be increased to thirty grains or even a drachm between the paroxysms. M. Maillot gave one hundred and twenty-eight grains, in the course of a few hours, in a case of malignant fever occurring in Northern Africa, with the happiest results. The caution, however, is necessary, not to employ this heroic practice against easily conquerable diseases. Very large doses of the sulphate have recently been given in acute rheumatism, and with great asserted success; but the occurrence of at least one fatal case from inflammation of the brain should lead to some hesitation in this employment of the remedy. When the stomach will not retain the medicine, it may be administered with nearly as much efficacy by enema; from six to twelve grains, with two fluidounces of liquid starch, and from twenty to forty drops of laudanum, being injected into the rectum, in ordinary cases, every six hours. Should circumstances render this mode of application impracticable, an equal quantity, diluted with arrow-root or other mild powder, may be sprinkled, at the same intervals, upon a blistered surface denuded of the cuticle. The epigastrium, or the inside of the thighs and arms, would be the proper place for the blister. The sulphate has also been employed by friction in the form of ointment, in cases of malignant intermittent. The ointment should be made by incorporating a saturated alcoholic solution of the salt with lard, and should be applied to the inside of the thighs and arms. It is said that quinia is more readily absorbed when united with a fatty acid. This union may be effected by mixing solutions of soap and of a salt of quinia. The quinia soap is precipitated.

Solutions of sulphate of quinia have been advantageously employed as local applications to indolent ulcers, and chronic mucous inflammations. (Wedderburn and Fearn, *New Orleans Med. and Surg. Journ.*, iii. 161 and 341.)

Off. Prep. Pilulæ Quiniæ Sulphatis; Quinæ Murias; Tinctura Quinæ Composita. W.

QUINÆ MURIAS. *Dub.* *Muriate of Quinia.*

"Take of Sulphate of Quinia *one ounce* [avoirdupois]; Chloride of Barium *one hundred and twenty three grains;* Distilled Water *thirty-two* [*fluid*] *ounces.* Dissolve the Chloride of Barium in two [fluid] ounces of the Water, and the Sulphate of Quinia in the remainder, raised to the temperature of ebullition. Mix the two solutions, evaporate to one-half, filter, and continue the evaporation by means of a steam or water heat, until crystalline spicula begin to appear. The solution is now to be permitted to cool, and the crystals which separate to be dried on blotting paper. The liquor decanted off the crystals will, by further concentration and cooling, yield an additional product." *Dub.*

The only advantage of this salt of quinia over the sulphate is its greater solubility; and this is scarcely worth the trouble of the process, especially as the latter salt may be so readily rendered soluble by the addition of an acid. The dose is the same as that of the sulphate, to which the reader is referred. (See *Quiniæ Sulphas.*)

Off. Prep. Quinæ Valerianas. W.

QUINÆ VALERIANAS. *Dub.* *Valerianate of Quinia.*

"Take of Muriate of Quinia *seven drachms* [Dub. weight]; Valerianate of Soda *one hundred and twenty-four grains;* Distilled Water *sixteen* [*fluid*] *ounces.* Dissolve the Valerianate of Soda in two ounces, and the Muriate of Quinia in the remainder of the Water, and, the temperature of each solution being raised

to 120°, but not higher, let them be mixed, and let the mixture be set by for twenty-four hours, when the valerianate of quinia will have become a mass of silky acicular crystals. Let these be pressed between folds of blotting paper, and dried without the application of artificial heat." *Dub.*

This is a case of double decomposition between the two salts employed, resulting in the production of chloride of sodium which remains in solution, and of valerianate of quinia which crystallizes. This salt has a strong and adhesive odour of valerianic acid, which is very repulsive, and quite distinct from that of oil of valerian. It is soluble in water, more so in that liquid at a somewhat elevated temperature than when cold, and is deposited from its warm solution in fine crystals on cooling. In boiling water it melts into oily globules, and undergoes decomposition, with the escape of valerianic acid; and the Dublin College directs that its solution shall not be heated above 120°. Even at common temperatures it is probably undergoing a constant, though slow loss of the acid, of which it smells so strongly. It is soluble in alcohol. We are unacquainted with any special virtues in this salt. It may, however, be given in the dose of a grain or two repeated several times a day, in cases of debility attended with nervous disorder. A combination of Peruvian bark and valerian has long been known as peculiarly efficacious in hemicrania. Perhaps the valerianate of quinia may be used advantageously in the same affection. W.

SODA.

Preparations of Soda.

LIQUOR SODÆ. *Lond.* SODÆ CAUSTICÆ LIQUOR. *Dub. Solution of Soda. Solution of Caustic Soda.*

"Take of Carbonate of Soda *thirty-one ounces;* Lime *nine ounces;* boiling Distilled Water *a gallon* [Imp. meas.]. Prepare this Solution in the manner directed for Liquor Potassæ." *Lond.* The specific gravity of this Solution is 1·061.

The *Dublin College* takes *two pounds* [avoirdupois] of crystallized carbonate of soda, *ten ounces* [avoird.] of fresh burnt lime, and *a gallon and seven fluid-ounces* [Imp. meas.] of distilled water, and proceeds precisely in the manner directed for obtaining solution of potassa. The phraseology of the two formulæ is the same. The resulting Solution is stated to have the specific gravity of 1·056.

Solution of soda is prepared in the same way as solution of potassa. By a double decomposition between carbonate of soda and hydrate of lime, there are formed hydrate of soda in solution, and carbonate of lime which precipitates. In both the processes an excess of lime is used, which is necessary to insure a full decomposition of the carbonate.

Properties, &c. Solution of soda, commonly called solution of *caustic* soda, is a new officinal of the Dublin Pharmacopœia of 1850, and the London of 1851. It is a colourless liquid, having a caustic taste and alkaline reaction. Its properties and tests are the same as those of solution of potassa, with the exception that no precipitate is produced by chloride of platinum or tartaric acid. The London solution is somewhat stronger than the Dublin, and contains four per cent. of soda. The alkali dissolved must be viewed as hydrate of soda, consisting of one eq. of soda 31·3, and one of water 9=40·3.

Solution of soda is used by the London College as a chemical agent for preparing oxysulphuret of antimony, and by the Dublin College for saturating valerianic acid in forming valerianate of soda.

Off. Prep. Sodæ Valerianas. B.

SODÆ CARBONAS EXSICCATUS. *U. S.* SODÆ CARBONAS EXSICCATA. *Lond.* SODÆ CARBONAS SICCATUM. *Ed., Dub. Dried Carbonate of Soda.*

"Take of Carbonate of Soda *a convenient quantity*. Expose it to heat, in a clean iron vessel, until it is thoroughly dried, stirring constantly with an iron spatula; then rub it into powder." *U. S.*

The *London College* takes *a pound* of the salt, exposes it to heat until the crystals fall to pieces, then subjects it to a red heat, and finally rubs it to powder. The *Edinburgh College* heats any convenient quantity in a shallow vessel till it is dry, then urges it with a red heat in a crucible, and reduces it to powder when cold.

"Take of Crystallized Carbonate of Soda of Commerce *any convenient quantity*. Expose it in a porcelain capsule to a pretty strong sand heat, until the liquid which first forms is converted into a dry cake, and having rubbed this to powder, enclose it in a bottle." *Dub.*

Carbonate of soda contains ten equivalents of water of crystallization, and when heated, readily undergoes the watery fusion. Upon continuing the heat, the water is dried off, and a white porous mass remains, which is easily reduced to powder. The London and Edinburgh Colleges expose the dry mass to a red heat before powdering it. Dried carbonate of soda is in the form of a white powder, and differs in no respect from the crystallized carbonate, except in being devoid of water of crystallization. (See *Sodæ Carbonas.*) When decomposed by dilute sulphuric acid, it evolves 40·7 per cent. of carbonic acid. (*Lond. Pharm.*)

Medical Properties and Uses. This preparation was introduced into practice by Dr. Beddoes, who extolled its virtues in calculous complaints. It is applicable to the cure of such affections, only when dependent on a morbid secretion of uric acid. Its advantage over the common carbonate is that it admits of being made into pills, in consequence of being in the dried state. As the water of crystallization forms more than half of the carbonate, the dose of the dried salt must be reduced in proportion. From five to fifteen grains may be given three times a day in the form of pill, prepared with soap and aromatics. The general medical properties of this salt have been given under the head of *Sodæ Carbonas.*

Off. Prep. Sodæ Bicarbonas. B.

SODÆ CARBONATIS LIQUOR. *Dub. Solution of Carbonate of Soda.*

"Take of Crystallized Carbonate of Soda of Commerce *one ounce and a half* [avoirdupois]; Distilled Water *one pint* [Imp. meas.]. Dissolve and filter. The specific gravity of this Solution is 1·026." *Dub.*

This preparation furnishes a solution of carbonate of soda of determinate strength, each Imperial fluidounce of which contains nearly thirty-three grains of the salt. It is convenient for prescribing the alkali in solution, and for forming effervescing draughts, each fluidounce being saturated, on an average, by half a fluidounce of lemon juice. The dose is from one to two tablespoonfuls, sufficiently diluted with water, and given two or three times a day. B.

SODÆ BICARBONAS. *U.S., Lond., Ed., Dub. Bicarbonate of Soda.*

"Take of Carbonate of Soda, in crystals, *a convenient quantity*. Break the crystals in pieces, and put them into a wooden box, having a transverse partition near the bottom pierced with numerous small holes, and a cover which can be tightly fitted on. To a bottle having two tubulures, and half filled with water,

adapt two tubes, one connected with an apparatus for generating carbonic acid and terminating under the water in the bottle, the other commencing at the tubulure in which it is inserted, and entering the box by an opening near the bottom, beneath the partition. Then lute all the joints, and cause a stream of carbonic acid to pass through the water into the box until the carbonate of soda is fully saturated. Carbonic acid is obtained from Marble by the addition of dilute sulphuric acid." *U. S.*

In the *London Pharmacopœia* of 1851, bicarbonate of soda has been transferred from the Preparations to the list of Materia Medica.

"Fill with fragments of Marble a glass jar, open at the bottom and tubulated at the top; close the bottom in such a way as to keep in the Marble without preventing the free passage of a fluid; connect the tubulature closely by a bent tube and corks with an empty bottle, and this in like manner with another bottle, filled with one part of Carbonate of Soda and two parts of Dried Carbonate of Soda well triturated together; and let the tube be long enough to reach the bottom of the bottle. Before closing the last cork closely, immerse the jar to the top in diluted muriatic acid, contained in any convenient vessel; when the whole apparatus is thus filled with carbonic acid gas, secure the last cork tightly; and let the action go on till next morning, or till the gas is no longer absorbed by the salt. Remove the damp salt which is formed, and dry it, either in the air without heat, or at a temperature not above 120°." *Ed.*

"Take of Crystallized Carbonate of Soda of Commerce *two pounds* [avoirdupois]; Distilled Water *one quart* [two pints Imp. meas.]; Muriatic Acid of Commerce *one pint and a half* [Imp. meas.]; Water *three pints* [Imp. meas.]; Chalk, in fragments, *one pound* [avoird.], or *a sufficient quantity.* Having diluted the Muriatic Acid with the Water, and dissolved the Carbonate of Soda in the Distilled Water, manipulate with these solutions, and with the Chalk, as directed in the formula for *Potassæ Bicarbonas*, employing also the arrangement of apparatus there described. With the view, however, of obtaining from the mother liquor an additional quantity of Bicarbonate, it is not necessary that the evaporation shall be preceded by a filtration." *Dub.*

The object of these processes is to unite the soda with an additional equivalent of carbonic acid, whereby it becomes converted into the bicarbonate.

The process adopted in the U. S. Pharmacopœia since 1840, is that which has been practised for many years in the United States, and which was described in 1830, by Dr. Franklin R. Smith, in the first volume of the Journal of the Philadelphia College of Pharmacy. This process is attributed to Dr. Smith by Soubeiran, who characterizes it as the best that can be employed. (*Nouv. Traité de Pharm.*) It was adopted in the French Codex on its revision of 1837. A stream of carbonic acid is passed into a suitable vessel, containing the crystallized carbonate placed on a diaphragm, pierced with numerous holes. As the bicarbonate combines with much less water of crystallization than is contained in the carbonate, it follows that, during the progress of the saturation of the carbonate, a considerable quantity of water is liberated. This water would finally dissolve the bicarbonate formed, were it not for the pierced diaphragm, through which it is allowed to drain off, holding in solution a part of the carbonate. When the saturation is completed, the pieces of crystals, still supported on the diaphragm, are found to have retained their original form, but to have become opaque and of a porous texture. The necessary carbonic acid for forming the bicarbonate may be economically obtained from other processes in which this acid is evolved; as, for example, from the process for making tartaric acid, in which tartrate of lime is formed from cream of tartar by the addition of carbonate of lime.

The process adopted in the last Edinburgh Pharmacopœia is that of Berzelius.

In the U. S. process, the excess of water over the quantity necessary for the bicarbonate is allowed to drain off; but it holds a certain portion of carbonate in solution, which thus escapes the action of the carbonic acid. To avoid this result it is only necessary to prepare a carbonate containing just sufficient water of crystallization to accommodate the bicarbonate; and the process recommended by Berzelius accomplishes that purpose. Thus, the salt which he prepares to be submitted to the carbonic acid, is an intimate mixture, in fine powder, of four parts of effloresced carbonate, with one of the crystallized salt. The proportion adopted by the Edinburgh College is different, namely, two parts of the dried carbonate to one of the crystallized carbonate; and is such as to afford a slight excess of water over that required to constitute the bicarbonate. Hence the Edinburgh process furnishes a damp salt, which is dried in the air without heat, or at a temperature not exceeding 120°. The apparatus employed by the College for obtaining the carbonic acid is precisely the self-regulating generator, devised by Dr. Hare on the principle of Gay-Lussac's. The empty bottle, placed between the generating apparatus and that containing the salt, is intended to detain any impurity which may be carried over with the stream of carbonic acid.

The Dublin College, in its Pharmacopœia of 1850, has adopted the process of dissolving the carbonate in water before submitting it to the action of the carbonic acid. The solution, when saturated, lets fall the sparingly soluble bicarbonate in minute crystals, which are washed, drained, and dried as directed for bicarbonate of potassa. A second crop of crystals is obtained from the mother water without filtration, by evaporating it to one-half by a heat not exceeding 110°.

Artus has given a process for obtaining bicarbonate of soda, similar to that of Wöhler for forming the corresponding salt of potassa. (See *Potassæ Bicarbonas.*) In this process, the effloresced carbonate, mixed with half its weight of freshly ignited and finely powdered charcoal, is saturated by a stream of carbonic acid, derived from the fermentation of sugar. The presence of the charcoal greatly promotes the absorption. (*Pharm. Cent. Blatt*, 1843, p. 254.)

Properties, &c. As obtained by the U. S. formula, bicarbonate of soda is in opaque, porous masses, made up of numerous, aggregated crystalline grains, and having a snow-white colour. For the convenience of the apothecary these masses are reduced to powder. As procured by the Edinburgh process, it is in small, white, opaque, irregular scales. The Dublin preparation is in minute, colourless, indistinct crystals. Bicarbonate of soda is permanent in the air, and slightly alkaline to the taste and to turmeric paper. It is soluble in thirteen parts of cold water. When the solution is exposed to heat, the salt gradually parts with carbonic acid, and, at the temperature of 212°, is converted into sesquicarbonate. At a red heat, the water of crystallization and the second equivalent of carbonic acid, amounting together to 37 per cent., are expelled, and the anhydrous carbonate is left. One eq., or 84·3 parts of the crystallized bicarbonate should lose, on complete decomposition by dilute sulphuric acid two eqs. or 44 parts of carbonic acid, equal to 52·1 per cent. The salt is seldom so perfect as to satisfy this test; as good commercial samples generally contain from two to three per cent. of carbonate. The note of tests of the London Pharmacopœia calls for the presence of 51·7 per cent. of carbonic acid, which is very near the theoretical quantity. The presence of carbonate may be known by a decided alkaline taste and reaction, by a cold solution of the salt yielding a precipitate with sulphate of magnesia, and by a solution in 40 parts of water, affording, without agitation, an orange-coloured or reddish-brown precipitate with corrosive sublimate; whereas the pure salt produces a slight opalescence only with this test. The corrosive sublimate test is adopted in the Edinburgh Pharmacopœia, and, according to Dr. Christison, readily detects one per cent. of carbonate. The pure bicarbonate is

not precipitated by chloride of platinum, or, when supersaturated with nitric acid, by chloride of barium or nitrate of silver. The non-action of these tests shows the absence of salts of potassa, and of sulphates and chlorides. The incompatibles of this salt are the same as those of the carbonate, except sulphate of magnesia in the cold, which decomposes the carbonate, but not the bicarbonate.

Composition. Bicarbonate of soda, when perfect, consists of two eqs. of carbonic acid 44, one of soda 31·3, and one of water 9=84·3. The London College formerly prepared this salt by a faulty process, and gave it the name of sesquicarbonate. In its Pharmacopœia of 1851, it has placed the salt, under the correct name of bicarbonate, in the catalogue of Materia Medica; where, perhaps, it properly stands, as it is now prepared in great perfection on a large scale.

Medical Properties. This salt has the general medical properties of the carbonate; but, from its mild taste and less irritating qualities, proves more acceptable to the palate and stomach. It is often resorted to in calculous cases, characterized by predominant uric acid. When the carbonate is given in these cases, its continued use is liable to induce phosphatic deposits, after the removal of the uric acid. According to D'Arcet, who made the observation at the springs of Vichy, this objection does not lie to the bicarbonate, especially when taken in carbonic acid water; for this salt, by its superabundant acid has the power of maintaining the phosphates in solution, even after the alkali has caused the uric acid to disappear. The same remark is applicable to the bicarbonate of potassa. Bicarbonate of soda has been given in infantile croup, with apparent advantage in promoting the expulsion of the false membrane, in the dose of a grain every five minutes, dissolved in milk and water. Dr. Lemaire has proposed it as an antiphlogistic remedy in the treatment of pneumonia, membranous angina, and croup, supposing it to act on the principle of removing from the blood the excess of fibrin, a morbid condition which is supposed to characterize that liquid in local inflammations. The dose for an adult is from ten grains to a drachm, and is taken most conveniently in a glass of carbonic acid water. This salt is principally consumed in making soda and Seidlitz powders. (See *pages* 53 and 54.) It is sometimes made into lozenges. (See *Trochisci Sodæ Bicarbonatis.*)

Off. Prep. Pulveres Effervescentes; Pulveres Effervescentes Citrati; Sodæ Aqua Effervescens; Trochisci Sodæ Bicarbonatis. B.

SODÆ AQUA EFFERVESCENS. *Ed. Effervescing Water of Soda.*

"Take of Bicarbonate of Soda *one drachm;* Water *one pint* [Imp. meas.]. Dissolve the Bicarbonate in the Water, and saturate it with carbonic acid under strong pressure. Preserve the liquid in well closed vessels." *Ed.*

This is a solution of bicarbonate of soda in carbonic acid water, in the proportion of three grains to the Imperial fluidounce. The name given to it is incorrect. The reason is not obvious why this solution is made with water, and the corresponding one of potassa with distilled water. B.

LIQUOR SODÆ CHLORINATÆ. *U. S., Lond.* SODÆ CHLORINATÆ LIQUOR. *Dub. Solution of Chlorinated Soda. Solution of Chloride of Soda. Labarraque's Disinfecting Liquid.*

"Take of Chlorinated Lime *a pound;* Carbonate of Soda *two pounds;* Water *a gallon and a half.* Dissolve the Carbonate of Soda in three pints of the Water, with the aid of heat. To the remainder of the Water add, by small portions at a time, the Chlorinated Lime previously well triturated, stirring the mixture after each addition. Set the mixture by for several hours that the dregs may subside; then decant the clear liquid, and mix it with the solution of Carbonate of Soda. Lastly, decant the clear liquor from the precipitated carbonate

of lime, pass it through a linen cloth, and keep it in bottles secluded from the light." *U. S.*

"Take of Carbonate of Soda *a pound;* Distilled Water *forty-eight fluidounces* [Imp. meas.]; Chloride of Sodium *four ounces;* Binoxide of Manganese *three ounces;* Sulphuric Acid *two fluidounces and a half.* Dissolve the Carbonate in two pints [Imp. meas.] of Water. Then put the Chloride and Binoxide, rubbed to powder, into a retort; and add to them the Acid, previously mixed with three fluidounces of Water, and cooled. Heat the mixture, and pass the chlorine first through five fluidounces of Water, and afterwards into the solution of the Carbonate above directed." *Lond.*

"Take of Chlorinated Lime *half a pound* [avoirdupois]; Water *half a gallon* [Imp. meas.]; Crystallized Carbonate of Soda of Commerce *seven ounces* [avoird.]. Blend well by trituration in a mortar the Chlorinated Lime with three pints of the Water, and, having transferred the mixture to a stoppered bottle, let this be well shaken several times for the space of three hours. Pour out the contents of the bottle on a calico cloth, and to the filtered solution add the Carbonate of Soda, dissolved in the remaining pint of Water. Having stirred the mixture well for ten minutes, separate the liquid by a second filtration, and preserve it in a well stopped bottle. The specific gravity of this liquid is 1·034." *Dub.*

This solution was first brought into notice as a disinfecting agent by Labarraque, an apothecary of Paris. It was afterwards found to possess valuable therapeutic properties. The process of the *U. S.* Pharmacopœia is that of Payen, adopted in the French Codex of 1837. It consists in decomposing a solution of carbonate of soda by one of chlorinated lime. Carbonate of lime is precipitated and the chlorinated soda remains in solution. The proportion employed gives an excess of carbonate of soda, the presence of which renders the solution more permanent. The process of the Dublin College for this newly adopted officinal is the same in principle as that of the U. S. Pharmacopœia; but the proportions employed are different. While the U. S. process gives an excess of carbonate of soda, the Dublin formula orders a proportion so small as not to be sufficient to decompose the whole of the chlorinated lime, even assuming this to be of inferior quality. The water taken is not much more than half that ordered in the U. S. Pharmacopœia; from which it follows that the Dublin solution is denser. In consequence of the chlorinated lime being taken in excess, the Dublin preparation must be a mixed aqueous solution of chlorinated soda and chlorinated lime. The London process is that of Labarraque. All the chlorine generated from the prescribed quantity of materials for forming that gas, is passed into the solution of carbonate of soda; and when the chlorine gas is limited to this quantity, no carbonic acid is disengaged. The chlorine is first passed through water to free it from muriatic acid, which, if suffered to come over, would convert the alkali into common salt.

Properties. The *U. S.* solution is a colourless liquid, having an alkaline reaction, and a faint smell of chlorine. With lime-water it yields a precipitate of carbonate of lime, known as a carbonate by its dissolving with effervescence in an acid. This precipitate is caused by the excess of carbonate of soda. Owing to the presence of loosely combined chlorine, it rapidly destroys the colour of sulphate of indigo. The *London* solution has a pale-yellow colour, and a sharp saline, astringent taste. The colour of turmeric is first rendered brown, and afterwards destroyed. When it is boiled, chlorine is not given off, nor is its bleaching property sensibly impaired; and, when carefully evaporated, a mass of damp crystals is obtained, which, when redissolved in water, possess the properties of the original liquid. Upon the addition of muriatic acid, both these solutions emit carbonic acid and chlorine together, the former known by its pre-

cipitating lime from lime-water, the latter by its decolorizing power on sulphate of indigo. The *Dublin* solution is peculiar in containing no undecomposed carbonate of soda. It therefore has not an alkaline reaction, is not precipitated by lime-water, and does not emit carbonic acid on the addition of an acid. All three solutions, when exposed to the air, absorb carbonic acid, and slowly evolve chlorine. It is on this property of gradually evolving chlorine that their disinfecting power depends.

Nature and Composition. The chemical nature of these solutions is different. Assuming the chlorinated lime to be essentially hypochlorite of lime with chloride of calcium (see *page* 156), the U. S. solution will contain *hypochlorite of soda* with *chloride of sodium*. Besides these there will be present more or less *carbonate of soda*, according as there happens to be in the chlorinated lime less or more chlorine to decompose it. In all cases, however, there will be an excess of carbonate; as the best chlorinated lime does not contain sufficient chlorine to effect its entire decomposition, in the proportion in which it is taken in the formula. The constitution of the London preparation is more complicated. As it is a peculiarity in its formation that no carbonic acid is evolved, it is necessary to assume the presence of all the carbonic acid of the carbonate of soda; and hence it is considered to be a combination of *hypochlorite of soda*, *chloride of sodium*, and *bicarbonate of soda*. The reaction is supposed to take place between four eqs. of carbonate of soda and two of chlorine. By a transfer of carbonic acid from two eqs. of carbonate to the remaining two eqs. of the same salt, two eqs. of bicarbonate are formed, and two of soda left. The sodium and oxygen of one eq. of soda, unite, each, with one eq. of chlorine, so as to form one eq. of chloride of sodium, and one of hypochlorous acid. This acid then unites with the remaining eq. of soda to form hypochlorite of soda. The view here taken makes the U. S. and London solutions analogous in constitution; but differing in one containing the carbonate, the other the bicarbonate of soda. In the London preparation, half the soda is bicarbonated; in the U. S. solution, from a half to a third is monocarbonated, according to the quality of the chlorinated lime used. The Dublin may be supposed to be the same as the U. S. preparation, with the exception that, instead of having an excess of carbonate of soda, it contains an excess of undecomposed chlorinated lime. According to Millon's views, all these solutions contain *oxychloride of sodium*, $Na_2 \left\{ \begin{matrix} O \\ Cl \end{matrix} \right.^2$, or, which is the same thing, chloride of soda, containing two eqs. of soda to one of chlorine ($2NaO,Cl$); thus making the compound assimilate in constitution to the sesquioxide of sodium (Na_2O_3). On Millon's supposition, two eqs. of carbonate of soda would be necessary to decompose one of chlorinated lime, with the result of forming one eq. of chlorinated soda, one of carbonate of lime, and one of free carbonic acid. Mr. B. Kavanagh, of Dublin, finds that a solution of alum has its alumina precipitated upon being added to the London chlorinated soda liquid, without effervescence of carbonic acid, but with the evolution of chlorine on the application of heat. Hence he infers that the soda, not combined with carbonic acid in the preparation, is united with chlorine and not with hypochlorous acid, and, accordingly, conceives that he has proved the correctness of Millon's views. Upon the whole, analyses are wanting before we can determine the true constitution of the officinal solutions of chlorinated soda. The London solution, though made on Labarraque's plan, is considerably stronger than his preparation; for the London College dissolves the carbonate in about three times its weight of water, before transmitting the chlorine; whereas Labarraque dissolved it in four times its weight.

Medical Properties and Uses. Solution of chlorinated soda is stimulant, antiseptic, and resolvent. Internally it has been employed in diseases termed *putrid*

or *malignant*, as typhus fever, scarlatina maligna, &c. The conditions which indicate the propriety of its use are great prostration of strength, fetid evacuations, and dry and furred tongue. Under these circumstances it promotes urine, creates a moisture on the skin, and improves the secretions and evacuations. It has also been given in dysentery accompanied with peculiarly fetid stools, in dyspepsia attended with putrid eructations, and in glandular enlargements and chronic mucous discharges. Other diseases in which it has been recommended, are secondary syphilis, scrofula, bilious disorders, and chronic diseases of the skin. M. Chailly speaks in praise of it in suppressed or deficient menstruation. In asphyxia from sulphuretted hydrogen it forms, like chlorinated lime, an efficacious antidote. The dose is from thirty drops to a teaspoonful, given in a cupful of water or mild aqueous liquid, and repeated every two or three hours.

As a local remedy it is found useful in all affections attended with fetor, such as gangrenous, cancerous, scrofulous, and syphilitic ulcers, ulceration of the gums, carbuncle, ozæna, mortification, putrid sorethroat, &c. In these cases it is applied as a gargle, wash, ingredient of poultices, or imbibed by lint. In the sloughing of the fauces attendant upon severe cases of scarlatina, Dr. Jackson, late of Northumberland, found it efficacious, used as a gargle, or injected into the throat. In the sore mouth from ptyalism, it forms a good mouth-wash, when diluted with eight parts or more of water. In fetid discharges from the vagina, uterus, and bladder, it has been employed with advantage as an injection, diluted with from fifteen to thirty parts of water for the vagina and uterus, and with sixty parts when the object is to wash out the bladder by means of a double cannula. The solution of chlorinated soda has also been applied successfully to burns, and to cutaneous eruptions, particularly psoriasis, tinea capitis, scabies, and obstinate herpetic affections. In these cases it is diluted with from ten to thirty parts of water, the strength varying according to circumstances. For the cure of sore nipples, Dr. Chopin found nothing so successful as frequently repeated lotions with this solution.

Solution of chlorinated soda is a powerful disinfectant, better suited for disinfecting operations on a small scale than chlorinated lime. In the bed-chambers of the sick, especially with infectious diseases, it will be found highly useful, sprinkled on the floor or bed, and added to the vessels intended to receive the excretions.

Off. Prep. Cataplasma Sodæ Chlorinatæ. B.

SODÆ ET POTASSÆ TARTRAS. *U. S.*, *Dub.* SODÆ POTASSIO-TARTRAS. *Lond.* POTASSÆ ET SODÆ TARTRAS. *Ed.* *Tartrate of Potassa and Soda.* *Tartarized Soda.* *Rochelle Salt.*

"Take of Carbonate of Soda *a pound;* Bitartrate of Potassa [cream of tartar], in powder, *sixteen ounces;* Boiling Water *five pints.* Dissolve the Carbonate of Soda in the Water, and gradually add the Bitartrate of Potassa. Filter the solution, and evaporate until a pellicle forms; then set it aside to crystallize. Pour off the liquor, and dry the crystals on bibulous paper. Lastly, again evaporate the liquor, that it may furnish more crystals." *U. S.*

The *Edinburgh* and *Dublin* processes correspond with the above. The *London College* has transferred this salt to the list of Materia Medica.

This is a double salt, consisting of tartrate of potassa combined with tartrate of soda. The theory of its formation is exceedingly simple, being merely the saturation of the excess of acid in the bitartrate of potassa by carbonate of soda, the carbonic acid of which is extricated with effervescence. The proper quantities of the materials for mutual saturation are 143·3 parts of carbonate and 188·2 of bitartrate, or one eq. of each. This gives the ratio of 3 to 3·95. The proportion adopted in the U. S., Edinburgh, and Dublin Pharmacopœias is as 3 to 4, which is very near the theoretical quantities. As the salts employed are

apt to vary in composition and purity, the carbonate from the presence of more or less water of crystallization, and the bitartrate from containing tartrate of lime, it is, perhaps, best in all cases, after indicating the nearest average proportion as a general guide, to present to the operator the alternative of using the cream of tartar to the point of exact saturation.

Properties. Tartrate of potassa and soda is in the form of colourless, transparent, slightly efflorescent crystals, often very large, and having the shape, when carefully prepared, of right prisms, with ten or twelve unequal sides. As ordinarily crystallized, they are generally in half prisms, as if split in the direction of their axis. The salt is of a saline and slightly bitter taste. It dissolves in five times its weight of cold water, and in much less boiling water. Any undissolved residue is impurity, probably tartrate of lime or bitartrate of potassa, or both. Its solution is neutral to test paper, and yields no precipitate with chloride of barium or a dilute solution of nitrate of silver. The non-action of these tests shows the absence of sulphates and chlorides. When the salt is exposed to a strong heat, the tartaric acid is destroyed, and a mixture of the carbonates of potassa and soda is left. It sometimes contains tartrate of lime, which may be removed by solution and crystallization; but, when the crystals are large and well defined, it may be assumed to be pure. It is incompatible with most acids, and with all acidulous salts except bitartrate of potassa. It is also decomposed by the acetate and subacetate of lead, by the soluble salts of lime, and by those of baryta, unless the solution of the tartrate be considerably diluted. The way in which acids act in decomposing it, is by combining with the soda, and throwing down bitartrate of potassa as a crystalline precipitate. This double salt was discovered by Seignette, an apothecary of Rochelle; and hence it is frequently called *Seignette's salt*, or *Rochelle salt.*

Composition. Tartrate of potassa and soda consists of two eqs. of tartaric acid 132, one of potassa 47·2, one of soda 31·3, and eight of water 72=282·5; or, considered as a double salt, of one eq. of tartrate of potassa 113·2, and one of tartrate of soda 97·3, with the same quantity of water.

Medical Properties and Uses. This salt is a mild, cooling purgative, well suited to delicate and irritable stomachs, being among the least unpalatable of the neutral salts. As it is not incompatible with tartar emetic, it may be associated with that salt in solution. It is an ingredient in the effervescing aperient called Seidlitz powders. (See *page* 54.) The dose as a purge is from half an ounce to an ounce. Given in small and repeated doses it does not purge, but is absorbed, and renders the urine alkaline. (Millon and Laveran, *Journ. de Pharm.*, 3e *sér.*, vi. 222.)

Tartrate of potassa and magnesia, formed by saturating cream of tartar with carbonate of magnesia, has been proposed by M. Maillier as a safe and pleasant purgative. (*Journ. de Pharm.*, xiii. 252.) B.

SODÆ MURIAS PURUM. *Ed.* *Pure Muriate of Soda. Pure Chloride of Sodium.*

"Take *any convenient quantity* of Muriate of Soda; dissolve it in boiling water; filter the solution, and boil it down over the fire, skimming off the crystals which form. Wash the crystals quickly with cold water, and dry them." *Ed.*

This formula of the Edinburgh College is unnecessary. If commercial samples of chloride of sodium cannot be found pure enough to form muriatic acid, the salt may be purified as a preparatory step to the process for obtaining that acid; as is ordered by the College in the formula for *Acidum Muriaticum Purum*, where the directions for purifying the salt are unnecessarily repeated, after the admission of a distinct formula for that purpose. Pure muriate of soda is ordered by the College, with needless refinement, as an ingredient in the compound saline powder.

Off. Prep. Pulvis Salinus Compositus. B.

SODÆ PHOSPHAS. *U.S., Lond., Ed., Dub. Phosphate of Soda. Tribasic Phosphate of Soda.*

"Take of Bone, burnt to whiteness and powdered, *ten pounds;* Sulphuric Acid *six pounds;* Carbonate of Soda *a sufficient quantity.* Mix the powdered Bone with the Sulphuric Acid in an earthen vessel; then add a gallon of water, and stir them well together. Digest for three days, occasionally adding a little water to replace that which is lost by evaporation, and frequently stirring the mixture. At the expiration of this time, pour in a gallon of boiling water, and strain through linen, gradually adding more boiling water until the liquid passes nearly tasteless. Set by the strained liquor that the dregs may subside, from which pour off the clear solution, and boil it down to a gallon. To this solution, poured off from the dregs and heated in an iron vessel, add by degrees the Carbonate of Soda, previously dissolved in hot water, until effervescence ceases, and the phosphoric acid is completely neutralized; then filter the liquor, and set it aside to crystallize. Having removed the crystals, add, if necessary, a small quantity of Carbonate of Soda to the liquor, so as to render it slightly alkaline; then alternately evaporate and crystallize, so long as crystals are produced. Lastly, preserve the crystals in a well stopped bottle." *U. S.*

The *Edinburgh College* takes the same materials and in the same proportion, and proceeds substantially as above. The two pints and four fluidounces (Imperial measure) of sulphuric acid ordered by the College weigh six pounds. The *Dublin* takes *ten avoirdupois pounds* of calcined bone, *fifty-six Imperial fluid-ounces* (six and a half avoird. pounds nearly) of acid, *four and a half Imperial gallons* or *sufficient* distilled water, and *twelve avoird. pounds* or *sufficient* crystallized carbonate of soda, and makes the salt in the usual way.

The *London College* places this salt in the list of Materia Medica.

The incombustible part of bones is obtained by burning them to whiteness, and consists of a peculiar phosphate of lime, called bone-phosphate, associated with some carbonate of lime, &c. (See *Os.*) When this is mixed with sulphuric acid, the carbonate of lime is entirely decomposed, giving rise to effervescence. The phosphate of lime undergoes partial decomposition; the greater part of the lime, being detached, precipitates as sulphate of lime, while the phosphoric acid, set free, combines with the undecomposed portion of the phosphate, and remains in solution as a superphosphate of lime, holding dissolved a small portion of the sulphate of lime. In order to separate the superphosphate from the precipitated mass of sulphate of lime, boiling water is added to the mixture, the whole is strained, and the sulphate washed as long as superphosphate is removed, which is known by the water passing through in an acid state. The different liquids which have passed the strainer, consisting of the solution of superphosphate of lime, are mixed and allowed to stand, and by cooling a portion of sulphate of lime is deposited, which is got rid of by decantation. The bulk of the liquid is now reduced by evaporation, and, in consequence of the diminution of the water, a fresh portion of sulphate of lime is deposited, which is separated by subsidence and decantation as before. The superphosphate of lime solution being heated, is now saturated by means of a hot solution of carbonate of soda. The carbonic acid is extricated with effervescence, and the alkali, combining with the *excess* of acid of the superphosphate, generates that variety of phosphate of soda, called the tribasic phosphate; while the superphosphate of lime, by the loss of its excess of acid, becomes the neutral phosphate, and precipitates. It is recommended by the editor of the Dublin Hospital Gazette to have both solutions *boiling hot*, in order to insure the full extrication of the carbonic acid, and the complete precipitation of the phosphate of lime; and this plan is adopted in the Dublin formula. The phosphate of lime is separated by a new filtration;

and the filtered liquor, consisting of the solution of phosphate of soda, is evaporated so as to crystallize.

In the U. S. and Edinburgh processes, the calcined bone is to the acid as 10 to 6; in the Dublin process as 10 to 6½ nearly. The proportion recommended by Berzelius is as 10 to 6·66. The acid, in the officinal processes, is added to the calcined bone in the concentrated state, and afterwards diluted with more or less water. In the process given by Berzelius it is first diluted with twelve times its weight of water. All the writers state that phosphate of soda crystallizes more readily by allowing its solution to be slightly alkaline; and a remarkable fact is that a neutral solution, when it crystallizes, leaves a supernatant liquid which is slightly acid and uncrystallizable. Hence it is necessary, after getting each successive crop of crystals, to render the mother water neutral or slightly alkaline, before it will furnish an additional quantity.

M. Funcke, a German chemist, has given the following cheap and expeditious method for obtaining phosphate of soda. Add to the powdered calcined bone, diffused in water, sufficient dilute sulphuric acid to decompose all the carbonate of lime which it contains. As soon as the effervescence has ceased, the matter is acted on with nitric acid, which dissolves the phosphate of lime, and leaves the sulphate. The nitric solution of the phosphate is then treated with sulphate of soda, equal in quantity to the bone employed; and, after the reaction is completed, the nitric acid is recovered by distillation. In consequence of a double decomposition, sulphate of lime and phosphate of soda are formed; and the latter is separated from the former by the action of water, and crystallized in the usual manner.

Properties, &c. The medicinal phosphate of soda is in large colourless crystals, which are transparent at first, but speedily effloresce and become opaque when exposed to the air, and which have the shape of oblique rhombic prisms. It possesses a pure saline taste, resembling that of common salt. With tests it displays a slight alkaline reaction. It dissolves in four parts of cold, and in two of boiling water, but is insoluble in alcohol. Before the blowpipe it first undergoes the aqueous fusion, and afterwards, at a red heat, melts into a globule of limpid glass, which becomes opaque on cooling. It is not liable to any adulterations, but sometimes contains carbonate of soda, from this salt being added in excess; in which case it will effervesce with acids. If it contain sulphate of soda, or any other soluble sulphate, the precipitate caused by chloride of barium will be a mixture of sulphate and phosphate of baryta, and will not be totally soluble in nitric acid. Chloride of barium will detect carbonate of soda also, by producing a precipitate (carbonate of baryta), soluble with effervescence in nitric acid. If a chloride be present, the *yellow* precipitate caused by nitrate of silver will be a mixed one of chloride and phosphate of silver, not entirely soluble in the same acid. It is incompatible with soluble salts of lime, with which it gives a precipitate of phosphate of lime, and with neutral metallic solutions. This salt is found in several of the animal secretions, particularly the urine.

The medicinal phosphate of soda is the tribasic phosphate, consisting, when crystallized, of one eq. of phosphoric acid 72, two of soda 62·6, one of basic water 9, and twenty-four of water of crystallization 216=359·6. Its formula is, therefore, $2NaO,HO,PO_5+24HO$. When gently heated it loses its water of crystallization; and at a red heat its basic water is driven off, and the salt is converted into *pyrophosphate of soda*, or the *bibasic phosphate*, which has the formula $2NaO,PO_5$, and is characterized by giving a *white* precipitate with nitrate of silver. When the tribasic salt is thus dried and ignited, it loses 62·3 per cent. of water. (*Lond. Pharm.*)

Medical Properties and Uses. This salt was introduced into practice about the year 1800, by Dr. Pearson, of London. It is a mild purgative, and, from

its pure saline taste, is well adapted to the cases of children, and of persons of delicate stomach. The dose is from one to two ounces, and is best given in gruel or weak broth, to which it communicates a taste, as if seasoned with common salt.

Off. Prep. Ferri Phosphas; Pulvis Antimonialis. *Dub.* B.

SODÆ VALERIANAS. *Dub. Valerianate of Soda.*

"Take of Bichromate of Potash, reduced to powder, *nine ounces* [avoirdupois]; Fusel Oil *four fluidounces* [Imp. meas.]; Oil of Vitriol of Commerce *six fluidounces and a half* [Imp. meas.]; Water *half a gallon* [Imp. meas.]; Solution of Caustic Soda *one pint* [Imp. meas.], or *as much as is sufficient.* Dilute the Oil of Vitriol with ten [fluid] ounces, and dissolve with the aid of heat the Bichromate of Potash in the remainder of the Water. When both solutions have cooled to nearly the temperature of the atmosphere, place them in a matrass, and, having added the Fusel Oil, mix well by repeated shaking, until the temperature of the mixture, which first rises to about 150°, has fallen to 80° or 90°. The matrass having been now connected with a condenser, heat is to be applied, so as to distil over about half a gallon of liquid. Let this, when exactly saturated with the Solution of Caustic Soda, be separated from a little oil that floats on its surface, and evaporated down until, the escape of aqueous vapour having entirely ceased, the residual salt is partially liquefied. The heat should now be withdrawn, and when the Valerianate of Soda has concreted, it is, while still warm, to be divided into fragments, and preserved in a well stopped bottle." *Dub.*

This is a new officinal of the Dublin Pharmacopœia of 1850. The process for making it consists essentially of two steps; first, the artificial formation of valerianic acid, and, secondly, the saturation of this acid with caustic soda. By distilling fusel oil with a mixture of sulphuric acid and bichromate of potassa, valerianic acid is formed, and passes over with water. The change is effected by the oxidizing agency of the chromic acid of the bichromate; for when fusel oil loses two eqs. of hydrogen by oxidation into water, and gains two of oxygen, it is converted into valerianic acid. Thus, $C_{10}H_{11}O+HO$ and $4O=C_{10}H_9O_3+HO$ and 2HO. (See *Potassæ Bichromas* and *Alcohol Amylicum.*) The distillate, by being exactly saturated with the solution of caustic soda, is converted into a solution of valerianate of soda, which, by the application of heat until the water is driven off, and the residual matter is partially liquefied, furnishes, on cooling, the concrete salt. The small portion of oil that floats on the surface of the solution of valerianate of soda is valerianate of amylic ether ($C_{10}H_{11}O$, $C_{10}H_9O_3$).

Properties, &c. Valerianate of soda is a deliquescent very soluble salt, in snow-white masses, having the odour of valerian, and a taste at first styptic, and afterwards sweetish. When heated to 285°, it fuses without loss of acid, and, upon cooling, concretes into a white solid. The salt, as ordered by the Dublin College, is in the form produced by partial fusion. It consists of one eq. of valerianic acid and one of soda ($NaO,C_{10}H_9O_3$). It has no medical applications; having been introduced into the Dublin officinal catalogue for the sole purpose of forming, by double decomposition, the valerianates of iron, quinia, and zinc.

Off. Prep. Ferri Valerianas; Quinæ Valerianas; Zinci Valerianas. B.

SPIRITUS. *U. S., Lond.*

Spirits. Ed., Dub.

Spirits, as the term is here used, are alcoholic solutions of volatile principles, formerly procured by distillation, but now frequently prepared by simply dissolving the volatile principle in alcohol or diluted alcohol. The distilled spirits are prepared chiefly from aromatic vegetable substances, the essential oils of

which rise with the vapour of alcohol, and condense with it in the receiver. Some of the oils, however, will not rise at the temperature of boiling alcohol, but may be distilled with water. In this case it is necessary to employ proof spirit or diluted alcohol, with the water of which the oil comes over in the latter part of the process. As the proof spirit of the shops is often impregnated with foreign matters, which give it an unpleasant flavour, it is better to use alcohol which has been carefully rectified, and to dilute it with the due proportion of water, as directed by the U. S. Pharmacopœia. In preparing the spirits, care should be taken to avoid the colour and empyreumatic flavour arising from the decomposition of the vegetable matter by heat. Sufficient water must, therefore, be added to cover the vegetable matter after the alcohol shall have been distilled; and, as a general rule, the heat should be applied by means of a water-bath, or of steam. The aromatic should be macerated for some days with the alcohol, before being submitted to distillation; as the oil, being thus dissolved, rises more readily with the spirituous vapour than when confined in the vegetable tissue. It is necessary, during the process, frequently to renew the water in the refrigeratory; as otherwise much of the vapour will escape condensation. A good apparatus for the purpose is described and figured in *page* 793.

The aromatic spirits are used chiefly to impart a pleasant odour and taste to mixtures, and to correct the nauseating and griping effects of other medicines. They serve also as carminatives in flatulent colic, and agreeable stimulants in debility of stomach; but their frequent use may lead to the formation of intemperate habits, and should, therefore, be avoided. W.

SPIRITUS ANISI. *Lond.* *Spirit of Aniseed.*

"Take of Oil of Anise *three fluidrachms;* Proof Spirit *a gallon* [Imperial measure]. Dissolve." *Lond.*

The dose of this preparation, as a stomachic and carminative, is one or two fluidrachms. W.

SPIRITUS ARMORACIÆ COMPOSITUS. *Lond.* *Compound Spirit of Horse-radish.*

"Take of Horse-radish [root], sliced, Dried Orange Peel, each, *twenty ounces;* Nutmeg, bruised, *five drachms;* Proof Spirit *a gallon* [Imperial measure]; Water *two pints* [Imp. meas.]. Mix them; then, with a slow fire, distil a gallon." *Lond.*

This may be used advantageously as an addition to diuretic remedies, in dropsy attended with debility, especially in the cases of drunkards. The dose is from one to four fluidrachms.

Off. Prep. Infusum Armoraciæ Compositum. W.

SPIRITUS CARUI. *Lond., Ed.* *Spirit of Caraway.*

"Take of Oil of Caraway *two fluidrachms;* Proof Spirit *a gallon* [Imperial measure]. Dissolve." *Lond.*

"Take of Caraway, bruised, *half a pound;* Proof Spirit *seven pints* [Imperial measure]. Macerate for two days in a covered vessel; add a pint and a half [Imp. meas.] of water; and distil off seven pints." *Ed.*

The dose as a carminative is one or two fluidrachms. W.

SPIRITUS CASSIÆ. *Ed.* *Spirit of Cassia.*

"Take of Cassia in coarse powder, *one pound.* Proceed as for the Spirit of Caraway." *Ed.* (See *Spiritus Carui.*)

This is essentially the same as the spirit of cinnamon. W.

SPIRITUS CINNAMOMI. *Lond., Ed.* *Spirit of Cinnamon.*

"Take of Oil of Cinnamon *two fluidrachms;* Proof Spirit, *a gallon* [Imperial measure]. Dissolve." *Lond.*

The *Edinburgh College* prepares it from *a pound* of cinnamon, in coarse powder, in the same manner as spirit of caraway. (See *Spiritus Carui.*)

The spirit of cinnamon is an agreeable aromatic cordial, and may be given in debility of the stomach in the dose of one or two fluidrachms.

Off. Prep. Infusum Digitalis; Infusum Rhei; Mistura Cretæ. W.

SPIRITUS JUNIPERI COMPOSITUS. *U. S., Lond., Ed., Dub. Compound Spirit of Juniper.*

"Take of Oil of Juniper *a fluidrachm and a half;* Oil of Caraway, Oil of Fennel, each, *ten minims;* Diluted Alcohol *a gallon.* Dissolve the Oils in the Diluted Alcohol." *U. S.*

"Take of Oil of Juniper *a fluidrachm and a half;* Oil of Caraway, Oil of Fennel, each, *twelve minims;* Proof Spirit *a gallon* [Imperial measure]. Dissolve." *Lond.*

"Take of Juniper Berries, bruised, *a pound;* Fennel [seed], bruised, and Caraway, bruised, of each, *an ounce and a half;* Proof Spirit *seven pints* [Imp. meas.]; Water *two pints.* Macerate the fruits in the Spirit for two days, add the Water, and distil off seven pints." *Ed.*

"Take of Juniper Berries, bruised, *eight ounces* [avoirdupois]; Caraway Seed, bruised, Fennel Seed, bruised, of each, *one ounce* [avoird.]; Proof Spirit *half a gallon* [Imp. meas.]. Macerate the Berries and the Seeds in the Spirit for twenty-four hours; then add the Water, and with a slow fire distil off half a gallon." *Dub.*

This spirit is a useful addition to diuretic infusions and mixtures in debilitated cases of dropsy. The dose is from two to four fluidrachms.

Off. Prep. Mistura Creasoti. W.

SPIRITUS LAVANDULÆ. *U. S., Ed. Spirit of Lavender.*

"Take of Fresh Lavender [flowers] *two pounds;* Alcohol *a gallon;* Water *two pints.* Mix them, and with a slow fire distil a gallon." *U. S.*

The *Edinburgh College* takes *two pounds and a half* of the fresh flowers, and *a gallon* [Imperial measure] of rectified spirit; mixes them, and with the heat of a vapour-bath distils seven pints.

Mr. Brande asserts that the dried flowers produce as fragrant a spirit as the fresh. Spirit of lavender is used chiefly as a perfume, and as an ingredient in other preparations. The perfume usually sold under the name of *lavender water* is not a distilled spirit, but an alcoholic solution of the oil, with the addition of other odorous substances. The following is given by Mr. Brande as one of the most approved recipes for preparing it. "Take of rectified spirit of wine five gallons, essential oil of lavender twenty ounces, essential oil of bergamot five ounces, *essence of ambergris* [made by digesting one drachm of ambergris and eight grains of musk in half a pint of alcohol] half an ounce. Mix."

Off. Prep. Mistura Ferri Composita; Spiritus Lavandulæ Comp. W.

SPIRITUS LAVANDULÆ COMPOSITUS. *U. S., Ed., Dub.* TINCTURA LAVANDULÆ COMPOSITA. *Lond. Compound Spirit of Lavender.*

"Take of Spirit of Lavender *three pints;* Spirit of Rosemary *a pint;* Cinnamon, bruised, *an ounce;* Cloves, bruised, *two drachms;* Nutmeg, bruised, *half an ounce;* Red Saunders, rasped, *three drachms.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* takes *a fluidrachm and a half* of oil of lavender, *ten minims* of oil of rosemary, *two drachms and a half* of bruised cinnamon, *the same quantity* of bruised nutmeg, *five drachms* of sliced red saunders, and *two pints* [Imp. meas.] of rectified spirit; macerates the solids in the spirit for seven days; then expresses, filters, and dissolves the oils. The *Edinburgh College*

takes *two pints* [Imp. meas.] of spirit of lavender, *twelve fluidounces* of spirit of rosemary, *an ounce* of cinnamon in coarse powder, *two drachms* of bruised cloves, *half an ounce* of bruised nutmeg, and *three drachms* of red saunders; macerates for seven days, and then strains the liquor through calico.

"Take of Oil of Lavender *three fluidrachms;* Oil of Rosemary *one fluidrachm;* Cinnamon, bruised, *one ounce* [avoirdupois]; Nutmeg, bruised, *half an ounce* [avoird.]; Cloves, bruised, Cochineal in powder, each, *two drachms* [Dub. weight]; Rectified Spirit *two pints* [Imp. meas.]. Macerate for fourteen days, strain, express, and filter." *Dub.*

Many druggists prepare this spirit with a spirit of lavender, made by dissolving the oil of lavender in alcohol in the proportion of a fluidounce to a gallon. Mr. Coggeshall, of New York, states that it is seldom made according to the U. S. formula, in consequence of the difficulty of procuring the distilled spirit of lavender, and that the oil dissolved in spirit yields an inferior preparation. He proposes the following formula, which he has employed with entire satisfaction. "Take of Lavender flowers *twelve ounces;* Rosemary leaves, Cinnamon, bruised, each, *four ounces and a half;* Nutmegs, bruised, Cloves, bruised, each, *six drachms;* Coriander, bruised, Red Saunders, each, *three ounces;* powdered Turmeric *one drachm;* Alcohol *six pints*, and Water *five pints and a quarter.* Mix, digest for fourteen days, and filter." (*N. Y. Journ. of Pharm.*, i. 99.)

When properly made, this is a delightful compound of spices. It is much employed as an adjuvant and corrigent of other medicines, and as a remedy for gastric uneasiness, nausea, flatulence and general languor or faintness. The dose is from thirty drops to a fluidrachm, and is most conveniently administered on a lump of sugar.

Off. Prep. Aqua Lauro-cerasi; Liquor Potassæ Arsenitis. W.

SPIRITUS MENTHÆ PIPERITÆ. *Lond.* SPIRITUS MENTHÆ. *Ed. Spirit of Peppermint.*

"Take of Oil of Peppermint *three fluidrachms;* Proof Spirit *a gallon* [Imperial measure]. Dissolve." *Lond.*

The *Edinburgh College* prepares this spirit from *a pound and a half* of fresh peppermint, in the same manner as spirit of caraway. (See *Spiritus Carui.*)

The distilled spirit of peppermint has no advantage over a simple solution of the oil in alcohol; and the London College has adopted this mode of preparing it. The U. S. Pharmacopœia has a preparation consisting of the oil dissolved in alcohol, such as has long been used under the name of *essence of peppermint.* But this is much stronger than the Spirits, and has been placed among the tinctures in our officinal code. (See *Tinctura Olei Menthæ Piperitæ.*) W.

SPIRITUS MENTHÆ VIRIDIS. *Lond. Spirit of Spearmint.*

This is prepared by the *London College* from the oil of spearmint, in the manner directed for the preparation of the spirit of peppermint. (See *Spiritus Menthæ Piperitæ.*)

The two spirits are used for the same purposes, in the dose of from thirty drops to a fluidrachm. They are employed chiefly as carminatives. W.

SPIRITUS MYRISTICÆ. *U. S., Lond., Ed. Spirit of Nutmeg.*

"Take of Nutmeg, bruised, *two ounces;* Diluted Alcohol *a gallon;* Water *a pint.* Mix them, and with a slow fire distil a gallon." *U. S.*

The *London* and *Edinburgh Colleges* take *two ounces and a half* of bruised nutmeg, *a gallon* [Imp. meas.] of proof spirit, and *a pint* [Imp. meas.] of water; mix them; and distil a gallon.

The spirit of nutmeg is used chiefly for its flavour, as an addition to other medicines. The dose is one or two fluidrachms.

Off. Prep. Mistura Ferri Composita. W.

SPIRITUS PIMENTÆ. *U. S., Lond., Ed. Spirit of Pimento.*

"Take of Oil of Pimento *two fluidrachms;* Diluted Alcohol *a gallon.* Dissolve the Oil in the Diluted Alcohol." *U. S.*

The *London College* prepares it as above, using an Imperial gallon of proof spirit; the *Edinburgh*, from *half a pound* of bruised pimento, in the same manner as spirit of caraway.

This preparation may be used for the general purposes of the aromatic spirits, in the dose of one or two fluidrachms. W.

SPIRITUS PULEGII. *Lond. Spirit of European Pennyroyal.*

"Take of Oil of Pennyroyal *three fluidrachms;* Proof Spirit *a gallon* [Imperial measure]. Dissolve." *Lond.*

This is never used in this country. W.

SPIRITUS ROSMARINI. *U. S., Lond., Ed. Spirit of Rosemary.*

"Take of Oil of Rosemary [by weight] *four drachms;* Alcohol *a gallon.* Dissolve the Oil in the Alcohol." *U. S.*

The *London College* dissolves *two drachms* of oil of rosemary in *a gallon* [Imperial measure] of rectified spirit. The *Edinburgh College* takes *two pounds and a half* of rosemary, and proceeds as for the spirit of lavender.

Spirit of rosemary is a grateful perfume, and is used chiefly as an ingredient in lotions and liniments.

Off. Prep. Linimentum Ammoniæ Compositum; Linimentum Saponis; Spiritus Lavandulæ Compositus. W.

SPONGIA.

Preparation of Sponge.

SPONGIA USTA. *U. S. Burnt Sponge.*

"Take of Sponge *a convenient quantity.* Cut it into pieces, and beat it, that any extraneous matters may be separated; then burn it in a close iron vessel until it becomes black and friable; lastly, rub it into very fine powder." *U. S.*

The sponge is decomposed, the volatile matters being driven off by the heat, and a black friable coal remaining. Preuss found that, of 1000 parts of sponge submitted to calcination, 343·848 were dissipated; and the residue consisted of 327·0 parts of carbon and insoluble matters, 112·08 of chloride of sodium, 16·43 of sulphate of lime, 21·422 of iodide of sodium, 7·57 of bromide of magnesium, 103·2 of carbonate of lime, 35·0 of phosphate of lime, 4·73 of magnesia, and 28·72 of protoxide of iron. (*Pharm. Cent. Blatt*, 1837, 169.) Herberger found in burnt sponge one per cent. of iodide of potassium, and 0·5 per cent. of bromide of potassium. (*Annal. der Pharm.*, xx. 204.) As the remediate value of burnt sponge depends chiefly upon the presence of iodine, it cannot be esteemed good unless it affords purple fumes when acted on by sulphuric acid assisted by heat. It is said that the preparation is most efficient as a remedy, when the sponge is kept on the fire no longer than is necessary to render it friable. The powder is then of a much lighter colour. Guibourt recommends that the sponge selected for burning should be unwashed, of a strong odour, firm, and compact, that it should be put into a roaster similar to that sometimes used for coffee, and heated over a moderate fire till it becomes of a blackish-brown colour, that it should then be removed, powdered, and enclosed in a well stopped glass bottle. It is best when recently prepared; as the iodine is dissipated by time, and the specimens, at first richest in this principle, contain little of it at the end of a year. (*Journ. de Chim. Méd.*, Dec. 1831.) According to Herberger, the fine and coarse sponges do not materially differ in the proportion of their organic constituents; so that the coarse may be selected for this operation.

Burnt sponge has been highly recommended in goitre, glandular swellings of a scrofulous character, and obstinate cutaneous eruptions. It is most conveniently administered mixed with syrup or honey, in the form of an electuary, with the addition of some aromatic, as powdered cinnamon. The dose is from one to three drachms. W.

STANNUM.

Preparation of Tin.

STANNI PULVIS. *U. S., Ed., Dub. Powder of Tin.*

"Take of Tin *a convenient quantity*. Melt it in an iron vessel over the fire, and, while it is cooling, stir it until it is reduced to a powder, which is to be passed through a sieve." *U. S.*

"Melt Tin in an iron vessel; pour it into an earthenware mortar, heated a little above the melting point of the metal; triturate briskly as the metal cools, ceasing as soon as a considerable proportion is pulverized; sift the product, and repeat the process with what remains in the sieve." *Ed.*

"Take of grain Tin *a convenient quantity*. Melt the Tin in a black lead crucible, and, while it is cooling, stir it with a rod of iron until it is reduced to powder. Let the finer particles be separated by means of a sieve, and when, after having been several times in succession shaken with distilled water, the decanted liquor appears quite clear, let the product be dried and preserved for use." *Dub.*

Tin, being a very fusible metal, is easily granulated by fusion, and subsequent agitation in the act of congealing. On a small scale, the process is most conveniently performed in a wooden box, the inside of which has been well rubbed with chalk. This should be afterwards washed away by water; and, as the granulated powder is of unequal fineness, the coarser particles must be separated by a sieve. For the properties of this metal and the tests of its purity, see *Stannum.*

Medical Properties and Uses. Powder of tin is used exclusively as an anthelmintic, and is supposed to act by its mechanical properties. It is considered particularly adapted to the expulsion of *Ascaris lumbricoides*, and is sometimes employed to expel the tapeworm. For internal exhibition it should be free from oxidation. The dose is half an ounce, mixed with molasses, given for several successive mornings, and then followed by a brisk cathartic. Dr. Alston was in the habit of administering larger doses for the expulsion of the tapeworm. He began by giving an ounce on an empty stomach, which was followed, for two successive days, by half an ounce each day, and finally by a brisk purge. B.

STRYCHNIA.

Preparations of Strychnia.

STRYCHNIA. *U. S., Lond., Ed., Dub. Strychnia.*

"Take of Nux Vomica, rasped, *four pounds;* Lime, in powder, *six ounces;* Muriatic Acid *three fluidounces;* Alcohol, Diluted Sulphuric Acid, Solution of Ammonia, Purified Animal Charcoal, Water, each, *a sufficient quantity*. Digest the Nux Vomica in two gallons of Water, acidulated with a fluidounce of the Muriatic Acid, for twenty-four hours; then boil for two hours, and strain with expression through a strong linen bag. Boil the residuum twice successively in the same quantity of acidulated Water, each time straining as before. Mix the decoctions and evaporate to the consistence of thin syrup; then add the Lime previously mixed with a pint of Water, and boil for ten minutes, frequently

stirring. Pour the mixture into a double linen bag, and, having washed the precipitate well with water, press, dry, and powder it. Treat the powder repeatedly with boiling Alcohol, until deprived of its bitterness; mix the liquors; and distil off the Alcohol by means of a water-bath. Mix the residue with Water, and, having applied heat, drop in sufficient Diluted Sulphuric Acid to neutralize and dissolve the Strychnia; then add Purified Animal Charcoal, boil for a few minutes, filter, evaporate, and crystallize. Dissolve the crystals in Water, and add sufficient Solution of Ammonia to precipitate the Strychnia. Lastly, dry the precipitate on bibulous paper." *U. S.*

The *London College* has transferred strychnia to its Materia Medica list.

"Take of Nux Vomica *one pound;* Quicklime *one ounce and a half;* Rectified Spirit *a sufficiency.* Subject the Nux Vomica for two hours to the vapour of steam, chop or slice it, dry it thoroughly in the vapour-bath, or hot air-press, and immediately grind it in a coffee-mill. Macerate it for twelve hours in two pints [Imperial measure] of water, and boil it; strain through linen or calico, and squeeze the residuum; repeat the maceration and decoction twice with a pint and a half of water. Concentrate the decoctions to the consistence of thin syrup; add the Lime in the form of milk of lime; dry the precipitate in the vapour-bath; pulverize it, and boil it with successive portions of Rectified Spirit till the Spirit ceases to acquire a bitter taste. Distil off the Spirit till the residuum be sufficiently concentrated to crystallize on cooling. Purify the crystals by repeated crystallizations." *Ed.*

"Take of Nux Vomica, in powder, *one pound* [avoirdupois]; Water *one gallon and a half;* Oil of Vitriol of Commerce *half a fluidounce;* Slaked Lime *one ounce* [avoird.]; Rectified Spirit *one quart;* Dilute Sulphuric Acid, Solution of Ammonia, of each, *a sufficient quantity;* Prepared Animal Charcoal *half an ounce* [avoird.]. Macerate the Nux Vomica for twenty-four hours with half a gallon of the Water, acidulated with two [fluid]drachms of the Acid, and, having boiled for half an hour, decant. Boil the residuum with a second half gallon of the Water, acidulated with one [fluid]drachm of the acid; decant, and repeat this process with the remaining Water and Acid, the undissolved matter being finally submitted to strong expression. The decanted and expressed liquors having been passed through a filter, and then evaporated to the consistence of a syrup, let this be boiled with the Rectified Spirit for twenty minutes, the Lime being added in successive portions during the ebullition, until the solution becomes decidedly alkaline. Filter through paper, and, having drawn off by distillation the whole of the spirit, let the residuum be dissolved in the Dilute Sulphuric Acid, and to the resulting liquid, after having been cleared by filtration, add the Solution of Ammonia in slight excess, and let the precipitate which forms be collected upon a paper filter, dried, and then dissolved in a minimum of boiling rectified spirit. Into this solution introduce the Animal Charcoal, digest for twenty minutes, then filter, and allow the residual liquor to cool, when the strychnia will separate in crystals." *Dub.*

It should be recollected that the British Imperial measure is employed by the Edinburgh and Dublin Colleges throughout these processes.

In preparing strychnia, the first step is properly to comminute the nux vomica. This may be done by rasping the seeds, or, as directed in the Edinburgh Pharmacopœia, by first softening them by steam, then slicing, drying, and grinding them. The next object is to extract the strychnia. For this purpose water is employed, acidulated in the U. S. process with muriatic acid, in the Dublin with sulphuric acid, in the Edinburgh without addition. In the last, the native igasurate of strychnia is taken up; in the first the muriate, which is a very soluble salt, and in the second the sulphate. In the U. S. and Edinburgh processes, after a concentration of the infusion, the salt of strychnia is

decomposed by lime, which precipitates the strychnia along with the excess of lime employed and impurities. The strychnia is extracted from the precipitate by boiling alcohol, and may be obtained in crystals by the concentration of the solution. But in this state it is much coloured and impure. The Edinburgh College contents itself with directing it to be purified by repeated solution in alcohol and crystallization. In the U. S. process, the impure strychnia is converted into a sulphate by the addition of sulphuric acid, and precipitated again by ammonia; being, while in the state of the sulphate, decolorized by means of animal charcoal. The Dublin College adds the rectified spirit before adding the lime, so that the separated strychnia is held in solution; then, having got rid of the insoluble impurities by filtration, it distils off the spirit, and proceeds to purify the residue by dissolving it in sulphuric acid, precipitating with ammonia, redissolving the precipitated strychnia in boiling alcohol, decolorizing by animal charcoal, and crystallizing by refrigeration. Throughout the process, the brucia contained in the nux vomica attends the strychnia, and is only left behind in the mother liquors, when the latter alkali crystallizes from the alcoholic solution upon cooling; brucia being much more soluble than strychnia in cold alcohol. It would, therefore, be better to conclude the U. S. process by one or more solutions and crystallizations in alcohol, as directed by the Edinburgh and Dublin Colleges. To free the strychnia entirely from brucia requires repeated crystallizations, and a little of the latter principle is consequently almost always retained; but the impurity is not injurious, as the effects of the two alkalies upon the system are very similar. The bean of St. Ignatius yields strychnia more easily and more largely than nux vomica, but is less plentiful.*

If thought desirable, brucia may be in great measure separated from the strychnia of the shops, by dissolving the latter in very dilute nitric acid, filtering, and concentrating to the point of crystallization. The nitrate of brucia crystallizes in short, thick, dense prisms, grouped together; the nitrate of strychnia in radiated tufts of long, light, capillary needles. By gentle agitation with water, the latter salt is suspended and may be poured off, leaving the former. The alkalies may be obtained by dissolving the salts separately in water, and precipitating with ammonia. (*Christison.*)

As usually kept in the shops, strychnia is a grayish-white powder. When rapidly crystallized from its alcoholic solution, it has the form of a white, granular powder; when slowly crystallized, that of elongated octohedra, or quadrilateral prisms with quadrilateral terminations. It is permanent in the air, inodorous, but excessively bitter, with a metallic after taste. So intense is its bitterness, that one part of it is said to communicate a sensible taste to 600,000 parts of water. It melts like a resin, but is not volatile, being decomposed at a comparatively low temperature, and entirely dissipated at a red heat. It is soluble in 6667 parts of water at 50°, and about 2000 at the boiling point. Boiling officinal alcohol dissolves it without difficulty, and deposits it upon cool-

* M. J. F. Molyn proposes, previously to the extraction of strychnia, to subject nux vomica to fermentation, by which the saccharine and gummy matters of the seeds are decomposed, and lactic acid is formed, which decomposes the igasurate of strychnia and brucia, producing with these bases very soluble lactates. For the particulars of his process, see the *Am. Journ. of Pharm.* (xix. 99).

We are informed that none of the officinal processes are followed exactly by the large manufacturers in reference to the preliminary comminution of the nux vomica. The plan most approved is to macerate the whole seeds in dilute sulphuric acid, and to pass steam through them, under pressure, in a covered vat, lined with lead. The seeds softened in this way are then ground, and the pulp lixiviated or expressed. One advantage of the sulphuric acid, employed in this way, is thought to be the conversion of the bassorin, which impedes the process, into soluble dextrin. The liquors are precipitated with lime, and the process completed as officinally directed.—*Note to the tenth edition.*

ing. In absolute alcohol and in ether it is very sparingly soluble. The volatile oils dissolve it freely. It has an alkaline reaction on test paper, and forms salts with the acids. Nitric acid does not redden it if perfectly pure, but almost always reddens it as found in the shops, in consequence of the presence of brucia. M. Eugene Marchand proposes the following test, by which a very minute proportion of strychnia may be detected. If a little of the alkali be rubbed with a few drops of concentrated sulphuric acid containing one-hundredth of nitric acid, it will be dissolved without change of colour; but if the least quantity of peroxide of lead be added to the mixture, a magnificent blue colour will be instantly developed, which will pass rapidly into violet, then gradually to red, and ultimately become yellow. (*Journ. de Pharm.*, 3e *sér.*, iv. 200.) Professor Otto recommends as a test a minute quantity of solution of bichromate of potassa, which, added to the solution of strychnia in concentrated sulphuric acid, produces a splendid violet colour. (*Am. Journ. of Pharm.*, xix. 77.) A similar change of colour is produced, according to Dr. E. W. Davy, by substituting a strong solution of ferrocyanuret of potassium for that of bichromate of potassa. (*Ibid.*, xxv. 414.) Strychnia consists of nitrogen, carbon, hydrogen, and oxygen; but the proportion of its constituents is very differently given by different authors. Liebig states the composition to be $N_2C_{44}H_{23}O_4$. The salts of strychnia are for the most part soluble and crystallizable. Their solution is decomposed by the alkalies and their carbonates, and by tannic, but not by gallic acid; and is not affected by the salts of sesquioxide of iron. Strychnia is apt to contain impurities, of which the chief, besides brucia, are colouring matter, and lime or magnesia. The Edinburgh College gives the following test of its purity. "A solution of 10 grains in 4 fluidrachms of water by means of a fluidrachm of pyroligneous acid, when decomposed by one fluidounce of concentrated solution of carbonate of soda, yields on brisk agitation a coherent mass, weighing when dry 10 grains, and entirely soluble in solution of oxalic acid."

Medical Properties and Uses, &c. The effects of strychnia upon the system are identical in character with those of nux vomica, and it is employed for the same purposes as a medicine. (See *Nux Vomica*, page 491.) It operates in the same way by whatever avenue it may enter into the circulation; but is said to act most powerfully when injected into the veins, or applied to a fresh wound. The blood of an animal under its influence produces similar effects in another if transfused into its veins. In over-doses it is a most violent poison. Pelletier and Caventou killed a dog in half a minute with one-sixth of a grain of the pure alkali. One grain or even less might prove fatal in the human subject. A case, however, is recorded in which recovery took place after seven grains had been swallowed; but the medicine was probably impure. (See *Am. Journ. of Med. Sci.*, N. S., xxx. 562.) According to M. Duclos, the poisonous effects of strychnia upon animals subside under the application of negative electricity, while they are aggravated by the positive. (See *Am. Journ. of Pharm.*, xvi. 154.) M. Boudet has found that chlorine water alternated with tartar emetic, so as to produce vomiting, obviates these effects in dogs. (*Arch. Gén.*, Feb. 1853, p. 222.) Kermes mineral has been recommended by M. Thorel as an antidote, being thought by him to form with strychnia an insoluble sulphuret, at the same time aiding any other emetic which may be administered in its expulsion. In cases of poisoning with strychnia he recommends fifteen grains of kermes and one and a half grains of tartar emetic. MM. Bouchardat and Gobley state that, out of the body, the ioduretted iodide of potassium acts far more powerfully in producing an absolutely insoluble compound. (See *Am. Journ. of Pharm.*, xxiii. 84.) Chloroform by inhalation, has been found to correct the poisonous effects of strychnia, and the same is said of camphor taken internally. The indications

are to evacuate the stomach, and to relieve the spasms by opiates or other narcotics. Different persons are very differently susceptible to its action, and some are powerfully affected by the smallest doses. Besides, being more or less impure as kept in the shops, it cannot be relied on with certainty. Hence the necessity of great caution in prescribing it, and of carefully watching the patient during its use. The best plan is always to begin with very small doses, and gradually increase till its effects are observed. From one-twelfth to one-sixth of a grain internally, and from a quarter to half a grain externally, upon a blistered surface, may be employed at first; but, if the alkali is very pure, the dose may be still further reduced with propriety. It is most conveniently administered in the form of pill. It may be given also in the saline state, which is produced by dissolving it in water acidulated with sulphuric, muriatic, nitric, or acetic acid.

Off. Prep. Strychniæ Murias. W.

STRYCHNIÆ MURIAS. *Dub. Muriate of Strychnia.*

"Take of Strychnia *one ounce* [avoirdupois]; Dilute Muriatic Acid *one fluid-ounce* or *a sufficient quantity;* Distilled Water *two* [*fluid*]*ounces and a half.* Pour the Acid upon the Strychnia, and, adding the Water, apply heat until a perfect solution is obtained. Let this cool, and let the crystals which form be dried upon bibulous paper. By evaporating the residual liquid to one-third of its bulk, and then allowing it to cool, an additional quantity of the salt will be obtained." *Dub.*

The only advantage of this preparation is that, in consequence of its solubility in water, it affords the means of administering strychnia in the dissolved state; but this end, when desired, is so easily obtained by adding a few drops of an acid to strychnia, that it seems scarcely an object of sufficient importance to call for a distinct officinal preparation, especially as the intensely bitter taste of strychnia renders its administration in the form of pill generally preferable. Perhaps, in consequence of its solubility, muriate of strychnia may be preferable to the uncombined alkaloid for application to a blistered surface, with a view to its effects on the system. W.

SULPHUR.

Preparations of Sulphur.

SULPHUR PRÆCIPITATUM. *U. S., Lond.* Lac Sulphuris. *Precipitated Sulphur. Milk of Sulphur.*

"Take of Sulphur [sublimed] *a pound;* Lime *a pound and a half;* Water *two gallons;* Muriatic Acid *a sufficient quantity.* Slake the Lime with a small portion of the Water, and, having mixed it with the Sulphur, add the remainder of the Water, boil for two or three hours, occasionally adding water so as to preserve the measure, and filter. Dilute the filtered liquor with an equal bulk of water; then drop into it sufficient Muriatic Acid to precipitate the Sulphur. Lastly, wash the precipitate repeatedly with water till the washings are tasteless, and dry it." *U. S.*

This preparation, after having been dismissed from the London Pharmacopœia of 1836, has been restored in that of 1851, being placed in the list of Materia Medica with this definition: "Sulphur precipitated from sulphuret of calcium by hydrochloric acid."

In the U. S. process two eqs. of lime react with six of sulphur, so as to form two eqs. of bisulphuret of calcium, and one of hyposulphurous acid, which latter then unites with one eq. of lime to form hyposulphite of lime. On the addition of the muriatic acid, six eqs. of sulphur are precipitated (four from the two eqs. of bisulphuret of calcium and two from the one eq. of hyposulphurous acid),

and the calcium and oxygen unite with the muriatic acid, so as to form chloride of calcium and water. This acid is the most eligible precipitant for the sulphur; as it gives rise to chloride of calcium, which is a very soluble salt, and easily washed away. Sulphuric acid is wholly inadmissible; as it generates sulphate of lime, which, from its sparing solubility, becomes necessarily intermingled with the precipitated sulphur. According to Schweitzer, the best material from which to precipitate the sulphur is the sulphuret of potassium, formed by boiling sulphur with caustic potassa. Dr. Otto, of Brunswick, finds that sulphuret of potassium is apt to contain sulphuret of copper, and therefore prefers sulphuret of calcium. (*Pharm. Cent. Blatt*, Jan. 1845.)

Properties, &c. Precipitated sulphur is in friable lumps having a white colour, with a pale yellowish-green tint, and consisting of finely divided particles, slightly cohering together. Water boiled upon it should not redden litmus. When recently prepared, it is devoid of taste, but possesses a peculiar smell. When long exposed, in a moist state, to the air, it becomes strongly contaminated with sulphuric acid. (*Annalen der Pharm.*, xx. 151.) From its colour it was formerly called *lac sulphuris*, or *milk of sulphur*. It is insoluble in water, but dissolves in a boiling solution of caustic potassa, and in oil of turpentine by the aid of heat. When of a brilliant white colour, the presence of sulphate of lime may be suspected; in which case the preparation will not be wholly volatilized by heat. If pure it communicates a harsh feel when rubbed between the fingers, owing to the friction between the crystalline particles. (*Dr. Bridges.*) We have seen a sample of so-called precipitated sulphur, which consisted almost entirely of sulphate of lime. Precipitated sulphur differs from sublimed sulphur, in being in a state of more minute division, and in presenting, after fusion, a softer and less brittle mass. Its peculiarities are supposed to depend upon the presence of water, which, however, is found in too small a quantity to constitute a regular *hydrate*. According to Rose, its white colour is occasioned by the presence of a small proportion of bisulphuretted hydrogen. Soubeiran states that it always contains some sulphuretted hydrogen, which causes it to differ as a therapeutic agent from sublimed sulphur.

Medical Properties and Uses. Precipitated sulphur possesses similar medical properties to those of sublimed sulphur. Its state of extreme division renders it more readily suspended in liquids; but its liability to become acid by keeping is an objection to it. It is sometimes selected for forming ointments, which have the advantage to the eye of being of a lighter colour than when made with sublimed sulphur. The dose is from one to three drachms. (See *Sulphur.*) B.

SULPHURIS IODIDUM. *U. S., Lond.* SULPHUR IODATUM. *Dub.* *Iodide of Sulphur. Bisulphuret of Iodine.*

"Take of Iodine *four ounces;* Sulphur *an ounce.* Rub the Iodine and Sulphur together in a glass, porcelain, or marble mortar until they are thoroughly mixed. Put the mixture into a matrass, close the orifice loosely, and apply a gentle heat so as to darken the mass without melting it. When the colour has become uniformly dark throughout, increase the heat so as to melt the Iodide; then incline the matrass in different directions, in order to return into the mass any portions of Iodine which may have condensed on the inner surface of the vessel; lastly, allow the matrass to cool, break it, and put the Iodide into bottles, which are to be well stopped." *U. S.*

"Take of Sulphur *an ounce;* Iodine *four ounces.* Put the Sulphur into a glass vessel, and place the Iodine upon it. Hold the vessel in boiling water until they unite. Then break the vessel when the Iodide has become cold, and reduce this to pieces, which are to be kept in another vessel, well stopped." *Lond.*

The *Dublin College* takes *an ounce* of its pure iodine and *two drachms* of sublimed sulphur, and proceeds as in the U. S. formula.

The U. S. and Dublin process is that of the French Codex. The combination may be conveniently effected in a Florence flask. The London formula is peculiar in directing the application of the necessary heat by means of boiling water. This is an improvement on the usual mode of proceeding; as it effectually prevents the application of too high a heat. The iodine and sulphur are taken in the same proportion in all the formulæ.

Properties, &c. Iodide of sulphur has a grayish-black colour, and radiated crystalline appearance like that of sulphuret of antimony. Its smell resembles that of iodine, and it stains the cuticle in a similar manner. It is rapidly decomposed, when in the state of powder, upon the addition of several of the volatile oils, violet vapours of iodine being evolved, and the smell of sulphur perceived. (Dr. G. W. Patterson, *Am. Journ. of Pharm.*, July, 1852, p. 203.) It is entirely volatilized by heat, and by continued boiling with water is wholly decomposed, iodine escaping with the steam, and sulphur being left nearly pure. The proportion of sulphur thus obtained is about 20 per cent. (*Lond Pharm.*) This analysis shows that the compound is a bisulphuret. Iodide of sulphur has been used by Biett, Rayer, Lugol, and others as an external application in various skin diseases, such as tinea capitis, lupus, lepra, &c., applied in the form of ointment. (See *Unguentum Sulphuris Iodidi.*)

Off. Prep. Unguentum Sulphuris Iodidi. B.

SYRUPI.

Syrups.

Syrups are concentrated solutions of sugar in watery fluids, either with or without medicinal impregnation. When the solution is made with pure water, it is named *syrup* or *simple syrup*, when with water charged with one or more medicinal agents, it is called in general terms a *medicated syrup*, and receives its particular designation from the substance or substances added.

Medicated syrups are usually prepared by incorporating sugar with vegetable infusions, decoctions, expressed juices, fermented liquors, or simple aqueous solutions. When the active matter of the vegetable is not readily soluble in water, is associated with soluble matter which it is desirable to avoid, or is volatilized or decomposed by a heat of 212°, it is sometimes extracted by diluted alcohol, the spirituous ingredient of which is subsequently driven off. Medicated syrups are also occasionally prepared by adding a tincture to simple syrup, and evaporating the alcohol. Another and better mode of effecting the same object, when aromatic or other volatile substances are concerned, is to mix the tincture with sugar in coarse powder, expose the mixture to a very gentle heat or in the sun till the alcohol has evaporated, and then prepare the syrup from the impregnated sugar by dissolving it in the requisite proportion of water. Since the introduction into use of the process of percolation or filtration by displacement, it has been applied very advantageously to the preparation of various syrups, especially of those made from vegetables of which the active principle is injured or dissipated by decoction. But, unless the operator be at once skilful and very careful, there will be great danger of imperfectly extracting the active matters, and thus making a feeble preparation. One practical rule of importance, when the liquid obtained by percolation requires concentration, is to set aside the first portions of percolated liquor, which are usually strongly impregnated, and to subject only the subsequent weaker portions to evaporation. For the mode of properly conducting this process the reader is referred to *pages* 782 and 789.

The quality and quantity of the sugar employed are points of importance. Refined sugar should always be preferred, as it often saves the necessity of clarification, and makes a clearer and better flavoured syrup than the impure kinds. The U.S. Pharmacopœia simply directs sugar, but explains that it is the purified or refined sugar which is indicated by that term. In relation to the quantity of sugar, if in too small proportion, fermentation is apt to occur; if too abundant, crystallization. The proper proportion is about two parts to one of the liquid. A somewhat smaller quantity will answer where an acid, such as lemon juice or vinegar, is used.

As it is desirable, in many instances, that the active matters should be in as concentrated a state as possible in the syrup, it is often necessary to evaporate a large proportion of the watery fluid in which they are dissolved. This may be done either before the addition of the sugar or afterwards. In either case, care is requisite not to apply a heat too great or too long continued, lest the active principles should be injured. When these are very volatile or easily decomposed by heat, it is necessary to dispense with concentration altogether. Some substances which are volatilized or decomposed at the temperature of boiling water, remain fixed and unaltered at that which is necessary for the evaporation of alcohol. These, as before observed, may be dissolved in diluted alcohol, and the concentration effected by evaporating the spirituous part of the solvent. Independently of the injury which the medicinal ingredient of the syrup may sustain, the syrup itself is apt to become brown by a long-continued application of heat, even when the degree is not excessive. It is recommended, therefore, that syrups which admit of concentration should be boiled briskly over a lively fire, so as to accomplish the object as quickly as possible. It is important to be able to ascertain positively when they have attained the due consistence. An operator skilled in their preparation can judge with sufficient accuracy by various familiar signs; such as the slowness with which the parts of a drop of syrup coalesce, when previously separated by the edge of a blunt instrument; and the receding of the last portion of each drop, when the syrup, after being cooled, is poured out drop by drop. A pellicle forming upon the surface of the syrup when it cools, indicates that it has been too much boiled. But these signs are not to be relied on except by those who have acquired much experience. The easiest method of ascertaining the proper point of concentration is by the use of that variety of Baumé's hydrometer, called a *saccharometer;* an instrument almost indispensable to the apothecary. This should stand at 30° in boiling syrup (30½ in hot weather) and at 35° in the syrup when it is cool. Another very accurate though less ready method is to ascertain the sp. gr. by weighing a portion of the liquid. Syrup when boiling should have a sp. gr. of about 1·261; when cold, about 1·319. Thomson and Duncan are mistaken in giving the proper sp. gr. of cold syrup as 1·385. We found that of a specimen of simple syrup made with two pounds and a half of sugar to a pint of water, to be 1·326 at 68° F.; and this consistence is rather too great for practical convenience in cold weather. A third method of ascertaining the proper point of concentration is by the thermometer, which, in boiling syrup of the proper consistence, stands at 221° F. This indication is founded on the fact, that the boiling point of syrup rises in proportion to the increase of its density.

When carefully prepared with the best double refined sugar, syrups usually require no other clarification than to remove any scum which may rise to their surface upon standing, and to pour them off from any dregs which may subside. But as the sugar employed is seldom free from impurities, it may be best, as a general rule, to remove the scum as it rises during the heating process, and to strain them while hot through muslin or flannel. Should they at any time want

the due degree of clearness, they may be filtered through flannel, or, when not likely to be injured by the treatment, may be clarified by means of the white of eggs or animal charcoal, as mentioned under the head of *syrupus*. But the active principles of vegetables are so apt to be absorbed by the charcoal along with impurities, that this agent should be resorted to with great caution.

The medicated syrups are liable to undergo various alterations, according to their nature and mode of preparation. The acid syrups, when too much boiled, often let fall a copious white precipitate, which is said to be a saccharine matter analogous to the sugar of grapes, produced by the reaction of the acid upon the sugar. It has been shown that, even at ordinary temperatures, acids slowly convert common sugar into the sugar of grapes, which, being less soluble than the former, is gradually deposited in the form of crystalline grains. Syrups which contain too little sugar are apt to pass into the vinous fermentation, in consequence of the presence of matters which act as a ferment. Those which contain too much deposit a portion in the crystalline state; and the crystals, attracting the sugar remaining in solution, gradually weaken the syrup, and render it liable to the same change as when originally made with too little sugar. The want of a due proportion of saccharine matter frequently also gives rise to mouldiness, when air has access to the syrup. It is said that syrups, enclosed, while they are still hot, in bottles, are apt to ferment; because the watery vapour, rising to the surface and there condensing, diminishes the proportion of sugar, so as to produce a commencement of chemical action, which gradually extends through the whole mass; but if the bottles are well shaken this result is obviated; and the syrups will generally keep better when thus treated. When syrups undergo the vinous fermentation, they become covered at the surface with froth, produced by the disengagement of carbonic acid, and acquire a vinous odour from the presence of alcohol; while their consistence is diminished by the loss of a portion of the sugar, which has been converted into that liquid. When the quantity of alcohol has increased to a certain point, the fermentation ceases or goes on more slowly, owing to the preservative influence of that principle; and, as the active ingredient of the syrup has frequently undergone no material change, the preparation may often be recovered by boiling so as to drive off the alcohol and carbonic acid, and concentrate the liquid sufficiently. A syrup thus revived is less liable afterwards to undergo change, because the principles which acted as ferments have been diminished or consumed. It is obvious that syrups which depend for their virtues upon a volatile ingredient, or one readily changeable by heat, cannot be restored to their original condition

At best, syrups are too apt to change, and various measures have been proposed for their preservation. According to Dr. Macculloch, the addition of a little sulphate of potassa or of chlorate of potassa which is tasteless, prevents their fermentation. M. Chereau has found sugar of milk effectual to the same end, in the instance of the syrup of poppies; and it may prove useful in others. The proportion which he employs is 32 parts of the sugar of milk to 1000 of the syrup. Mr. E. Durand has found that 1·3 per cent. of Hoffmann's anodyne (*Spiritus Ætheris Compositus*), added to syrups, has the property of completely arresting or preventing fermentation, probably through the agency chiefly of the oil of wine which it contains. (*Am. Journ. of Pharm.*, xiii. 185.) But the best plan is to make small quantities of syrups at a time, and to keep them, unless when wanted for immediate use, in bottles quite full and well stopped, which should be put in the cellar or other cool place.

The following general officinal directions are given in relation to syrups.

"Syrups whose density is not precisely determined by the process, should have the specific gravity 1·261 when boiling, and about 1·319 at ordinary temperatures." *U. S.*

"Let the syrups be preserved in vessels well closed, and in a place where the heat never exceeds 55°." *Lond.* It would be difficult to comply exactly with such a rule in this country. W.

SYRUPUS. *U.S., Lond.* SYRUPUS SIMPLEX. *Ed., Dub.* *Syrup. Simple Syrup.*

"Take of Sugar [refined] *two pounds and a half;* Water *a pint.* Dissolve the Sugar in the Water with the aid of heat, remove any scum which may form, and strain the solution while hot." *U. S.*

"Take of Sugar [refined] *three pounds;* Distilled Water *a pint* [Imperial measure]. Dissolve with a gentle heat." *Lond.*

"Take of Pure Sugar *ten pounds;* boiling Water *three pints* [Imperial measure]. Dissolve the Sugar in the Water with the aid of a gentle heat." *Ed.*

"Take of Refined Sugar, in powder, *five pounds* [avoirdupois]; Distilled Water *two pints* [Imp. meas.]. Dissolve the Sugar in the Water with the aid of a steam or water heat. The sp gr. of this Syrup is 1·330." *Dub.*

This syrup, when properly prepared, is inodorous, of a sweet taste without peculiar flavour, thick, viscid, nearly colourless, and perfectly transparent. If somewhat turbid, as it is apt to be when made with sugar not well refined, it may be clarified by beating the white of an egg to a froth with three or four ounces of water, mixing this with the syrup, boiling the mixture for a short time that the albumen may coagulate, and taking off the scum which rises to the surface, or separating it by filtration through paper or flannel. Two gallons of the syrup may be thus clarified. Any colour and peculiar flavor which it may possess may be removed by treating it, at the same time, with a small proportion (about 5 per cent.) of animal charcoal.

The white of egg is beaten to a froth in order that, when it coagulates, it may be rendered by the air which it contains specifically lighter than the syrup, and thus rise to the surface. If not thus treated, it floats, when coagulated, in the syrup, or sinks to the bottom. Now it is obvious that, if the syrup and albumen be heated together, the latter must be deprived of a portion of the air which it contains, before the point of coagulation is attained, and thus be rendered less disposed to rise to the surface. Guibourt, therefore, recommends that the albumen should not be added till the syrup is boiling hot, and should then be poured into it from a height, in order to increase the quantity of air entangled in it.

M. Salles, an apothecary of Clermond-Ferrand, in France, recommends that syrups which require clarification should be treated in the following manner. Allow the liquor with which the syrup is to be prepared, without previously decanting or filtering it, to become quite cold; then mix with it the white of eggs unbeaten, in the proportion of one egg for every five or six pounds (avoirdupois) of sugar employed; and, having added the sugar or honey, boil the whole for half an hour, or until a portion of the syrup upon cooling exhibits flocculi of albumen floating in a transparent medium. During the ebullition care must be taken to agitate the syrup in such a manner as to prevent the formation of foam upon its surface. When allowed to cool, the coagulated albumen with the impurities subsides, and the clear syrup floats above, and may be drawn off or decanted. In this process the albumen sinks because not incorporated with air. M. Salles calls it clarification *per descensum*, and states that it is applicable to all syrups of a density below 30° Baumé at the boiling point. (*Journ. de Pharm.*, xxiv. 490.)

Syrup is very useful in the formation of pills and mixtures, and in various other pharmaceutical operations in which sugar in solution is required.

Off. Prep. Confectio Aromatica; Confectio Catechu Composita; Confectio Opii; Confectio Scammonii; Infusum Catechu; Mistura Creasoti; Mistura

Cretæ; Pilulæ Ferri Compositæ; Syrupus Acidi Citrici; Syrupus Ferri Iodidi; Syrupus Ipecacuanhæ; Syrupus Morphiæ Acetatis; Syrupus Morphiæ Muriatis; Syrupus Rhei Aromaticus; Syrupus Tolutanus. W.

SYRUPUS ACACIÆ. *U.S. Syrup of Gum Arabic.*

"Take of Gum Arabic [in lumps] *two ounces;* Sugar [refined] *fifteen ounces;* Water *eight fluidounces.* Dissolve first the Gum in the Water without heat, then the Sugar with a gentle heat, and strain." *U. S.*

The gum should be carefully selected; and if its solution contain impurities, it should be strained before the addition of the sugar. This syrup is useful in the preparation of mixtures, pills, and troches, and is a good demulcent; but unfortunately the proportion of the gum to the sugar is too small to meet all the indications calling for the conjoint use of these two substances, and could not be much increased without endangering the stability of the preparation. W.

SYRUPUS ACETI. *Ed. Syrup of Vinegar.*

"Take of Vinegar, French in preference, *eleven fluidounces;* Pure Sugar *fourteen ounces.* Boil them together." *Ed.*

Syrup of vinegar forms with water a refrigerant and grateful drink in fevers. It may be added to barley water and other farinaceous and mucilaginous beverages and mixtures, when a vegetable acid is not contra-indicated. W.

SYRUPUS ACIDI CITRICI. *U.S., Dub. Syrup of Citric Acid.*

"Take of Citric Acid, in powder, *two drachms;* Oil of Lemons *four minims;* Syrup *two pints.* Rub the Citric Acid and Oil of Lemons with a fluidounce of the Syrup, then add the mixture to the remainder of the Syrup, and dissolve with a gentle heat." *U. S.*

"Take of Citric Acid, in powder, Distilled Water, of each, *two and a half ounces* [avoirdupois]; Tincture of Lemon Peel *five fluidrachms;* Simple Syrup *three pints* [Imperial measure]. Dissolve the Acid in the Water with the aid of heat; then add the solution and Tincture of Lemon Peel to the Syrup, and mix with agitation." *Dub.*

This is more uniform in its character, keeps better, and is more readily prepared than lemon syrup, but does not equal it in flavour, if the latter is well made. It is much employed as an agreeable and refrigerant addition to drinks, especially carbonic acid water. Tartaric acid, on account of its greater cheapness, is not unfrequently substituted for the citric; but the syrup made with it does not keep so well, and, moreover, is more apt to irritate the stomach.

Off. Prep. Liquor Magnesiæ Citratis. W.

SYRUPUS ALLII. *U.S. Syrup of Garlic.*

"Take of Fresh Garlic, sliced and bruised, *six ounces;* Diluted Acetic Acid *a pint;* Sugar [refined], in coarse powder, *two pounds.* Macerate the Garlic in ten fluidounces of the Diluted Acetic Acid, in a glass vessel, for four days, and express the liquor. Then mix the residue with what remains of the Acid, and again express until sufficient has passed to make the whole, when filtered, measure a pint. Lastly, pour the filtered liquor on the Sugar contained in a quart bottle, and agitate till it is dissolved." *U. S.*

This preparation is made upon correct principles, as vinegar is a much better solvent of the active matter of garlic than water. The syrup is given in chronic catarrhal affections of the lungs, and is particularly beneficial in infantile cases, by the stimulus which it affords to the nervous system. A teaspoonful may be given for a dose to a child a year old. W.

SYRUPUS ALTHÆÆ. *Lond., Ed. Syrup of Marshmallow.*

"Take of Marshmallow [root], sliced, *an ounce and a half;* Sugar [refined] *three pounds,* or *a sufficient quantity;* Distilled Water *a pint* [Imperial measure]; Rectified Spirit *two fluidounces and a half,* or *a sufficient quantity.* Macerate

the Marshmallow in the Water for twelve hours. Express the liquor and strain through linen. Then add a weight of the Sugar double that of the strained liquor, and dissolve with a gentle heat. Finally, when the Syrup has cooled, mix with each fluidounce of it half a fluidrachm of the Spirit." *Lond.*

"Take of Althæa Root, fresh and sliced, *eight ounces;* Boiling Water *four pints* [Imp. meas.]; Pure Sugar *two pounds and a half.* Boil the Althæa Root with the Water down to two pints; strain and express strongly through calico; let the impurities subside; and dissolve the Sugar in the clear liquor with the aid of heat." *Ed.*

This syrup made according to the directions of the former London, and of the present Edinburgh Pharmacopœia, contains a considerable quantity of starch, besides mucilage, and is very liable to ferment. The French prepare it with cold water, and thus avoid the starch; and the London College has adopted this method in the last edition of the Pharmacopœia. The syrup is simply demulcent; but is not much used in this country. W.

SYRUPUS AMYGDALÆ. *U. S.* *Syrup of Almonds.* *Syrup of Orgeat.*

"Take of Sweet Almonds *a pound;* Bitter Almonds *four ounces;* Water *three pints;* Sugar [refined] *six pounds.* Having blanched the Almonds, rub them in a mortar to a very fine paste, adding, during the trituration, three fluidounces of the Water and a pound of the Sugar. Mix the paste thoroughly with the remainder of the Water, strain with strong expression, add the remainder of the Sugar to the strained liquor, and dissolve it with the aid of a gentle heat. Strain the Syrup through fine linen, and, having allowed it to cool, put it into bottles, which must be well stopped, and kept in a cool place." *U. S.*

This process corresponds closely with that of the French Codex. Orange-flower water, however, which is an ingredient of the French preparation, is wanting in ours. It may be added to the syrup in the quantity of half a pint immediately after the sugar is dissolved.

This is an elegant syrup much employed in Europe, and occasionally in this country. It is demulcent, nutritive, and, in consequence of the hydrocyanic acid of the bitter almonds, somewhat sedative. It is said to impair greatly the odour of musk and assafetida, when mixed with them. It may be added to cough mixtures, or used for flavouring drinks in complaints of the chest. W.

SYRUPUS AURANTII CORTICIS. *U. S.* SYRUPUS AURANTII. *Lond., Ed., Dub.* *Syrup of Orange Peel.*

"Take of Orange Peel, bruised, *two ounces;* Boiling Water *a pint;* Sugar [refined] *two pounds and a half.* Macerate the Orange Peel in the Water, in a covered vessel, for twelve hours, and strain; then add the Sugar, and proceed in the manner directed for Syrup." *U. S.*

The *London College* takes *two ounces and a half* of the dried peel, *a pint* [Imperial measure] of boiling distilled water, *three pounds*, or *a sufficient quantity* of refined sugar, and *two fluidounces and a half*, or *a sufficient quantity* of rectified spirit; macerates the peel in the water for twelve hours, in a covered vessel; then expresses the liquor, and boils for ten minutes; lastly, strains, and completes the process as directed for the syrup of marshmallow. The *Edinburgh College* takes the same materials in the same quantities, excepting the spirit; infuses the peel in the water for twelve hours in a covered vessel, pours off the liquor, filters if necessary, adds the sugar, and dissolves it with the aid of heat. The *Dublin College* employs *two ounces and a half* [avoirdupois] of dried bitter orange peel, *a pint* [Imp. meas.] of boiling distilled water, and *a sufficiency* of powdered refined sugar; infuses the peel in the water for twelve hours, and strains without expression; then adds to the liquor twice its weight of sugar, and dissolves with a steam or water heat.

In the preparation of this syrup, the solution of the sugar in the infusion of orange peel should be effected with as little heat as possible, in consequence of the volatile nature of the active principle of the peel; and, to facilitate the solution, the sugar should be previously powdered.

The syrup has an agreeable flavour, for which alone it is employed. Prepared according to the U. S. process, it is apt to ferment in warm weather. To obviate this result, a syrup may be made by adding a fluidounce of the tincture of orange peel to a pint of simple syrup. This preparation is little inferior to the officinal, though the presence of the spirit may in some instances be objectionable. Professor Procter proposes to prepare the syrup in the following manner. Two ounces of recently dried sweet orange peel, in powder, is subjected to percolation with a mixture of two parts of alcohol and one of water until six fluidounces are obtained; the tincture is mixed with about two and a half pounds of sugar, in coarse powder, which is then spread on paper until the alcohol has evaporated; and, finally, the sugar thus prepared is dissolved in a pint of water at a boiling heat. (*Am. Journ. of Pharm.*, xix. 97.)

Off. Prep. Confectio Aromatica. W.

SYRUPUS COCCI. *Lond.* *Syrup of Cochineal.*

"Take of Cochineal, bruised, *four scruples;* boiling Distilled Water *a pint* [Imperial measure]; Sugar [refined] *three pounds*, or *a sufficient quantity;* Rectified Spirit *two fluidounces and a half*, or *a sufficient quantity.* Boil the Cochineal in the Water for fifteen minutes, in a covered vessel, occasionally stirring, then strain and complete the preparation as directed for Syrup of Marshmallow." *Lond.* (See *Syrupus Althææ.*)

This syrup is used chiefly for imparting colour to mixtures. W.

SYRUPUS CROCI. *Lond.*, *Ed.*, *Dub.* *Syrup of Saffron.*

"Take of Saffron *five drachms;* boiling Distilled Water *a pint* [Imperial measure]; Sugar [refined] *three pounds*, or *a sufficient quantity;* Rectified Spirit *two fluidounces and a half*, or *a sufficient quantity.* Macerate the Saffron in the Water for twelve hours, in a covered vessel; then strain the liquor, and finish in the manner directed for Syrup of Marshmallow." *Lond.* (See *Syrupus Althææ.*)

The *Edinburgh College* takes *ten drachms* of saffron, an *Imperial pint* of boiling water, and *three pounds* of sugar, and proceeds in the manner directed for syrup of orange peel. The *Dublin College* infuses *half an ounce* [avoirdupois] of saffron for twelve hours in *a pint* [Imp. meas.] of boiling distilled water, boils for five minutes, strains with expression through calico, sets aside to settle, decants the clear liquor, adds twice its weight of sugar, and dissolves with a steam or water heat.

This is slightly stimulant, but is valued chiefly for its fine colour.

Off. Prep. Confectio Sulphuris. W.

SYRUPUS HEMIDESMI. *Dub.* *Syrup of Indian Sarsaparilla.*

"Take of Indian Sarsaparilla, bruised, *four ounces* [avoirdupois]; Boiling Distilled Water *one pint* [Imperial measure]; Refined Sugar, in powder, *as much as is sufficient.* Infuse the Sarsaparilla in the Water for four hours, in a covered vessel, and strain; set it by until the sediment subsides, then decant the clear liquor, and, having added to it twice its weight of sugar, dissolve with the aid of a steam or water heat." *Dub.*

This is a very weak preparation, and may be taken almost ad libitum. (See *Hemidesmus.*) W.

SYRUPUS IPECACUANHÆ. *U. S.*, *Ed.* *Syrup of Ipecacuanha.*

"Take of Ipecacuanha, in coarse powder, *an ounce;* Diluted Alcohol *a pint;* Sugar *two pounds and a half;* Water *a sufficient quantity.* Macerate the Ipecacuanha in the Alcohol for fourteen days, and filter. Evaporate the filtered

liquor to six fluidounces, again filter, and add sufficient Water to make the liquid measure a pint. Lastly, add the Sugar, and proceed in the manner directed for Syrup.

"Syrup of Ipecacuanha may also be prepared by putting the Ipecacuanha, previously moistened with Diluted Alcohol, into a percolator; pouring upon it gradually Diluted Alcohol until a pint of filtered liquor is obtained; then evaporating to six fluidounces, and completing the process as above directed." *U. S.*

"Take of Ipecacuanha, in coarse powder, *four ounces;* Rectified Spirit *one pint* [Imperial measure]; Proof Spirit and Water, of each, *fourteen fluidounces;* Syrup *seven pints.* Digest the Ipecacuanha in fifteen fluidounces of the Rectified Spirit at a gentle heat for twenty-four hours; strain, squeeze the residuum, and filter. Repeat this process with the residuum and Proof Spirit, and again with the Water. Unite the fluids, and distil off the Spirit, till the residuum amount to twelve ounces; add to the residuum five fluidounces of the Rectified Spirit, and then the Syrup." *Ed.*

By the U. S. process, a tincture of ipecacuanha is first formed with diluted alcohol, then reduced by evaporation so as to drive off the alcohol, and afterwards diluted with water and made into a syrup with sugar. The alternative of preparing the tincture by maceration or percolation is allowed; but the latter mode should be resorted to only by those experienced in the process. The French Codex dissolves the alcoholic extract of ipecacuanha in water, and then mixes it with syrup; but it is obvious that the U. S. process is preferable, as it spares the continued heat requisite to reduce the tincture to dryness. The Edinburgh process is unnecessarily complex; and the addition of the rectified spirit to the syrup, if thought necessary for its preservation, might have been dispensed with, had the direction been given to concentrate the syrup.

Mr. Laidley, of Richmond, Va., having found this syrup as ordinarily made to spoil by keeping, recommends the preparation of a fluid extract from the root by means of alcohol, and the addition of this to simple syrup in such proportion as to have the due officinal strength. It is probably owing to the substances extracted by the water of the diluted alcohol employed in the officinal process, that the syrup is liable to change. (*Am. Journ. of Pharm.*, xxvi. 103.)

This syrup is chiefly applicable to the cases of children. One fluidounce of it, prepared according to the U. S. formula, should contain the virtues of fifteen grains of ipecacuanha. The dose of it, as an emetic, is for an adult from one to two fluidounces, for a child a year or two old, from one to two fluidrachms, repeated every fifteen or twenty minutes till it acts. As an expectorant, the dose for an adult is one or two fluidrachms, for a child from five to twenty minims. The Edinburgh syrup is somewhat, but not materially weaker. W.

SYRUPUS KRAMERIÆ. *U. S.* *Syrup of Rhatany.*

"Take of Rhatany, in coarse powder, *a pound;* Sugar [refined] *two pounds and a half;* Water *a sufficient quantity.* Mix the Rhatany with a pint of Water, and, having allowed the mixture to stand for twenty-four hours, introduce it into a percolator, and gradually pour Water upon it, until four pints of filtered liquor are obtained. Evaporate this, by means of a water-bath, to seventeen fluidounces; then add the Sugar, and proceed in the manner directed for Syrup. This Syrup may also be prepared in the following manner.

"Take of Extract of Rhatany *two ounces;* Water *a pint;* Sugar *two pounds and a half.* Dissolve the extract in the Water and filter; then add the Sugar, and proceed in the manner directed for Syrup." *U. S.*

As rhatany yields a variable proportion of extract, it follows that the syrup resulting from these two modes of preparation must differ. To obviate this evil as far as possible, care should be taken, in following the first process, to select

the best rhatany, and preferably the small roots, as it is these only which will yield two ounces of good extract to the pound.

In the second process extract of rhatany as free as possible from insoluble matter should be chosen; and that prepared according to the U. S. directions will be found the best. (See *Extractum Krameriæ.*) This preparation affords a convenient mode of exhibiting rhatany to infants. The dose for an adult is half a fluidounce, for a child a year or two old, twenty or thirty minims. W.

SYRUPUS LIMONIS. *U. S.* SYRUPUS LIMONUM. *Lond., Ed.* *Lemon Syrup.*

"Take of Lemon-juice, strained, *a pint;* Sugar [refined] *two pounds.* Add the Sugar to the Juice, and proceed in the manner directed for Syrup." *U. S.*

"Take of Juice of Lemons, strained, *a pint* [Imp. meas.]; Sugar [refined] *two pounds and a half;* Rectified Spirit *two fluidounces and a half.* Boil the Juice for ten minutes, and strain. Add the Sugar, and dissolve. Lastly, when the Syrup has cooled, mix the Spirit with it." *Lond.*

"Take of Lemon-juice, freed from impurities by subsidence and filtration, *a pint* [Imp. meas.]; Sugar [refined] *two pounds and a half.* Dissolve the Sugar in the Lemon-juice with the aid of a gentle heat, and after twenty-four hours' rest remove the scum, and pour the clear liquor from the dregs." *Ed.*

This syrup forms a cooling and grateful addition to beverages in febrile complaints, and serves to conceal the taste of saline purgatives in solution. W.

SYRUPUS MORI. *Lond.* *Syrup of Mulberries.*

"Take of Mulberry Juice, strained, *a pint* [Imperial measure]; Sugar [refined] *two pounds and a half;* Rectified Spirit *two fluidounces and a half.* Dissolve the Sugar in the Mulberry Juice, with a gentle heat, and set aside for twenty-four hours; then remove the scum, and pour off the clear liquor from the dregs, if there be any. Lastly, mix the Spirit with it." *Lond.*

This may be used for the same purposes with lemon syrup. In like manner syrups may be prepared from various succulent fruits, such as *strawberries, raspberries, blackberries, currants, pineapples, &c.* When the juice is thick, it may be diluted with from one-third of its bulk to an equal bulk of water, previously to the addition of the sugar. In the preparation of *raspberry syrup,* which, as ordinarily made, is apt to gelatinize, M. Blondeau recommends that the strained juice be allowed to stand from eight to fifteen hours, according to the temperature, in order to ferment. The juice separates into two portions, the upper thick, the lower clear. The latter is to be separated by straining, and made into a syrup with the usual proportion of sugar. The new process of the London College for Syrupus Mori is in accordance with this recommendation. These syrups are employed to flavour drinks, and are much used as grateful additions to carbonic acid water.* W.

* Some practical remarks in relation to these syrups, so much used with artificial mineral water, may prove useful to the inexperienced pharmaceutist. Care should be taken that the fruit employed should be fully ripe, and freed from all its natural attachments, as calyx, stem, &c., and from all other impurities. Without being previously crushed, it should be put into canvass or woollen bags, which should be about two-thirds full when placed under the press. The expressing force should be gradually increased, so as effectually to remove the juice with as little of the tissue of the fruit as possible. It is customary to make a pint of syrup from a pint measure of fruit, and, if the expressed juice is insufficient for the purpose, to dilute it with water; but this is obviously an arbitrary rule which cannot be universally applied without injuriously affecting the character of the product. The rule in the text is better; viz., to dilute the juice when too thick. In dissolving the sugar, as short an exposure to heat as possible is desirable. Some dissolve the sugar in a portion of the juice with heat, and add the remainder a few minutes before removal from the fire. Some fruits contain so much pectin that their syrups are apt to gelatinize. This is particularly the case with currants and raspberries. A mode of preventing this result has been mentioned in the text. Another method is to add to the juice

SYRUPUS MORPHIÆ ACETATIS. *Dub. Syrup of Acetate of Morphia.*

"Take of Solution of Acetate of Morphia *one fluidounce;* Simple Syrup *fifteen fluidounces.* Mix with agitation." *Dub.*

SYRUPUS MORPHIÆ MURIATIS. *Dub. Syrup of Muriate of Morphia.*

"Take of Solution of Muriate of Morphia *one fluidounce;* Simple Syrup *seventeen fluidounces.* Mix with agitation." *Dub.*

These are mere sweetened solutions of the respective salts of morphia, and were probably intended to take the place of the syrup of poppies, omitted by the Dublin College in its Pharmacopœia of 1850. About four fluidounces of the syrups contain a grain of the respective salts. The full dose, therefore, for an adult would be from half a fluidounce to a fluidounce; for a child two years old, half a fluidrachm to a fluidrachm. W.

SYRUPUS PAPAVERIS. *Lond., Ed. Syrup of Poppies.*

"Take of Poppy [capsules], bruised and without seeds, *three pounds;* Sugar [refined] *five pounds;* boiling Distilled Water *five gallons* [Imperial measure]; Rectified Spirit *five fluidounces.* Boil down the Capsules in the Water to two gallons, and press strongly. Boil down the strained liquor again to four pints, and strain it while hot. Set it by for twelve hours, that the dregs may subside; then boil down the clear liquor to two pints; in this dissolve the sugar; lastly, mix in the spirit." *Lond.*

"Take of Poppy-heads, without the seeds, *one pound and a half;* boiling Water *fifteen pints* [Imperial measure]; Pure Sugar *three pounds.* Slice the Poppy-heads, infuse them in the water for twelve hours, boil down to five pints, strain, and express strongly through calico, boil again down to two pints and a half; then add the Sugar, and dissolve it with the aid of heat." *Ed.*

As the capsules contain variable proportions of the narcotic principle, the syrup prepared from them is necessarily of variable strength. It is, moreover, very apt to spoil. Its place might, with great propriety, be supplied by a syrup prepared from one of the salts of morphia, which would keep well, and have the advantage of uniform strength. Four grains of the sulphate of morphia dissolved in a pint of syrup, would afford a preparation at least equal to the average strength of the syrup of poppies, and much more certain in its operation. Mr. Southall recommends that the syrup of poppies should be prepared with a cold infusion made by percolation; the same proportions being employed as directed by the London Pharmacopœia. The virtues of the capsules are thus extracted without those principles which cause the syrup to ferment speedily. (See *Am. Journ. of Pharm.*, xv. 140.) Mr. Southall after preparing the infusion evaporates it to the proper measure before adding the sugar. Mr. Stocken prefers adding the sugar before the concentration is completed, and afterwards evaporating to 32° of the saccharometer. (*Pharm. Journ. and Trans.*, xi. 299.) It is probable that a syrup prepared with diluted alcohol as the menstruum would keep better than that made on either of the above plans.

The syrup of poppies is employed, chiefly in infantile cases, to allay cough,

after expression one-tenth of its bulk of the juice of sour cherries, allow the mixture to stand for fifteen hours, and then separate the coagulated pectin by very gentle pressure in a cloth. *Pineapple* syrup may be made either in the ordinary mode, or by slicing the fruit, alternating the slices with layers of powdered sugar, permitting them to stand twenty-four hours, and then expressing the syrup formed. Each pound of the pared fruit, with thirty ounces of sugar, should yield with the requisite quantity of water two pints of syrup. For some further practical remarks on the preparation of particular syrups, the reader is referred to a paper by Mr. Ambrose Smith in the *American Journal of Pharmacy* (xxii. 212).—*Note to the ninth edition.*

quiet restlessness, relieve pain, and promote sleep. The dose is from half a fluidrachm to a fluidrachm for an infant, from half a fluidounce to a fluidounce for an adult. W.

SYRUPUS PRUNI VIRGINIANÆ. *U. S.* *Syrup of Wild-cherry Bark.*

"Take of Wild-cherry Bark, in coarse powder, *five ounces;* Sugar [refined] *two pounds;* Water *a sufficient quantity.* Moisten the Bark thoroughly with Water, let it stand for twenty-four hours in a close vessel, then transfer it to a percolator, and pour Water upon it gradually until a pint of filtered liquor is obtained. To this add the Sugar, in a bottle, and agitate occasionally until it is dissolved." *U. S.*

This process affords a handsome syrup with the virtues of the bark unimpaired by the injurious effects of heat. It is based upon a formula proposed by Messrs. Procter and Turnpenny in the *American Journal of Pharmacy* (xiv. 27). The dose is half a fluidounce. W.

SYRUPUS RHAMNI. *Lond., Ed.* *Syrup of Buckthorn.*

"Take of Juice of Buckthorn [berries] *four pints* [Imperial measure]; Ginger, sliced, Pimento, in powder, each, *six drachms;* Sugar [refined] *four pounds;* Rectified Spirit *six fluidounces.* Set by the Juice for three days that the dregs may subside, and then strain it. To a pint of the clear Juice add the Ginger and Pimento; then macerate for four hours with a gentle heat, and strain. Boil down the remainder of the Juice to a pint and a half. Mix the liquors, and dissolve the Sugar in them. Finally, mix in the Spirit." *Lond.*

The *Edinburgh* process is the same as the above, omitting the spirit.

The syrup of buckthorn is a brisk cathartic, but, having an unpleasant taste, and being apt to gripe violently, is seldom employed. In Europe it is used occasionally with other medicines in cathartic and diuretic mixtures. The dose is from half a fluidounce to a fluidounce. The patient should drink freely of thin gruel, or other demulcent beverage, during its operation. W.

SYRUPUS RHEI. *U. S.* *Syrup of Rhubarb.*

"Take of Rhubarb, in coarse powder, *two ounces;* Alcohol *half a pint;* Water *a pint and a half;* Sugar [refined] *two pounds.* Mix the Alcohol and Water, pour four fluidounces of the liquid on the Rhubarb previously mixed with an equal bulk of sand, and allow the whole to stand four hours; then transfer the mass to a percolator, and gradually pour upon it the remainder of the mixed Alcohol and Water. When the liquor has ceased to pass, evaporate it by means of a water-bath to thirteen fluidounces, and, having added the Sugar, proceed in the manner directed for Syrup." *U. S.*

This is a mild cathartic, adapted to the cases of infants, to whom it may be given in the dose of one or two fluidrachms. W.

SYRUPUS RHEI AROMATICUS. *U. S.* *Aromatic Syrup of Rhubarb.*

"Take of Rhubarb, bruised, *two ounces and a half;* Cloves, bruised, Cinnamon, bruised, each, *half an ounce;* Nutmeg, bruised, *two drachms;* Diluted Alcohol *two pints;* Syrup *six pints.* Macerate the Rhubarb and Aromatics in the Diluted Alcohol for fourteen days, and strain; then, by means of a water-bath, evaporate the liquor to a pint, and, while it is still hot, mix it with the Syrup previously heated.

"Aromatic Syrup of Rhubarb may also be prepared by putting the Rhubarb and Aromatics, previously reduced to coarse powder and moistened with Diluted Alcohol, into an apparatus for displacement; pouring upon them gradually Diluted Alcohol until two pints of filtered liquor are obtained; then evaporating to a pint, and completing the process as above directed." *U. S.*

Of these two modes of proceeding, the first should always be preferred by those not experienced in conducting the process of filtration by displacement. In preparing the syrup, the apothecary should be careful to employ aromatics of the best quality, and to effect the evaporation of the tincture, according to the officinal direction, by means of a water-bath.

The aromatic syrup of rhubarb is a warm stomachic laxative, too feeble for adult cases, but well calculated for the bowel-complaints of infants, which are so frequent in our cities during the summer season, and as a remedy for which this preparation, or one analogous to it, has been long in use under the name of *spiced syrup of rhubarb.* The dose for an infant with diarrhœa is a fluidrachm, repeated every two hours till the passages indicate by their colour that the medicine has operated. W.

SYRUPUS RHŒADOS. *Lond., Ed. Syrup of Red Poppy.*

"Take of Red Poppy [petals] *a pound;* boiling Water *a pint* [Imperial measure]; Sugar [refined] *three pounds,* or *a sufficient quantity;* Rectified Spirit *two fluidounces and a half,* or *a sufficient quantity.* To the Water heated by a water-bath, gradually add the Petals, occasionally stirring; then, having removed the vessel, macerate for twelve hours; express the liquor with the hand, and strain, and complete the process as directed for Syrup of Marshmallow." *Lond.* (See *Syrupus Althææ.*)

The *Edinburgh* process differs from the London only in using *two pounds and a half* of sugar, and not using rectified spirit.

The object of introducing the petals into water heated by a water-bath is that they may shrink by being scalded, as otherwise they could not be completely immersed in the quantity of water directed. After this has been accomplished, they should be immediately removed from the fire, lest the liquor should become too thick and ropy. The fine red colour of this syrup is its only recommendation. It has no medical virtues, and is very liable to ferment. W.

SYRUPUS ROSÆ. *Lond.* SYRUPUS ROSÆ CENTIFOLIÆ. *Ed. Syrup of Roses.*

"Take of Hundred-leaved Roses *seven ounces;* Sugar [refined] *six pounds;* boiling Distilled Water *three pints* [Imperial measure]; Rectified Spirit *five fluidounces and a half.* Macerate the Roses in the Water for twelve hours, and strain. Evaporate the strained liquor, by means of a water-bath, to two pints; in this dissolve the Sugar. Lastly, mix in the Spirit." *Lond.*

"Take of fresh Damask-rose Petals *one pound;* boiling Water *three pints* [Imp. meas.]; Pure Sugar *three pounds.* Infuse the Petals in the Water for twelve hours, strain the liquor, and dissolve the Sugar in it with the aid of heat." *Ed.*

This syrup is gently laxative, and, on account of its mildness, may be given with advantage to infants and persons of delicate habit. It is without the fragrance of the rose; but has a reddish colour which is rendered bright red by acids, and green or yellow by alkalies. The dose is from two fluidrachms to one or two fluidounces.

Off. Prep. Confectio Cassiæ; Confectio Scammonii. W.

SYRUPUS ROSÆ GALLICÆ. *Ed., Dub. Syrup of Red Roses.*

"Take of dried Red-rose Petals *two ounces;* boiling Water *one pint;* Pure Sugar *twenty ounces.* Proceed as for the Syrup of Damask-rose." *Ed.*

The *Dublin College* boils *two ounces* [avoirdupois] of the dried petals in *a pint* [Imperial measure] of boiling distilled water, in a glass or porcelain vessel, until their colour is completely extracted; strains with expression, and allows the decoction to settle; then, having decanted the supernatant liquor, adds to it twice its weight of sugar, and dissolves with a steam or water heat.

The syrup of red roses is mildly astringent; but is valued more for its fine red colour, on account of which it is occasionally added to mixtures.

Off. Prep. Electuarium Catechu. W.

SYRUPUS SARSÆ. *Lond.* SYRUPUS SARZÆ. *Ed.* *Syrup of Sarsaparilla.*

"Take of Sarsaparilla *three pounds and a half;* Distilled Water *three gallons* [Imperial measure]; Sugar [refined] *eighteen ounces;* Rectified Spirit *two fluid-ounces.* Boil the Sarsaparilla with two gallons of the Water to a gallon; pour off the liquor, and strain it while hot. Again boil the Sarsaparilla with the rest of the Water to one-half, and strain. Mix the liquors, evaporate to two pints, and in these dissolve the Sugar. Lastly, when they have cooled, mix in the Spirit." *Lond.*

The *Edinburgh College* infuses *fifteen ounces* of the sarsaparilla in *a gallon* [Imp. meas.] of boiling water for twenty-four hours; boils down to four pints, and strains the liquor while hot; and, lastly, adds *fifteen ounces* of pure sugar, and evaporates to the consistence of syrup.

This syrup is necessarily a weak if not inert preparation; the virtues of sarsaparilla being only partially extracted by water, at least by the quantity ordinarily employed, and being injured or destroyed by long boiling. It is scarcely used in this country, our own compound syrup being preferred. W.

SYRUPUS SARSAPARILLÆ COMPOSITUS. *U. S.* *Compound Syrup of Sarsaparilla.*

"Take of Sarsaparilla, bruised, *two pounds;* Guaiacum Wood, rasped, *three ounces;* Hundred-leaved Roses, Senna, Liquorice Root, bruised, each, *two ounces;* Oil of Sassafras, Oil of Anise, each, *five minims;* Oil of Partridgeberry *three minims;* Diluted Alcohol *ten pints;* Sugar [refined] *eight pounds.* Macerate the Sarsaparilla, Guaiacum Wood, Roses, Senna, and Liquorice Root in the Diluted Alcohol for fourteen days; then express and filter. Evaporate the tincture by means of a water-bath to four pints, filter, add the Sugar, and proceed in the manner directed for Syrup. Lastly, having rubbed the Oils with a small quantity of the Syrup, mix them thoroughly with the remainder.

"Compound Syrup of Sarsaparilla may also be prepared by mixing the solid materials, excepting the Sugar, in coarse powder, with three pints of Diluted Alcohol, allowing the mixture to stand for twenty-four hours, then transferring it to a percolator, gradually pouring upon it Diluted Alcohol until ten pints have passed, and proceeding with the tincture as in the above process." *U. S.*

In the original edition of the U. S. Pharmacopœia published in 1820, a process for a syrup of sarsaparilla was adopted, intended to represent the famous French *sirop de Cuisinier.* This was very much improved in the revised edition published in 1830; and the amended process has been retained with little alteration in the subsequent editions, being the first of the two quoted above. In the original process, the sarsaparilla was subjected to long decoction with water. Now it has been proved that diluted alcohol more thoroughly extracts the acrid principle of the root, upon which its activity probably depends, than water, and that this principle is either dissipated or destroyed by the long-continued application of a boiling heat.* In the present formula, therefore, which employs diluted alcohol as the menstruum, the root is more completely exhausted of its active matter; while the heat applied to the concentration, being no higher than is requisite for the evaporation of the alcohol, is insufficient to injure the pre-

* See a paper by J. Hancock, M. D., republished in the *Journ. of the Phil. Col. of Pharm.* (i. 295); a communication by M. Béral to the *Journal de Pharmacie* (xv. 657); another by M. Soubeiran in the same Journal (xvi. 38); and a paper by T. J. Husband in the *American Journ. of Pharm.* (xv. 6).

paration. The spirituous menstruum has, moreover, the advantage of not dissolving the inert fecula, which encumbers the syrup prepared by decoction, and renders it liable to spoil. In the Pharmacopœia of 1840, the pale or hundred-leaved roses were very properly substituted for the red; as their slightly laxative property accords better with the character of the preparation. The operator should be careful to comply exactly with the directions of the Pharmacopœia in relation to the period of maceration, and the use of the water-bath. The essential oils, being intended solely to communicate an agreeable flavour, are used in very small proportion. The only objection to this process is that a portion of the resin, extracted by the alcohol from the guaiacum wood, is deposited during the evaporation of the tincture; but this is separated by the filtration directed, and is therefore of no disadvantage to the preparation.

The second process above quoted differs from the first only in preparing the tincture for evaporation by percolation instead of maceration, having been very properly substituted, at the last revision of the Pharmacopœia, for the process by percolation in the edition of 1840, in which water was employed as the menstruum, and which was found to yield a syrup having less of the sensible properties of the root than that made with diluted alcohol.* But the practitioner should be aware that much of the sarsaparilla as it exists in the market is nearly or quite inert, and should be prepared to meet with disappointment in the use of this or any other preparation, unless satisfied of the good quality of the drug from which it is made.

Corrosive sublimate, which is often given in connexion with this syrup, is said to be completely decomposed by it, being converted into calomel. M. Lepage, of Gisors, proposes as a substitute the iodohydrargyrate of potassium (see *Appendix*), which he has found not to undergo decomposition. (*Journ. de Pharm.*, 3*e sér.*, viii. 63.)

The dose of the syrup is half a fluidounce, equivalent to somewhat less than a drachm of the root, to be taken three or four times a day. W.

SYRUPUS SCILLÆ. *U.S.*, *Ed.*, *Dub.* *Syrup of Squill.*

"Take of Vinegar of Squill *a pint;* Sugar [refined] *two pounds.* Add the Sugar to the Vinegar of Squill, and proceed in the manner directed for Syrup." *U. S.*

"Take of Vinegar of Squill *three pints;* Pure Sugar, in powder, *seven pounds.* Dissolve the Sugar in the Vinegar of Squill, with the aid of a gentle heat and agitation." *Ed.*

"Take of Vinegar of Squill *eight fluidounces;* Refined Sugar, in powder, *one pound* [avoirdupois]. Dissolve the Sugar in the Vinegar of Squill with the aid of a steam or water heat." *Dub.*

This syrup is much employed as an expectorant, especially in combination with a solution of tartarized antimony. The dose is about a fluidrachm. In infantile cases of catarrh and other pectoral complaints, it is sometimes given in the same dose as an emetic. W.

SYRUPUS SCILLÆ COMPOSITUS. *U.S.* *Compound Syrup of Squill.* *Hive-syrup.*

"Take of Squill, bruised, Seneka, bruised, each, *four ounces;* Tartrate of Antimony and Potassa *forty-eight grains;* Water *four pints;* Sugar [refined] *three pounds and a half.* Pour the Water upon the Squill and Seneka, and, having

* By an unfortunate error of the press in the edition of the Pharmacopœia for 1850, in a few of the earlier sold volumes, the word *two* was substituted for *ten* in the seventh line of the second process. This was corrected as soon as discovered, and in by far the greater number of copies the sentence is properly printed. The mistake is here referred to, in order to guard as far as possible against any embarrassment in the execution of the process, by those who may have the uncorrected volume.

boiled to one-half, strain, and add the Sugar; then evaporate to three pints, and, while the Syrup is still hot, dissolve in it the Tartrate of Antimony and Potassa.

"Compound Syrup of Squill may be advantageously prepared in the following manner by those familiar with the process of displacement.

"Take of Squill, in coarse powder, Seneka, in coarse powder, each, *four ounces;* Tartrate of Antimony and Potassa *forty-eight grains;* Alcohol *half a pint;* Water *a sufficient quantity;* Sugar *three pounds and a half.* Mix the Alcohol with two pints and a half of Water, and macerate the Squill and Seneka in the mixture for twenty-four hours. Put the whole into a percolator, and add as much Water as may be necessary to make the filtered liquor amount to three pints. Boil the liquor for a few minutes, evaporate to one-half, and strain; then add the Sugar, and evaporate until the resulting Syrup measures three pints. Lastly, dissolve the Tartrate of Antimony and Potassa in the Syrup, while it is still hot." *U. S.*

This is intended as a substitute for that very popular preparation called *Coxe's hive-syrup*, from which it differs chiefly in containing sugar instead of honey. Prepared as originally directed in the Pharmacopœia, it invariably fermented from the want of sufficient concentration. This defect was corrected at the revision of 1840, when also sugar was substituted for honey, in consequence of the uncertain consistence and constitution of the latter. It will be observed that two formulæ are given above; in the first of which the virtues of the squill and seneka are extracted by long boiling with water, in the second, by percolation with water to which a small portion of alcohol has been added. Either of them will furnish an efficient product; but the latter is preferable when skilfully performed; as it avoids in great measure the injurious influence of boiling upon the seneka, exhausts both this and the squill more readily in consequence of the addition of alcohol to the menstruum, and affords a solution of their active principles less embarrassed with inert matters calculated to favour fermentation. In this process, the filtered liquor is raised to the boiling point in order to coagulate the albumen, after which the evaporation should be conducted at a lower temperature. Mr. Laidley, of Richmond, Va., suggests that the liquor be strained immediately after the short boiling, and before the evaporation; as, if the albumen be retained in the concentrated liquor, this becomes so thick as to render filtering difficult. He also suggests that, instead of following the officinal processes, a fluid extract should be prepared from the materials with alcohol, and incorporated with simple syrup. (*Am. Journ. of Pharm.*, xxvi. 104.)*

The compound syrup of squill combines the virtues of seneka, squill, and tartar emetic, of the last of which it contains one grain in every fluidounce. It is emetic, diaphoretic, expectorant, and frequently cathartic, and may be given with advantage in mild cases of croup, in the latter stages of severe cases when the object is to promote expectoration, and in other pectoral affections in which the same indication is presented. As an emetic in inflammatory croup and infantile catarrh, we decidedly prefer a simple solution of tartar emetic in water. The dose of the compound syrup of squill is, for children, from ten drops to a fluidrachm, according to the age, and should be repeated in cases of croup every

* In the Pharmacopœia of 1830, this preparation was named *Mel Scillæ Compositum*, or compound honey of squill. The following was the officinal process: "Take of Squill, bruised, Seneka, bruised, each, *four ounces;* Tartrate of Antimony and Potassa *forty-eight grains;* Clarified Honey *two pounds.* Pour the Distilled Water upon the Squill and Seneka, and boil to one-half; strain, and add the Clarified Honey; then boil down to three pints, in which dissolve the Tartrate of Antimony and Potassa." The preparation thus made was insufficiently concentrated, measuring only 20½° Baumé, instead of 30°, which is the proper standard of density for syrup. It therefore speedily fermented. By boiling, however, down to two pints instead of three, it will have the proper consistence, and will keep much better. But in this case only 32 grains of tartar emetic should be added, so that there may still be one grain of the antimonial to each fluidounce of the syrup.

fifteen or twenty minutes till it vomits. As an expectorant for adults the dose is twenty or thirty drops. W.

SYRUPUS SENEGÆ. *U. S. Syrup of Seneka.*

"Take of Seneka, bruised, *four ounces;* Water *a pint;* Sugar [refined] *a pound.* Boil the Water with the Seneka to one half, and strain; then add the Sugar, and proceed in the manner directed for Syrup. Syrup of Seneka may also be prepared in the following manner.

"Take of Seneka, in coarse powder, *four ounces;* Alcohol *half a pint;* Water *a pint and a half;* Sugar [refined] *fifteen ounces.* Mix the Alcohol and Water, pour half a pint of the liquid on the Seneka, and allow the mixture to stand for twelve hours; then transfer it to a percolator, and gradually pour upon it the remainder of the menstruum. When the liquor has ceased to pass, evaporate it by means of a water-bath to half a pint, filter, and, having added the Sugar, proceed in the manner directed for Syrup." *U. S.*

The latter of these processes is preferable for an experienced operator, as it avoids the injury to the seneka resulting from long boiling, and has, moreover, the advantage of the solvent power of the alcohol added; but they who are not practically acquainted with the process of percolation should employ the former.

This is an active preparation, and affords a very convenient mode of exhibiting seneka in pectoral complaints. It may be given as a stimulant expectorant in the dose of one or two fluidrachms. W.

SYRUPUS SENNÆ. *U. S., Lond., Ed. Syrup of Senna.*

"Take of Senna *two ounces;* Fennel-seed, bruised, *an ounce;* Boiling Water *a pint;* Sugar [refined] *fifteen ounces.* Digest the Senna and Fennel-seed in the Water, with a gentle heat, for an hour; then strain, add the Sugar, and evaporate to the proper consistence." *U. S.*

"Take of Senna *three ounces and a half;* Fennel [seeds], bruised, *ten drachms;* Manna *three ounces;* boiling Distilled Water *a pint* [Imp. measure]; Molasses *three pounds.* Macerate the Senna and Fennel in the Water with a gentle heat for six hours; strongly express the liquor through linen, filter, and mix the Manna with it. Evaporate the Molasses by means of a water-bath, until a portion removed from the bath barely concretes; and to the same while yet hot add the liquor, constantly stirring, until they are mixed." *Lond.*

"Take of Senna *four ounces;* boiling Water *one pint and four fluidounces* [Imperial measure]; Treacle *forty-eight ounces.* Infuse the Senna in the Water for twelve hours; strain and express strongly through calico, so as to obtain a pint and two fluidounces at least of liquid. Concentrate the Treacle in the vapour-bath as far as possible, or till a little taken out upon a rod becomes nearly concrete on cooling; and, while the Treacle is still hot, add the infusion, stirring carefully, and removing the vessel from the vapour-bath as soon as the mixture is complete. If Alexandrian Senna be used for this preparation, it must be carefully freed of Cynanchum leaves by picking it." *Ed.*

The molasses in the Edinburgh and London syrup almost completely covers the taste of the senna; and the preparation, according to Dr. Christison, is very effectual, and seldom occasions nausea or griping. The U. S. process is liable to the objection, that considerable evaporation is necessary to bring the syrup to the proper consistence; so that, if a boiling heat be employed, the senna may be injured. This syrup is intended chiefly as a cathartic for children, to whom it may be given in the dose of one or two fluidrachms. W.

SYRUPUS TOLUTANUS. *U. S., Lond., Ed., Dub. Syrup of Tolu.*

"Take of Tincture of Tolu *a fluidounce and a half;* Water *a pint;* Sugar [refined] *two pounds and a half.* Mix the Tincture with the Sugar in coarse

powder; expose the mixture, in a shallow dish, to a gentle heat until the alcohol has evaporated; then pour the Water upon it in a covered vessel, heat gradually till the Sugar is dissolved, and strain." *U. S.*

"Take of Balsam of Tolu *ten drachms;* boiling Distilled Water *a pint* [Imp. meas.]; Sugar [refined] *two pounds and a half.* Boil the Balsam in the Water for half an hour, in a covered vessel, occasionally stirring, and strain the liquor when cold; then add the Sugar and dissolve it." *Lond.*

The *Edinburgh College* prepares this syrup by adding gradually *one ounce* of the tincture of tolu to *two pounds* of simple syrup just prepared, and before it has become cold. The *Dublin College* takes *an ounce* [avoirdupois] of the balsam to *a pint* [Imp. meas.] of distilled water, and proceeds essentially as the London College.

In the U. S. and Edinburgh processes, the syrup is prepared with the tincture of tolu; in the latter by adding it to simple syrup, in the former by mixing it with the sugar employed, and evaporating the alcohol, before dissolving the sugar in the water. By the U. S. method the advantage is gained of getting rid of the alcohol with the least possible loss of volatile oil by heat. The London and Dublin process affords a syrup with a finer flavour than that prepared with the tincture, but with much waste of balsam. To obviate this waste, the same portion of balsam is, according to Mr. Brande, usually employed in successive operations, and it long continues to impart odour and taste to boiling water. The quantity of the balsam is rather more than two grains in a fluidounce of the syrup, prepared according to the U. S. Pharmacopœia, which is a little stronger than the Edinburgh, and much stronger than the London and Dublin preparation. The syrup of tolu may, therefore, be considered inert as a medicine; and its only use is to impart its agreeable flavour to mixtures.* W.

SYRUPUS VIOLÆ. *Lond., Ed. Syrup of Violets.*

"Take of fresh Violets *one pound;* Boiling Water *two pints and a half* [Imp. meas.]; Pure Sugar *seven pounds and a half.* Infuse the flowers for twenty-four hours in the Water, in a covered glass or earthenware vessel; strain without squeezing, and dissolve the Sugar in the filtered liquor." *Ed.*

"Take of Violets [recent petals] *nine ounces;* boiling Distilled Water *a pint* [Imperial measure]; Sugar [refined] *three pounds,* or *a sufficient quantity;* Rectified Spirit *two fluidounces and a half,* or *a sufficient quantity.* Macerate the Violets in the Water for twelve hours; then express, and filter. Set apart that the dregs may subside, and finish in the manner directed for Syrup of Marshmallow." *Lond.* (See *Syrupus Althææ.*)

This syrup has a deep-blue colour and an agreeable flavour. It is said that its colour is most beautiful when it is prepared in well-cleaned pewter vessels; but the action of the metal has not been satisfactorily explained. As it is apt to fade by time, it is sometimes counterfeited with materials the colour of which is more permanent. The fraud may usually be detected by the addition of an acid or alkali, the former of which reddens the syrup of violets, the latter renders it green, while they produce no such change upon the counterfeit. It should not have the smell or taste of red cabbage, a syrup from which acts in the same way with acids and alkalies.

* Mr. J. D. Finley proposes the following plan of preparing the *syrup of tolu,* which affords a syrup twice as strong as the U. S. process, and perfectly clear, whereas the officinal syrup has a somewhat milky appearance. "Take of tincture of tolu *two fluidounces,* carbonate of magnesia *two drachms,* sugar a pound and a half (Avoirdupois), water *twelve fluidounces.* Rub the tincture with the carbonate and two ounces of the sugar in powder, gradually add the water, and filter. Then dissolve the remainder of the sugar in the filtered liquid with a gentle heat." The *syrup of ginger* may be prepared in the same way. (*Am. Journ. of Pharm.,* xxiii. 220.)

The syrup acts as a gentle laxative when given to infants in the dose of one or two fluidrachms; but it is used chiefly as a test of acids and alkalies. For the latter purpose, a syrup prepared from the juice of the red cabbage may be substituted. It is very seldom kept in our shops. W.

SYRUPUS ZINGIBERIS. *U.S., Lond., Ed., Dub. Ginger Syrup.*

"Take of Tincture of Ginger *four fluidounces;* Water *four pints;* Sugar [refined] *ten pounds.* Mix the Tincture with four pounds of the Sugar, in coarse powder, and expose the mixture, in a shallow dish, to a gentle heat until the alcohol has evaporated. Add the residue of the Sugar, and subsequently the Water in a covered vessel, heat gradually till the Sugar is dissolved, and strain." *U. S.*

The *London College* macerates *two ounces and a half* of sliced ginger, for four hours, in *a pint* [Imperial measure] of boiling distilled water, and, having expressed and strained the infusion, finishes the process in the manner directed for syrup of marshmallow. (See *Syrupus Althææ.*) The *Edinburgh College* infuses *two ounces and a half* of bruised ginger, for four hours, in *a pint* [Imperial measure] of boiling water, strains, adds *two pounds and a half* of pure sugar, and dissolves it with the aid of heat. The *Dublin College* mixes *a fluidounce* of tincture of ginger with *seven fluidounces* of simple syrup.

In the former U.S. process the tincture of ginger was added to syrup, as in the present Dublin process, and the alcohol was afterwards evaporated. In the late revision of the Pharmacopœia, the better plan has been adopted of adding the tincture to the sugar before its solution; as in this way the alcohol is driven off more thoroughly with less heat, and the volatile principle of the ginger is better preserved. The use of water as the menstruum in the London and Edinburgh processes encumbers the syrup with mucilage and starch, and thus renders it more liable to decomposition. (See *the note at the foot of page* 1215.)

In order that the preparation may be of the proper strength, it is necessary that the tincture should have been made with the best Jamaica ginger. The syrup of ginger is much used as a warm stomachic addition to tonic and purgative infusions or mixtures, and to impart flavour to drinks, particularly to carbonic acid water.

Off. Prep. Confectio Sulphuris; Electuarium Opii. W.

TINCTURÆ.

Tinctures.

Tinctures, in the pharmaceutical sense of the term, are solutions of medicinal substances in alcohol or diluted alcohol, prepared by maceration, digestion, or percolation. Solutions in spirit of ammonia and ethereal spirit are embraced under the same denomination, but are severally distinguished by the titles of *ammoniated tinctures* and *ethereal tinctures.* The advantages of alcohol as a menstruum are, that it dissolves principles which are sparingly or not at all soluble in water, and contributes to their preservation when dissolved; while it leaves behind some inert substances which are dissolved by water. In no instance, however, is absolute alcohol employed. The U.S. Pharmacopœia directs it of the sp. gr. 0·835; the London and Edinburgh, 0·838; and the Dublin, 0·840. When of these densities it contains water, and is capable of dissolving more or less of substances which are insoluble in anhydrous alcohol; while its solvent power, in relation to bodies soluble in that fluid, is sufficient for all practical purposes. Diluted alcohol or proof spirit is often preferable to officinal alcohol; as it is capable of extracting a larger proportion of those active principles of plants which require an aqueous menstruum, at the same time that it

is strong enough, in most instances, to prevent spontaneous decomposition, and has the advantages of being cheaper and less stimulating.* The diluted alcohol of the different Pharmacopœias is not of the same strength; that of the United States consisting of equal measures of officinal alcohol and water, and having the sp. gr. 0·935; while that of London and Dublin has the sp. gr. 0·920, and that of Edinburgh 0·912. The difference, however, is not very material. Alcohol or rectified spirit is preferred as the solvent, when the substance to be extracted or dissolved is nearly or quite insoluble in water, as in the instances of the resins, guaiac, camphor, and the essential oils. The presence of water is here injurious, not only by diluting the menstruum, but by exercising an affinity for the alcohol which interferes with its solvent power. Thus, water, added to an alcoholic solution of one of these bodies, produces a precipitate by abstracting the alcohol from it. Diluted alcohol or proof spirit is employed, when the substance is soluble both in alcohol and water, or when one or more of the ingredients are soluble in the one fluid, and one or more in the other, as in the case of those vegetables which contain extractive or tannin, or the native salts of the organic alkalies, or gum united with resin or essential oil. As these include the greater number of medicines from which tinctures are prepared, diluted alcohol is most frequently used.

In the preparation of the tinctures, the medicine should be in the dry state, and properly comminuted by being bruised, sliced, or pulverized. It is usually better in the condition of a coarse than of a very fine powder; as in the latter it is apt to agglutinate, and thus present an impediment to the penetration of the menstruum. When several substances differing in solubility are employed, they should be added successively to the spirit, those least soluble first, those most so last; as otherwise the menstruum might become saturated with the ingredient for which it has the strongest affinity, and thus be rendered incapable of dissolving a due proportion of the others.

Until recently, tinctures have been universally prepared by maceration or digestion. The Edinburgh College directs digestion to be continued usually for seven days. Our own Pharmacopœia directs maceration at ordinary temperatures, and extends the period to two weeks. The latter plan is preferable, as it is more convenient and equally effectual, the lower temperature being compensated by the longer maceration. When circumstances require that the tincture should be speedily prepared, digestion may be resorted to. Care should always be taken to keep the vessels well stopped, in order to prevent the evaporation of the alcohol. The materials should be frequently shaken during the digestion or maceration; and this caution is especially necessary when the substance acted on is in the state of powder. The tincture should not be used till the maceration is completed; when it should be separated from the dregs either by simply filtering it through paper, or, when force is requisite, by first expressing it through linen, and subsequently filtering.

The plan of preparing tinctures by percolation or displacement has recently been extensively adopted; and has been found to answer an excellent purpose, when skilfully executed. In the U. S. and Edinburgh Pharmacopœias, this mode of preparation has been given as an alternative in numerous instances; and would probably have been exclusively recommended in some, except for its

* Mr. Wm. Bastick, in a communication to the Pharmaceutical Journal and Transactions, states, as the result of his experience, that most of the tinctures prepared with proof spirit or diluted alcohol undergo deterioration by time, in consequence of acetous fermentation taking place in the alcoholic fluid. The tinctures most prone to this change are those of senna, rhubarb, columbo, henbane, digitalis, bark, hops, aloes, and the compound tincture of cinnamon. The best preventive is to keep them in full and well-closed bottles, at a low temperature. (*Am. Journ. of Pharm.*, xx. 47.)

liability to fail in the hands of inexperienced persons. The reader will find rules for the proper management of this process at *pages* 782 and 789.

Another mode of exhausting medicines by spirit has been proposed by Dr. H. Burton. It consists in suspending in the solvent, immediately under its surface, the solid matter contained loosely in a bag. The liquid in contact with the bag, becoming heavier by impregnation with the matters dissolved, sinks to the bottom; its place is supplied with a fresh portion, which in its turn sinks; and thus a current is established, which continues until the solid substance is exhausted or the liquid saturated. During the maceration, the bag should be occasionally raised above the surface of the liquor in the bottle, beneath the cover, and allowed to drain, and then again immersed. It is asserted that the period of maceration is much shortened in this way. (*Lond. Med. Gaz.*, Aug. 30, 1844.)*

Tinctures, prepared by adding alcohol to the expressed juices of plants, have been long in use on the Continent of Europe, and have been brought into notice in Great Britain. They are sometimes called in England *preserved vegetable juices.* The tinctures of some of the narcotic plants might no doubt be advantageously prepared in this way, as those of conium, hyoscyamus, and belladonna. Mr. Squire and Mr. Bentley have paid particular attention to these preparations. According to Mr. Squire, the leaves only of the plants should be used, and in the case of biennial plants those exclusively of the second year's growth; and they should always be preferably collected when the plant is in full flower. Mr. Bentley recommends the following mode of preparation. To the expressed juice, after it has stood for twenty-four hours, and deposited its feculent matter, alcohol of 0·838 is to be added in the proportion of one part by measure to four of the juice; and, after another period of twenty-four hours, the liquor is to be filtered. The proportion of alcohol mentioned has been found sufficient for the preservation of the juice, while it causes the precipitation of all the suspended mucilaginous matter.

Tinctures should be kept in bottles accurately stopped, in order to prevent evaporation, which might, in some instances, be attended with serious inconvenience, by increasing their strength beyond the officinal standard.

Medicines are most conveniently administered in tincture, which act powerfully in small doses; as the proportion of alcohol in which they are dissolved is too minute to produce an appreciable effect. Those which require to be given in large doses should be cautiously employed in this form, lest the injury done by the menstruum should more than counterbalance their beneficial operation. This remark is particularly applicable to chronic cases of disease, in which the use of tinctures is apt to result in the establishment of fatal habits of intemperance. The tinctures of the weaker medicines are more frequently given as adjuvants of other remedies than with the view of obtaining their own full effects upon the system.

The following general directions are given in the *U. S. Pharmacopœia.*

"Tinctures, when prepared by maceration, should be frequently shaken during the process, which should be conducted in glass vessels well stopped. When displacement is employed, great care should be taken to observe the directions given at page 4 [*page* 789, of this Dispensatory], so that the substances treated may be, as far as possible, exhausted of their soluble principles,

* For this mode of preparing tinctures, Mr. Samuel Gale has proposed the use of a cylindrical stoneware vessel, with a diaphragm capable of being supported at different heights by projections from the inner surface of the jar, with corresponding notches in the diaphragm, to permit its easy passage to the lower ledges. The material is to be placed upon the diaphragm and kept covered with the menstruum. (See *Am. Journ. of Pharm.*, xxii. 381, from *Pharm. Journ. and Trans.*)

and a perfectly clear tincture obtained. To those not familiar with this process, the plan of maceration is recommended."

The *London College* states that "all tinctures should be prepared in closed glass vessels, and frequently shaken during the maceration." The general directions of the *Edinburgh College*, which relate to the process of percolation, have been given at *page* 790. W.

TINCTURA ACONITI FOLIORUM. *U. S.* *Tincture of Aconite Leaves.*

"Take of Aconite Leaves *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Aconite Leaves, in powder, with Diluted Alcohol, allowing the mixture to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

This is a good preparation of aconite when made from the recently dried leaves, and may be given in the dose of twenty or thirty drops. A saturated tincture prepared from the root is now more used. It is much stronger than the tincture of the leaves, and great care should be taken not to confound them in prescription. (See *Tinctura Aconiti Radicis.*) W.

TINCTURA ACONITI RADICIS. *U. S.* TINCTURA ACONITI. *Lond.* TINCTURA RADICIS ACONITI. *Dub.* *Tincture of Aconite Root.*

"Take of Aconite Root, well bruised, *a pound;* Alcohol *two pints.* Macerate for fourteen days, express strongly, and filter through paper.

"This Tincture may also be prepared by the process of displacement, in the following manner.

"Take of Aconite Root, in powder, *a pound;* Alcohol a *sufficient quantity.* Mix the Aconite Root with a pint of Alcohol, and allow the mixture to stand twenty-four hours; then transfer it to a percolator, and pour Alcohol gradually upon it until two pints of filtered liquor are obtained." *U. S.*

The *London College* macerates *fifteen ounces* of the coarsely powdered root in *two pints* [Imperial measure] of rectified spirit, for seven days, then expresses, and filters. The *Dublin College* takes *ten ounces* [avoirdupois] of the root, and *a pint* [Imp. meas.] of rectified spirit, and macerates for fourteen days.

This tincture, as directed in the different Pharmacopœias, may be considered of about the same strength, being probably very nearly saturated. It is much stronger than the tincture of the leaves, and too much caution cannot be observed to avoid mistaking one for the other. In preparing it, each step of the process must be carefully attended to in order to insure a favourable result. The root should be thoroughly comminuted, the maceration continued for the full period directed, and the displacing menstruum very gradually added. The dose to begin with is from five to ten drops, which may be repeated three times a day, and gradually increased, if necessary, until its peculiar effects are experienced. (See *Aconiti Radix.*) We would repeat here the caution, already given when treating of Aconite in the Materia Medica, that physicians should be careful, in prescribing either of the tinctures of aconite, to give the whole name of the one they intend, as otherwise serious consequences may ensue.* W.

* The tincture proposed by Dr. Fleming should always be expressly designated when prescribed. It is considerably stronger than the officinal; and several deaths have occurred from the use of it. The following is his formula. Take of the root, carefully dried and finely powdered, *sixteen* [troy] *ounces;* Alcohol *sixteen fluidounces.* Macerate for four days, put into a percolator, and add alcohol until twenty-four fluidounces are obtained. Not more than five drops of this should be given as a commencing dose, to be increased till its peculiar effects are experienced.

TINCTURA ALOËS. *U. S., Lond., Ed. Tincture of Aloes.*

"Take of Aloes, in powder, *an ounce;* Liquorice [extract] *three ounces;* Alcohol *half a pint;* Distilled Water *a pint and a half.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* directs the *same quantity* of aloes (Socotrine or hepatic) and liquorice with *a pint and a half* [Imperial measure] of distilled water, and *half a pint* [Imp. meas.] of rectified spirit; macerates the aloes in the spirit for a week, then adds the liquorice, dissolves, and filters. The *Edinburgh College* takes *an ounce* of Socotrine or Indian Aloes, *three ounces* of liquorice, *twelve fluidounces* of rectified spirit, and *twenty-eight fluidounces* of water; digests for seven days; and filters the liquor, separated from the sediment.

The original tincture of aloes of the U. S. Pharmacopœia was prepared with the officinal diluted alcohol, without the addition of water. At present it corresponds with the tincture of the British Colleges. It is little more than an infusion, with the addition of sufficient alcohol to prevent spontaneous decomposition. The liquorice is added to cover the taste of the aloes; but it answers the end imperfectly; and the preparation, on account of its unpleasant bitterness, is little used, aloes being generally administered in the form of pill. The dose is from half a fluidounce to a fluidounce and a half. W.

TINCTURA ALOËS ET MYRRHÆ. *U. S., Ed.* TINCTURA ALOËS COMPOSITA. *Lond. Tincture of Aloes and Myrrh.*

"Take of Aloes, in powder, *three ounces;* Saffron *an ounce;* Tincture of Myrrh *two pints.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* takes *four ounces* of Socotrine or hepatic aloes, *two ounces* of saffron, and *two Imperial pints* of tincture of myrrh, and proceeds as above. The *Edinburgh College* takes *four ounces* of Socotrine or Indian aloes, *two ounces* of saffron, and *two Imperial pints* of tincture of myrrh; digests for seven days; and filters the clear "superincumbent" liquor.

This tincture is a modification of the *elixir proprietatis* of Paracelsus. The saffron, which has been retained in compliance with former prejudices, can add little to the efficacy of the preparation; and, being very expensive, has with great propriety been much reduced in the U. S. formula. It serves, however, to impart a richness to the tincture, the want of which might be considered a defect by those accustomed to its use.

The tincture is purgative, tonic, and emmenagogue; and is considerably employed in chlorosis, and other disordered states of health in females, connected with suppressed, retained, or deficient menstruation, and with a constipated state of bowels. It may also be used as a stomachic laxative in cold, languid habits, independently of menstrual disorder. The dose is from one to two fluidrachms. W.

TINCTURA AMMONIÆ COMPOSITA. *Lond. Compound Tincture of Ammonia.*

"Take of Mastich *two drachms;* Rectified Spirit *nine fluidrachms;* Oil of Lavender *fourteen minims;* Stronger Solution of Ammonia *a pint* [Imperial measure]. Macerate the Mastich in the Spirit that it may be dissolved, and pour off the clear tincture; then add the other ingredients, and shake them all together." *Lond.*

This has taken the place of the *Spiritus Ammoniæ Succinatus* of the old London Pharmacopœia, and was intended as a substitute for the *eau de luce.* The oil of amber, which was retained as an ingredient with the change of name in the edition of 1836, was abandoned in that of 1851. The tincture has a milky appearance, owing to the separation of the mastich from its alcoholic solution by the water of ammonia. Its properties are essentially those of its

ammoniacal ingredient; the mastich having no medical action, and the oil of lavender being in too small proportion to serve any other purpose than that of imparting flavour. It is used chiefly as a powerful stimulant applied to the nostrils, in cases of fainting and torpor. It has considerable reputation as an antidote to the bite of venomous animals, particularly of serpents, in which it is reported to have been often used successfully. The dose for internal use is from ten to thirty drops, very largely diluted with water. W.

ESSENTIA ANISI. *Dub. Essence of Anise.*

"Take of Oil of Anise *one fluidounce;* Rectified Spirit *nine fluidounces.* Mix with agitation." *Dub.*

The Dublin College introduced into the last edition of its Pharmacopœia, under the name of *essences*, a set of preparations consisting of solutions of the aromatic volatile oils in alcohol. They are essentially tinctures, as the term is here employed; and similar preparations of the oils of peppermint and spearmint have been so named in the U. S. Pharmacopœia. They are much stronger than the spirits, which, though, like the essences, solutions of volatile oil in alcohol, are either procured by distillation, or made to imitate the distilled spirits in strength. The dose of this preparation is from twenty minims or forty drops to a fluidrachm for an adult, which may be given in sweetened water.

Off. Prep. Aqua Anisi. W.

TINCTURA ASSAFŒTIDÆ. *U. S., Lond., Ed., Dub. Tincture of Assafetida.*

"Take of Assafetida *four ounces;* Alcohol *two pints.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* takes *five ounces* of assafetida, and *two Imperial pints* of rectified spirit, macerates for seven days, and filters. The *Edinburgh College*, with the same quantity of materials, digests for seven days, and filters the clear liquor. The *Dublin College* macerates *five ounces* [avoirdupois] with *two Imperial pints* for fourteen days, expresses, and filters.

This tincture becomes milky on the addition of water, in consequence of the separation of the resin. It possesses all the virtues of assafetida. The medium dose is a fluidrachm.

Off. Prep. Enema Fœtidum. W.

TINCTURA AURANTII. *Lond., Ed., Dub. Tincture of Orange Peel.*

"Take of dried Orange Peel *three ounces and a half;* Proof Spirit *two pints* [Imperial measure]. Macerate for seven days, then express, and filter." *Lond.*

"Take of Bitter Orange Peel, dried, *three ounces and a half;* Proof Spirit *two pints* [Imp. meas.]. Digest for seven days, strain and express strongly, and filter the liquor. This tincture may be prepared by percolation, by cutting the Peel into small fragments, macerating it in a little of the Spirit for twelve hours, and beating the mass into a coarse pulp before putting it into the percolator." *Ed.*

The *Dublin College* macerates *four ounces* [avoirdupois] of the dried bitter orange peel with *two pints* [Imp. meas.] of proof spirit, for fourteen days, strains, expresses, and filters.

It is the peel of the Seville orange which is intended by the London College; and the outer part only should be used, the inner whitish portion being inert. The tincture of orange peel is employed as a grateful addition to infusions, decoctions, and mixtures.

Off. Prep. Mistura Ferri Aromatica; Tinctura Quinæ Composita. W.

TINCTURA BELLADONNÆ. *U. S., Lond.* TINCTURA FOLIORUM BELLADONNÆ. *Dub. Tincture of Belladonna.*

"Take of Belladonna [leaves] *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Belladonna, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* macerates *four ounces* of dried belladonna with *two pints* [Imperial measure] of proof spirit for seven days, expresses, and filters; the *Dublin, five ounces* [avoirdupois] with *two pints* [Imp. meas.] for fourteen days, strains, expresses, and filters.

This tincture is an efficient preparation when made from the recently dried leaves; but the imported leaves are of very uncertain strength, and a tincture prepared from them is less to be relied upon than the extract. The dose is from fifteen to thirty drops. W.

TINCTURA BENZOINI COMPOSITA. *U. S., Lond., Ed. Compound Tincture of Benzoin.*

"Take of Benzoin *three ounces;* Purified Storax *two ounces;* Balsam of Tolu *an ounce;* Aloes, in powder, *half an ounce;* Alcohol *two pints.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* takes *three ounces and a half* of benzoin, *two ounces and a half* of prepared storax, *ten drachms* of balsam of Tolu, *five drachms* of Socotrine or hepatic aloes, and *two pints* [Imperial measure] of rectified spirit, macerates for seven days, and filters. The *Edinburgh College* takes *four ounces* of benzoin, *two ounces and a half* of balsam of Peru, *half an ounce* of East India aloes, and *two pints* [Imp. meas.] of rectified spirit, digests for seven days, pours off the clear liquor, and filters it.

This tincture is a stimulating expectorant, occasionally used in chronic catarrhal affections, but more frequently as a local application to indolent ulcers. It is the *balsamum traumaticum* of the older Pharmacopœias, and may be considered as a simplified form of certain complex compositions, such as *baume de commandeur, Wade's balsam, Friar's balsam, Jesuits' drops, &c.*, which were formerly in repute, and are still esteemed among the vulgar as pectorals and vulneraries. It is also an ingredient in *Turlington's balsam*, which is a popular remedy in this country for the same purposes.* It is scarcely necessary to state that the application of these preparations to fresh wounds must frequently prove injurious, by inducing too much inflammation, and thus preventing union by the first intention. The compound tincture of benzoin is decomposed by water. The dose is from thirty minims to two fluidrachms. A variety of *court plaster* is made by applying to black silk, by means of a brush, first a solution of isinglass, and afterwards an alcoholic solution of benzoin. W.

TINCTURA BUCHU. *Dub.* TINCTURA BUCKU. *Ed. Tincture of Buchu.*

"Take of Bucku *five ounces;* Proof Spirit *two pints* [Imperial measure]. Digest for seven days, pour off the clear liquor, and filter it. This tincture may be conveniently and quickly made also by the process of percolation." *Ed.*

"Take of Buchu Leaves, bruised, *five ounces* [avoirdupois]; Proof Spirit *two*

* The following is the formula for *Turlington's balsam* adopted by the Philadelphia College of Pharmacy. "Take of Alcohol Oviij., Benzoin ℥xij., Liquid Storax ℥iv., Socotrine Aloes ℥j., Peruvian Balsam ℥ij., Myrrh ℥j., Angelica Root ℥ss., Balsam of Tolu ℥iv., Extract of Liquorice Root ℥iv. Digest for ten days, and strain." (*Journ. of the Phil. Col. of Pharm.*, v. 28.)

pints [Imp. meas.]. Macerate for fourteen days, strain, express, and filter." *Dub.*

This tincture has the virtues of buchu leaves, and may be given in the dose of from one to four fluidrachms, either simply diluted with water, or as an addition to the infusion of the leaves. W.

TINCTURA CAMPHORÆ. *U. S., Ed., Dub.* SPIRITUS CAMPHORÆ. *Lond. Tincture of Camphor.*

"Take of Camphor *four ounces;* Alcohol *two pints.* Dissolve the Camphor in the Alcohol." *U. S.*

The *London College* dissolves *five ounces* of camphor in *two pints* [Imperial measure] of rectified spirit; the *Edinburgh, two ounces and a half* in *two pints* [Imp. meas.]; the *Dublin, an ounce* [avoirdupois] in *eight fluidounces.*

This is used chiefly as an anodyne embrocation in rheumatic and gouty pains, chilblains, and the inflammation resulting from sprains and bruises. It may also be employed internally, due regard being paid to the stimulant properties of the alcohol. The camphor is precipitated by the addition of water, but may be suspended by the intervention of sugar. The dose is from five drops to a fluidrachm, first added to sugar, and then mixed with water.

Off. Prep. Linimentum Ammoniæ Compositum; Mistura Camphoræ. W.

TINCTURA CANNABIS INDICÆ. *Dub. Tincture of Indian Hemp.*

"Take of Purified Extract of Indian Hemp *half an ounce* [avoirdupois]; Rectified Spirit *half a pint* [Imperial measure]. Dissolve the Extract in the Spirit." *Dub.*

The American reader must take care not to confound the Indian hemp, here alluded to, with the Apocynum Cannabinum known by the same name in this country. The dose, equivalent to a grain of the extract, is twenty-two minims or about forty drops, which is to be gradually increased till its effects are experienced. W.

TINCTURA CANTHARIDIS. *U. S., Lond., Ed., Dub. Tincture of Spanish Flies.*

Take of Spanish Flies, bruised, *an ounce;* Diluted Alcohol, *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Flies, in powder, with Diluted Alcohol, allowing them to stand for twenty-four hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *four drachms* of the flies and *two pints* [Imperial measure] of proof spirit, macerates for seven days, expresses and filters; the *Dublin, half an ounce* [avoirdupois] of the former and *two pints* [Imp. meas.] of the latter, and macerates for two weeks, strains, expresses, and filters. The *Edinburgh College* takes the same proportions as the London, digests for seven days, strains, expresses the residuum strongly, and filters; or prepares the tincture by percolation, having previously moistened the coarsely powdered flies with a little of the spirit, and allowed them to stand for twelve hours.

This tincture is one of the most convenient forms for the internal use of Spanish flies, the virtues of which it possesses to their full extent. (See *Cantharis.*) It is occasionally employed externally as a rubefacient; but its liability to vesicate should be taken into consideration. The British tinctures are all too feeble; the strongest containing the virtues only of three quarters of a grain of cantharides in a fluidrachm. The dose of the U. S. tincture is from twenty drops to a fluidrachm, repeated three or four times a day. W.

TINCTURA CAPSICI. *U.S., Lond., Ed., Dub. Tincture of Cayenne Pepper.*

"Take of Cayenne Pepper *an ounce;* Diluted Alcohol *two pints.* Macerate for fourteen days, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Cayenne Pepper, in powder, with Diluted Alcohol, putting it into a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *ten drachms* of bruised Cayenne pepper, and *two pints* (Imperial measure) of proof spirit, macerates for fourteen days, and filters; the *Dublin an ounce and a half* [avoirdupois] to *a pint* [Imp. meas.], and macerates fourteen days; the *Edinburgh* takes the same proportions as the London, digests for seven days, strains, expresses, and filters; or prepares the tincture by percolation, having previously made the capsicum into a pulp, with a little of the spirit.

This preparation of capsicum is a useful stimulant in very low states of the system with great gastric insensibility, as in malignant scarlet and typhus fevers, and in the cases of drunkards. It may also be used as a gargle, diluted with rose water or some mucilaginous fluid. (See *Capsicum.*) Applied by means of a camel's hair pencil to the relaxed uvula, it sometimes produces contraction, and relieves prolapsus of that part. The dose is one or two fluidrachms. W.

TINCTURA CARDAMOMI. *U.S., Ed. Tincture of Cardamom.*

"Take of Cardamom, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Cardamom, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *Edinburgh College* takes *four ounces and a half* of the bruised seeds, and *two pints* [Imp. meas.] of proof spirit, digests for seven days, strains, expresses, and filters; or prepares the tincture by percolation, first grinding the seeds in a coffee-mill, and making them into a pulp with a little of the spirit.

This tincture is an agreeable aromatic, and may be advantageously added to tonic and purgative infusions. The dose is one or two fluidrachms.

Off. Prep. Tinctura Conii. W.

TINCTURA CARDAMOMI COMPOSITA. *U.S., Lond., Ed., Dub. Compound Tincture of Cardamom.*

"Take of Cardamom, bruised, *six drachms;* Caraway, bruised, *two drachms;* Cinnamon, bruised, *five drachms;* Raisins, deprived of their seeds, *five ounces;* Cochineal, bruised, *a drachm;* Diluted Alcohol, *two pints and a half.* Macerate for fourteen days, express, and filter through paper." *U. S.*

"Take of Cardamom, Caraway, Cochineal, each, bruised, *two drachms and a half;* Cinnamon, bruised, *five drachms;* Raisins deprived of the seeds *five ounces;* Proof Spirit *two pints* [Imperial measure]. Macerate for seven days; then express, and filter." *Lond.*

The *Edinburgh College*, taking the same materials in the same quantities as the London, excepting cochineal, of which it takes only *a drachm*, digests for seven days, strains, expresses strongly, and filters. The same College allows the tincture to be prepared also by percolation; the solid materials being first beaten together, moistened with a little spirit, and allowed to stand for twelve hours before being introduced into the instrument. The *Dublin College* takes of cardamom and caraway, each, *half an ounce* [avoirdupois], cinnamon *an ounce* [avoird.], cochineal *two drachms* [Dub. weight], and proof spirit *two pints* [Imp. meas.], macerates for fourteen days, strains, expresses, and filters.

This is a very agreeable aromatic tincture, occasionally used as a carminative in the dose of one or two fluidrachms, but more frequently as an addition to mixtures, infusions, &c., which it renders pleasant to the taste, and acceptable to the stomach.

Off. Prep. Decoctum Aloës Compositum; Mistura Ferri Aromatica; Mistura Gentianæ Composita. W.

ESSENTIA CARUI. *Dub. Essence of Caraway.*

"Take of Oil of Caraway *one fluidounce;* Rectified Spirit *nine fluidounces.* Mix with agitation." *Dub.*

For general observations on the Dublin essences see *Essentia Anisi.* The dose of this preparation is from twenty drops to a fluidrachm.

Off. Prep. Aqua Carui. W.

TINCTURA CASCARILLÆ. *Lond., Ed., Dub. Tincture of Cascarilla.*

"Take of Cascarilla, bruised, *five ounces;* Proof Spirit *two pints* [Imperial measure]. Macerate for seven days; then express, and filter." *Lond.*

The *Edinburgh College* employs *five ounces* of the bark, in moderately fine powder, and *two pints* [Imp. meas.] of proof spirit; and proceeds by percolation or digestion as directed for the tincture of Peruvian bark. (See *Tinctura Cinchonæ.*) The *Dublin* takes *five ounces* [avoirdupois] of the bark, in coarse powder, and *two Imperial pints* of the menstruum, macerates for fourteen days, strains, expresses, and filters.

This tincture has the properties of cascarilla, but is seldom if ever used in this country. W.

TINCTURA CASSIÆ. *Ed. Tincture of Cassia.*

"Take of Cassia [Chinese cinnamon], in moderately fine powder, *three ounces and a half;* Proof Spirit *two pints* [Imperial measure]. Digest for seven days, strain, express the residuum strongly, and filter. This tincture is more conveniently made by the process of percolation, the Cassia being allowed to macerate in a little of the Spirit for twelve hours before being put into the percolator." *Ed.*

The properties of this tincture are identical with those of tincture of cinnamon. (See *Tinctura Cinnamomi.*) W.

TINCTURA CASTOREI. *U. S., Lond., Ed. Tincture of Castor.*

"Take of Castor, bruised, *two ounces;* Alcohol *two pints.* Macerate for seven days, express, and filter through paper." *U. S.*

The *London College* takes *two ounces and a half* of bruised castor, and *two Imperial pints* of rectified spirit, macerates for seven days, expresses, and filters. The *Edinburgh College* directs *two ounces and a half* of bruised castor, and *two Imperial pints* of rectified spirit, and allows the tincture to be prepared either by digestion or percolation, like the tincture of cassia.

As castor yields little if any of its virtues to water, alcohol is a better solvent than proof spirit. It is said also to form a more grateful preparation. The Russian castor should always be preferred when attainable. This tincture is used for the same purposes with castor in substance. The dose is from thirty minims to two fluidrachms. W.

TINCTURA CASTOREI AMMONIATA. *Ed. Ammoniated Tincture of Castor.*

"Take of Castor, bruised, *two ounces and a half;* Assafetida, in small fragments, *ten drachms;* Spirit of Ammonia *two pints* [Imperial measure]. Digest for seven days in a well-closed vessel; strain, and express strongly the residuum; and filter the liquor." *Ed.*

This is an active stimulant and antispasmodic, applicable to cases of severe spasm of the stomach, and to various hysterical and other nervous affections, unattended with inflammatory symptoms. The dose is from thirty minims to two fluidrachms. W.

TINCTURA CATECHU. *U. S., Ed., Dub.* TINCTURA CATECHU COMPOSITA. *Lond. Tincture of Catechu.*

"Take of Catechu *three ounces;* Cinnamon, bruised, *two ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper." *U. S.*

The *London College* takes *three ounces and a half* of powdered catechu, *two ounces and a half* of bruised cinnamon, and *two Imperial pints* of proof spirit, macerates for seven days, expresses, and filters. The *Edinburgh College* takes *three ounces and a half* of catechu, in moderately fine powder; *two ounces and a half* of cinnamon, in fine powder; and *two pints* [Imp. meas.] of proof spirit; digests for seven days, strains, expresses strongly, and filters. This College prepares the tincture also by percolation, introducing the mixed powders into the percolator without previously moistening them with spirit. The *Dublin College* macerates *four ounces* [avoirdupois] of catechu, and *two ounces* [avoird.] of cinnamon in *two Imperial pints* of proof spirit for fourteen days, strains, expresses, and filters.

This is a grateful astringent tincture, useful in all cases to which catechu is applicable, and in which small quantities of spirit are not objectionable. It may often be advantageously added to cretaceous mixtures in diarrhœa. The dose is from thirty minims to three fluidrachms, which may be given with sweetened water or some mucilaginous liquid, or in Port wine when this is not contraindicated. Like the tincture of kino, this is said sometimes to gelatinize when kept. In this state it is unfit for use. W.

TINCTURA CHIRETTÆ. *Dub. Tincture of Chiretta.*

"Take of Chiretta, bruised, *five ounces* [avoirdupois]; Proof Spirit *two pints* [Imperial measure]. Macerate for fourteen days, strain, express, and filter." *Dub.*

This is a tonic tincture, and may be given in the dose of one or two fluidrachms three or four times a day. W.

TINCTURA CINCHONÆ. *U. S., Lond., Ed. Tincture of Peruvian Bark.*

"Take of Yellow Bark, in powder, *six ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Bark with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* orders *eight ounces* of yellow bark, and *two Imperial pints* of proof spirit, macerates for seven days, expresses, and filters.

"Take of Yellow Bark, in fine powder (or of any other species of Cinchona, according to prescription), *eight ounces;* Proof Spirit *two pints* [Imperial measure]. Percolate the Bark with the Spirit, the Bark being previously moistened with a very little Spirit, left thus for ten or twelve hours, and then firmly packed in the cylinder. This tincture may also be prepared, though much less expeditiously, and with much greater loss, by the usual process of digestion, the bark being in that case reduced to coarse powder only." *Ed.*

This tincture is very properly made with a large proportion of bark; as, in the bitter tinctures, it is important that the alcohol should bear as small a pro-

portion to the tonic principle as possible. Even when strongest, however, it cannot, in ordinary cases, be given in doses sufficiently large to obtain the full effect of the bark, without stimulating too highly. Tincture of cinchona is used chiefly as an adjunct to the infusion or decoction of bark, or the solution of sulphate of quinia, to a dose of which it may be added in the quantity of from one to four fluidrachms. W.

TINCTURA CINCHONÆ COMPOSITA. *U. S.*, *Lond.*, *Ed.*, *Dub. Compound Tincture of Peruvian Bark.*

"Take of Red Bark, in powder, *two ounces;* Orange Peel, bruised, *an ounce and a half;* Virginia Snakeroot, bruised, *three drachms;* Saffron, cut, Red Saunders, rasped, each, *a drachm;* Diluted Alcohol *twenty fluidounces.* Macerate for fourteen days, express, and filter through paper.

"Compound Tincture of Peruvian Bark may be prepared from the same dry materials, by beating them well together, moistening them thoroughly with Diluted Alcohol, allowing the mixture to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until twenty fluidounces of filtered liquor are obtained." *U. S.*

"Take of Pale Bark, bruised, *four ounces;* dried Orange Peel *three ounces;* Virginia Snakeroot, bruised, *six drachms;* Saffron *two drachms;* Cochineal, bruised, *a drachm;* Proof Spirit *two pints* [Imperial measure]. Macerate for seven days, then express, and filter." *Lond.*

The *Edinburgh College* takes the same materials in the same quantities as the London, but specifies yellow bark, which it orders in coarse powder, if digestion, in fine powder, if percolation be employed. The serpentaria is directed in moderately fine powder. The process is conducted either by digesting for seven days, straining, expressing strongly, and filtering; or by percolation in the same way as compound tincture of cardamom. The *Dublin College* takes *four ounces* [avoirdupois] of pale bark, *two ounces* [avoird.] of orange peel, *six drachms* [Dub. weight] of Virginia snakeroot, *two drachms* [Dub. weight] of saffron, *one drachm* [Dub. weight] of cochineal, and *two Imperial pints* of proof spirit, macerates for fourteen days, strains, expresses, and filters.

This is the preparation commonly known by the name of *Huxham's tincture of bark.* It is unfortunate that the London and Dublin Colleges should have selected the feeblest of the officinal varieties of bark for this important tincture. The compound tincture of bark is an excellent stomachic cordial, and though too feeble in the principles of cinchona to serve as a substitute for that tonic when its full effect is required, may be very usefully employed as an addition to the decoction or infusion, or to the salts of quinia, in low forms of fever, particularly in malignant intermittents and remittents. Huxham was in the habit of uniting with it the *elixir of vitriol,* the aromatic sulphuric acid of the Pharmacopœias. The dose is from one to four fluidrachms.

Under the name of *Tinctura Cinchonæ Ferrata,* a preparation has been considerably employed in Philadelphia, of which the following formula is given by Mr. Samuel Simes, in the *Am. Journ. of Pharm.* (xxv. 402). With *one gallon* of the Edinburgh *compound tincture of bark, one ounce* of hydrated sesquioxide of iron, dried at a temperature not exceeding 130° F., is digested, and the liquor filtered. The tannic acid is removed by the iron, forming an insoluble tannate, which with the excess of oxide is separated by the filtration. In order not to lose any portion of the alkaloids which may adhere to the precipitate, this is to be well washed with boiling alcohol, the solution evaporated to dryness, the product dissolved in a little water acidulated with citric acid, and added to the filtered liquor. Lastly, *sixteen grains* of *ammonio-citrate of iron* are to be added to each fluidounce of the tincture. The dose is a fluidrachm. W.

TINCTURA CINCHONÆ PALLIDÆ. *Lond.* TINCTURA CINCHONÆ. *Dub.* *Tincture of Pale Bark.*

"Prepare this [from Pale Bark] in the manner directed for Tincture of Peruvian Bark [see *Tinctura Cinchonæ*]." *Lond.*

"Take of Crown or Pale Bark, in coarse powder, *eight ounces* [avoirdupois]; Proof Spirit *two pints* [Imperial measure]. Macerate for fourteen days, strain, express, and filter." *Dub.*

Pale bark from its general feebleness is especially inappropriate for tinctures. This preparation should be abandoned. The dose of it is one or two fluidrachms or more. W.

ESSENTIA CINNAMOMI. *Dub.* *Essence of Cinnamon.*

"Take of Oil of Cinnamon *one fluidounce;* Rectified Spirit *nine fluidounces.* Mix with agitation." *Dub.*

For general observations on the Dublin essences, see *Essentia Anisi.* The dose of this preparation is from ten to twenty drops.

Off. Prep. Aqua Cinnamomi. W.

TINCTURA CINNAMOMI. *U. S., Lond., Ed.* *Tincture of Cinnamon.*

"Take of Cinnamon, bruised, *three ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Cinnamon, in powder, with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *three ounces and a half* of cinnamon, and *two pints* [Imperial measure] of proof spirit, and macerates for fourteen days; the *Edinburgh, three ounces and a half* of the former, in moderately fine powder, and *two pints* [Imp. meas.] of the latter, and proceeds by percolation or digestion, as in the preparation of tincture of cassia.

This tincture has the aromatic and astringent properties of cinnamon, and may be used as an adjuvant to cretaceous mixtures, and astringent infusions or decoctions. The dose is from one to three or four fluidrachms.

Off. Prep. Infusum Digitalis. W.

TINCTURA CINNAMOMI COMPOSITA. *U.S., Lond., Ed., Dub.* *Compound Tincture of Cinnamon.*

"Take of Cinnamon, bruised, *an ounce;* Cardamom [seeds], bruised, *half an ounce;* Ginger, bruised, *three drachms;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"Compound Tincture of Cinnamon may be prepared from the same dry materials, in the state of powder, by moistening them thoroughly with Diluted Alcohol, allowing them to stand for forty-eight hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* orders *an ounce* of cinnamon, *half an ounce* of cardamom, *two drachms and a half* of long pepper, *the same quantity* of ginger, and *two pints* [Imperial measure] of proof spirit, macerates for a week, expresses, and filters. The *Edinburgh College* directs *an ounce* of cinnamon in coarse or fine powder, according as digestion or percolation is followed, *an ounce* of bruised cardamom seeds, *three drachms* of finely ground long pepper, and *two pints* [Imp. meas.] of proof spirit; and allows the tincture to be prepared either by digestion for seven days, straining, expressing, and filtering, or by percolation in the manner directed for compound tincture of cardamom; preferring, however,

the latter mode. The *Dublin College*, using the avoirdupois weights, takes *two ounces* of cinnamon, *an ounce* of cardamom seeds, *half an ounce* of ginger, and *two Imperial pints* of proof spirit, macerates for two weeks, strains, expresses, and filters.

This is a very warm aromatic tincture, useful in flatulence, spasm of the stomach, and gastric debility. The dose is one or two fluidrachms. W.

TINCTURA COCCI CACTI. *Dub. Tincture of Cochineal.*

"Take of Cochineal, in fine powder, *two ounces* [avoirdupois]; Proof Spirit *one pint* [Imperial measure]. Macerate for fourteen days, strain, express, and filter." *Dub.*

This is valued chiefly for imparting colour to liquid preparations. It may, however, be given internally in nervous affections in doses varying from twenty drops to a fluidrachm. W.

TINCTURA COLCHICI COMPOSITA. *Lond. Compound Tincture of Colchicum.*

"Take of Colchicum Seed, bruised, *five ounces;* Aromatic Spirit of Ammonia *two pints* [Imperial measure]. Macerate for seven days; then express, and filter." *Lond.*

This is the *Spiritus Colchici Ammoniatus* of a former London Pharmacopœia. It may be employed for the same purposes as the wine of colchicum, in cases which require or admit of an active stimulant. The dose is from thirty drops to a fluidrachm. W.

TINCTURA COLCHICI SEMINIS. *U. S.* TINCTURA COLCHICI. *Lond., Ed.* TINCTURA SEMINUM COLCHICI. *Dub. Tincture of Colchicum Seed.*

"Take of Colchicum Seed, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Colchicum Seed, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* orders *five ounces* of the bruised seeds, *two Imperial pints* of proof spirit, and maceration for a week; the *Dublin, five avoirdupois ounces* of the former and *two Imperial pints* of the latter, and maceration for two weeks. The *Edinburgh College* takes *five ounces* of the seeds finely ground in a coffee-mill, and *two pints* [Imp. meas.] of proof spirit; and prepares the tincture in the same manner as the tincture of Peruvian bark, either by percolation or digestion; preferring, however, the former process.

It was at one time supposed that the tincture was quite as effective made from the unbruised as the bruised seeds, and corresponding advice was given under the head of Colchici Semen, in the first part of this work; but the opinion has recently been shown to have been erroneous. (*Am. Journ. of Pharm.*, xxvi. 120.)

This tincture possesses the active properties of colchicum, and may be given whenever that medicine is indicated; but the wine, which contains less alcohol, is generally preferred. The dose is from half a fluidrachm to two fluidrachms. The tincture is sometimes used as an embrocation in rheumatic, gouty, and neuralgic pains. W.

TINCTURA COLOMBÆ. *U. S.* TINCTURA CALUMBÆ. *Lond., Ed., Dub. Tincture of Columbo.*

"Take of Columbo, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This tincture may also be prepared by thoroughly moistening the Columbo, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours; then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *three ounces* of finely sliced columbo, and *two Imperial pints* of proof spirit; the *Dublin, five avoirdupois ounces* of the former, and *two Imperial pints* of the latter; the former College macerating for seven, the latter for fourteen days. The *Edinburgh College* takes *three ounces* of columbo, in small fragments or moderately fine powder, according as digestion or percolation is followed, and *two pints* [Imp. meas.] of proof spirit; and prepares the tincture either by digesting for seven days, decanting, expressing, and filtering, or by the process of percolation, allowing the powder to be macerated with a little spirit for six hours before being put into the cylinder.

The tincture of columbo of the U. S. Pharmacopœia was, with great propriety, considerably increased in strength at the revision of 1840. The larger the proportion of the tonic is to the alcohol in these bitter tinctures, the better are they calculated to meet the indications for which they are usually prescribed. When the proportion is very small, the tonic power of the bitter is overwhelmed by the stimulant influence of the alcohol. The tincture of columbo may be added to tonic infusions or decoctions, to increase their stimulant power; but, like all the other bitter tinctures, should be used with caution. The dose is from one to four fluidrachms. W.

TINCTURA CONII. *U. S., Lond., Ed. Tincture of Hemlock.*

"Take of Hemlock Leaves *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Hemlock Leaves, in powder, with Diluted Alcohol, allowing them to stand for twenty-four hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of the dried leaves, and *two Imperial pints* of proof spirit, macerates for seven days, expresses, and filters.

"Take of fresh leaves of Conium *twelve ounces;* Tincture of Cardamom *half a pint* [Imp. meas.]; Rectified Spirit *one pint and a half* [Imp. meas.]. Bruise the Hemlock Leaves, express the juice strongly; bruise the residuum, pack it firmly in a percolator; transmit first the Tincture of Cardamom, and then the Rectified Spirit, allowing the spirituous liquors to mix with the expressed juice as they pass through; add gently water enough to the percolator for pushing through the Spirit remaining in the residuum. Filter the liquor after agitation." *Ed.*

The tincture of hemlock necessarily partakes of the uncertainty of the dried leaves from which it is prepared. There can be little doubt that the tincture of the Edinburgh College, made from the fresh leaves and their expressed juice, is the most efficient. Another superiority of the process of that College is the use of rectified spirit (Alcohol, U. S.), which extracts the conia, and leaves the mucilage and albumen. A preparation made by adding one measure of alcohol to four of the expressed juice, has been used in England under the name of *preserved juice of hemlock*, and is probably quite equal to the Edinburgh tincture. (See *page* 1218.) The U. S. and London Pharmacopœias have very properly excluded cardamom from this preparation; as it can have little influence upon its medical effects, and tends to obscure the odour which is an indication of the activity of the tincture. A strong odour of conia should be emitted by the tincture upon the addition of potassa. The dose is from thirty minims to a fluidrachm. W.

TINCTURA CROCI. *Ed., Dub. Tincture of Saffron.*

"Take of Saffron, chopped fine, *two ounces;* Proof Spirit *two pints* [Imperial measure]. This Tincture is to be prepared like Tincture of Cinchona, either by percolation or by digestion, the former method being the most convenient and expeditious." *Ed.*

The *Dublin College* macerates *two avoirdupois ounces* of finely chopped saffron with *an Imperial pint* of proof spirit for fourteen days, strains, expresses, and filters.

This tincture possesses all the properties of saffron; but is of little other use than to impart colour to mixtures. The dose is from one to three fluidrachms.

W.

TINCTURA CUBEBÆ. *U. S., Lond., Dub. Tincture of Cubebs.*

"Take of Cubebs, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This tincture may also be prepared by thoroughly moistening the Cubebs, in powder, with Diluted Alcohol, allowing the mixture to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *a pound* of powdered cubebs, and *two Imperial pints* of proof spirit; the *Dublin, five avoirdupois ounces* of the former and *two Imperial pints* of the latter; the former College macerating for seven, the latter for fourteen days.

This may be used as a carminative, and has been applied with advantage to the treatment of gonorrhœa in the advanced stages. The London tincture has been greatly increased in strength, and in this respect is nearly triple that of the Dublin College. The dose of the former tincture is from half a fluidrachm to two fluidrachms or more, the larger doses being used in gonorrhœal affections.

W.

TINCTURA CUSPARIÆ. *Ed. Tincture of Angustura Bark.*

"Take of Cusparia [Angustura Bark], in moderately fine powder, *four ounces and a half;* Proof Spirit *two pints* [Imperial measure]. This Tincture is to be made like the Tincture of Cinchona, and most expeditiously by the process of percolation." *Ed.*

The tincture contains the active principles of Angustura bark, and may be given in the dose of one or two fluidrachms. W.

TINCTURA DIGITALIS. *U. S., Lond., Ed., Dub. Tincture of Foxglove.*

"Take of Foxglove *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Foxglove, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* directs *four ounces* of the dried leaves, *two Imperial pints* of proof spirit, and maceration for seven days; the *Dublin, five avoirdupois ounces* of the dried leaves (the larger being rejected) and *two Imperial pints* of proof spirit, and maceration for two weeks.

"Take of Digitalis, in moderately fine powder, *four ounces;* Proof Spirit *two pints* [Imp. measure]. This tincture is best prepared by the process of percolation, as directed for the Tincture of Capsicum. If forty fluidounces of Spirit be passed through, the density is 0·944, and the solid contents of a fluidounce amount to twenty-four grains. It may also be made by digestion." *Ed.*

In preparing this tincture, great attention should be paid to the selection of

the leaves, according to the rules laid down under the head of Digitalis. From a neglect of these, it is apt to be weak or inefficient. The expressed juice of the leaves, preserved by means of alcohol, would probably be found a powerful preparation. (See *page* 1218.) The tincture of foxglove possesses all the virtues of that narcotic, and affords a convenient method of administering it, especially in mixtures. The dose is from ten to twenty drops, repeated two or three times a day, and increased if necessary, but with great caution. W.

TINCTURA ERGOTÆ. *Dub. Tincture of Ergot.*

"Take of Ergot of Rye, in coarse powder, *eight ounces* [avoirdupois]; Proof Spirit *two pints* [Imperial measure]. Macerate for fourteen days, strain, express, and filter." *Dub.*

The dose of this tincture is one or two fluidrachms. W.

TINCTURA ERGOTÆ ÆTHEREA. *Lond. Ethereal Tincture of Ergot.*

"Take of Ergot, bruised, *fifteen ounces;* Ether *two pints* [Imperial measure]. Macerate for seven days, then express, and filter." *Lond.*

We doubt the propriety of this preparation. Independently of its liability to the loss of ether by evaporation, and to consequent great diversity of strength, the inert fixed oil of the ergot is extracted abundantly along with the active matter. The dose of the recently prepared tincture would be from sixty to ninety minims. W.

ESSENTIA FŒNICULI. *Dub. Essence of Fennel.*

"Take of Oil of Fennel *one fluidounce;* Alcohol *nine fluidounces.* Mix with agitation." *Dub.*

The Alcohol of the Dublin College here directed is absolute alcohol, of the sp. gr. 0·795. For general observations on the Dublin essences the reader is referred to *Essentia Anisi.* The dose of the essence of fennel is from twenty drops to a fluidrachm.

Off. Prep. Aqua Fœniculi. W.

TINCTURA GALLÆ. *U.S., Lond., Dub.* TINCTURA GALLARUM. *Ed. Tincture of Galls.*

"Take of Galls, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Galls, in powder, with Diluted Alcohol, allowing them to stand for forty-eight hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* directs *five ounces* of powdered galls, *two Imperial pints* of proof spirit, and maceration for seven days; the *Dublin, five avoirdupois ounces* of the galls, *two Imperial pints* of the spirit, and maceration for fourteen days. The *Edinburgh College* takes the same quantity of materials as the London, and prepares the tincture either by digestion or percolation, as directed for tincture of capsicum.

The tincture of galls is powerfully astringent; but is more used as a test than as a medicine. When long kept it ceases to evince the reactions of tannic acid, in consequence of the conversion of this into gallic acid. The dose is from one to three fluidrachms. W.

TINCTURA GENTIANÆ COMPOSITA. *U.S., Lond., Ed., Dub. Compound Tincture of Gentian.*

"Take of Gentian, bruised, *two ounces;* Orange Peel [dried] *an ounce;* Cardamom [seeds], bruised, *half an ounce;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared from the same dry materials, in the state of powder, by moistening them thoroughly with Diluted Alcohol, allowing them to stand for forty-eight hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *two ounces and a half* of sliced gentian, *ten drachms* of dried orange peel, *five drachms* of bruised cardamom, and *two Imperial pints* of proof spirit, and macerates for seven days. The *Edinburgh College* takes *two ounces and a half* of bruised gentian, *ten drachms* of bruised dried bitter orange peel, *six drachms* of canella in moderately fine powder, *half a drachm* of bruised cochineal, and *two Imperial pints* of proof spirit; digests for seven days, strains, expresses strongly, and filters; or prepares the tincture by percolation as directed for the compound tincture of cardamom. The *Dublin College*, using the avoirdupois weights, takes *three ounces* of the root, *an ounce and a half* of the peel, *half an ounce* of the seeds, and *two Imperial pints* of proof spirit, and macerates for two weeks.

This is an elegant bitter, much used in dyspepsia, and as an addition to tonic mixtures in debilitated states of the digestive organs, or of the system generally. There is, however, much danger of its abuse, especially in chronic cases. The dose is one or two fluidrachms. W.

TINCTURA GUAIACI. *U.S., Ed., Dub. Tincture of Guaiac.*

"Take of Guaiac, in powder, *half a pound;* Alcohol *two pints.* Macerate for fourteen days, and filter through paper." *U. S.*

The *Edinburgh College* takes *seven ounces* of guaiac, and *two Imperial pints* of rectified spirit; the *Dublin*, *eight avoirdupois ounces* of the guaiac and *two Imperial pints* of the spirit; the former digests for a week, the latter macerates for two weeks.

This tincture is given in chronic rheumatism and gout, in the dose of from one to three fluidrachms three or four times a day. As it is decomposed by water, it is most conveniently administered in mucilage, sweetened water, or milk, by which the separated guaiac is held in temporary suspension. The following is a form of tincture of guaiac which the late Dr. Dewees found very efficient in the cure of suppression of the menses, and dysmenorrhœa. "Take of the best Guaiac, in powder, *four ounces;* Carbonate of Soda or of Potassa *one drachm and a half;* Pimento, in powder, *an ounce;* Diluted Alcohol, *a pound.* Digest for a few days." Dr. Dewees directed a drachm or two of the spirit of ammonia to be added, "*pro re nata*," to four fluidounces of the tincture. (*Treat. on Dis. of Females*, A. D. 1826, p. 81.) The dose is a teaspoonful three times a day, to be gradually increased if necessary. Within our own experience, this remedy has proved highly useful in painful menstruation, given in the intervals of the attacks. The quantity of alkaline addition is too small to produce any sensible effect, and the pimento can act only as a spice; so that the virtues of the tincture reside in the guaiac, and the officinal tincture would probably be found equally effectual. W.

TINCTURA GUAIACI AMMONIATA. *U.S., Ed.* TINCTURA GUAIACI COMPOSITA. *Lond. Ammoniated Tincture of Guaiac.*

"Take of Guaiac, in powder, *four ounces;* Aromatic Spirit of Ammonia *a pint and a half.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* takes *seven ounces* of guaiac, coarsely powdered, and *two Imperial pints* of aromatic spirit of ammonia, and macerates for seven days. The *Edinburgh College* takes *seven ounces* of guaiac and *two Imperial pints* of spirit of ammonia, and digests for seven days in a well closed vessel.

This tincture is celebrated in the treatment of chronic rheumatism. It is

more stimulating, and is thought to be more effectual than the preceding. Like that, it is decomposed by water, and should be administered in some viscid or tenacious vehicle which may hold the guaiac in suspension. The Edinburgh differs from the U. S. and London preparation in having as the menstruum the caustic "spirit of ammonia," instead of the carbonated "aromatic spirit of ammonia," and is therefore stronger in reference to the ammoniacal properties of the tincture. The dose is one or two fluidrachms. W.

TINCTURA HELLEBORI. *U. S., Lond. Tincture of Black Hellebore.*

"Take of Black Hellebore, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Black Hellebore, in powder, with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of the bruised root, and *two Imperial pints* of proof spirit, and macerates for seven days.

This tincture, formerly called *tinctura Melampodii*, possesses the properties of black hellebore, and, upon the recommendation of Dr. Mead, has been much used in suppression of the menses. It is said to be peculiarly applicable to cases in which the grade of action is too high for the use of chalybeates. At best, however, it is an uncertain remedy, and, though frequently almost inert from the bad quality of the root, should always be administered with caution, as it is sometimes violent in its action. The dose is from thirty minims to a fluidrachm, to be taken night and morning. W.

TINCTURA HUMULI. *U. S.* TINCTURA LUPULI. *Lond. Tincture of Hops.*

"Take of Hops *five ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper." *U. S.*

The *London College* takes *six ounces* of hops and *two Imperial pints* of proof spirit, macerates for seven days, expresses, and filters.

Hops are so light and bulky that, in the proportion directed, they absorb almost all the spirit, which, after the requisite maceration, can be separated only by strong pressure. As this absorption of the spirit obstructs its proper action on all parts of the hops, it is necessary that the mixture should be frequently stirred during the maceration. By thoroughly drying the hops and rubbing them between the hands, or by cutting and bruising them, they may be brought to a state of division which will in a great measure obviate the disadvantages alluded to. As the virtues of hops depend chiefly on the lupulin, and as the quantity of this substance is not the same in different parcels, the tincture is necessarily unequal in strength; and the tincture of lupulin itself is greatly preferable. (See *Tinctura Lupulinæ.*)

The tincture of hops is tonic and narcotic, and has been proposed as a substitute for laudanum when the latter disagrees with the patient; but little reliance can be placed upon it. The condition of disease to which it appears to be best adapted, is the wakefulness, attended with tremors and general nervous derangement, to which habitual drunkards are liable, and which frequently precedes an attack of delirium tremens. The dose is from one to three fluidrachms. W.

TINCTURA HYOSCYAMI. *U. S., Lond. Ed., Dub. Tincture of Henbane.*

"Take of Henbane Leaves *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Henbane Leaves, in powder, with Diluted Alcohol, allowing them to stand for twenty-four hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of the dried leaves, and *two Imperial pints* of proof spirit, and macerates for seven days; the *Dublin*, *five avoirdupois ounces* of the former and *two Imperial pints* of the latter, and macerates for two weeks. The *Edinburgh College* orders the same amount of materials as the London, the henbane being in moderately fine powder, and directs the tincture to be prepared either by digestion, or preferably, by percolation, as directed for the tincture of capsicum.

This tincture may be advantageously substituted, as an anodyne and soporific, for that of opium, when the latter disagrees with the patient, or is objectionable on account of its property of inducing constipation. When the tincture of henbane purges, as it sometimes does, it may be united with a very small proportion of laudanum. The dose is a fluidrachm. The expressed juice preserved by means of alcohol may be used for the same purposes as the tincture. (See *page* 1218.) W.

TINCTURA IODINII. *U. S.* Tinctura Iodinei. *Ed.* *Tincture of Iodine.*

"Take of Iodine *an ounce;* Alcohol *a pint.* Dissolve the Iodine in the Alcohol." *U. S.*

The *Edinburgh College* directs *two ounces and a half* of iodine to be dissolved, with the aid of a gentle heat and agitation, in *two Imperial pints* of rectified spirit, and the tincture to be kept in well stopped bottles.

These tinctures contain so nearly the same proportion of iodine that, for practical purposes, they may be considered identical. They have very nearly the strength of the tincture employed by Coindet, which contained one part of iodine to twelve of alcohol by weight; while the U. S. tincture contains one part of the former to about 12·7 parts of the latter. It is best to prepare the tincture in small quantities at a time; as the iodine reacts on the alcohol, especially when exposed to solar light, giving rise to chemical changes. The iodine should be thoroughly dried before being weighed out. The tincture should be kept in well stopped bottles, in order to prevent the evaporation of the alcohol, and the consequent crystallization of the iodine.

The tincture of iodine has a deep-brown colour. Sixteen minims, equal to about thirty-five drops, contain one grain of iodine. It is at present less used internally than it formerly was, in consequence of an impression that it is apt to irritate the stomach. Water decomposes the tincture, and when this is swallowed, it is supposed that the iodine is precipitated upon the mucous membrane. Besides, the tincture undergoes a gradual change when kept, owing, according to Guibourt, to the reaction between the alcohol and iodine. A portion of the latter is supposed to take hydrogen from the former, producing hydriodic acid, which combines with another portion of the iodine to form iodurettted hydriodic acid; while the place of the hydrogen in the alcohol is thought to be supplied by iodine, giving rise to another iodurettted compound. The new products are soluble in water; and consequently the tincture gradually loses by time the property of being precipitated on dilution. (*Journ. de Pharm.*, 3*e sér.*, x. 113.) Yet, from the experiments of Dr. A. Göpel, it would appear that the change is slow if the tincture is kept in the dark and at a low temperature; for in three months a specimen thus treated had lost but one per cent. of iodine. (*Pharm. Central Blatt*, No. 13, A. D. 1850.) On account of its liability to precipitation in the stomach, the tincture of iodine is now almost exclusively employed locally. Undiluted, it acts as a powerful

irritant to the skin, producing inflammation, desquamation of the cuticle, &c. Nevertheless, it is much used in this state in erysipelas, chilblains, and other cases of cutaneous and subcutaneous inflammation, and often with very happy effects. But its application requires some caution; and in erysipelas, we are in the habit rather of surrounding the inflamed surface with a border of the tincture, embracing a portion of both the sound and the diseased skin, so as to prevent the progress of the inflammation, than of attempting a complete cure by covering the whole surface affected. It has been found useful in rendering the variolous eruption abortive. It has also been employed externally in croup, the bites of serpents, and local rheumatism. It is most conveniently applied by means of a camel's hair pencil. Diluted with the camphorated tincture of soap, or other alcoholic liquid, it is sometimes employed as an embrocation in scrofulous tumours and other affections requiring the use of iodine. It is much used in the radical cure of hydrocele, as an injection into the sac; and a similar employment of it has been extended to other serous cavities morbidly distended with fluid, as in the cases of ovarian dropsy, ascites, and empyema; but in these latter affections it should be resorted to, if at all, with very great caution. In hydrocele, M. Velpeau employed it diluted with double its volume of water. In the other cases referred to it has been variously diluted with from three to ten times its bulk of water, or some demulcent liquid. To prevent the precipitation of the iodine, iodide of potassium is generally added in the proportion of from two scruples to a drachm to each fluidounce of the tincture.

The dose of the tincture is from ten to twenty drops, which may be gradually increased to thirty or forty drops, three times a day. It may be given in sweetened water, and still better in wine, when this is not contra-indicated. M. Debauque, an apothecary of Mons, has ascertained that tannic acid has the property of rendering iodine soluble in water, and states that an ounce of syrup of orange-peel in four or six ounces of water, will form a clear solution with a quantity of tincture of iodine containing five or six grains of the medicine. (*Journ. de Pharm.*, 3e *sér.*, xx. 34.) W.

TINCTURA IODINII COMPOSITA. *U.S.*, *Lond.*, *Dub.* *Compound Tincture of Iodine.*

"Take of Iodine *half an ounce;* Iodide of Potassium *an ounce;* Alcohol *a pint.* Dissolve the Iodine and Iodide of Potassium in the Alcohol." *U. S.*

The *London College* takes *an ounce* of iodine, *two ounces* of iodide of potassium, and *two Imperial pints* of rectified spirit; macerates till they are dissolved, and filters. The *Dublin College* dissolves *half an ounce* of pure iodine and *an ounce* of iodide of potassium in *an Imperial pint* of alcohol, using the avoirdupois weights.

The U. S. tincture is rather stronger than the London, the wine pint employed in the former containing about one-fifth less than the Imperial pint employed in the latter. The difference, however, is of no great practical importance. The advantage of this tincture over the simple tincture above described is, that the former may be diluted with water without decomposition; so that, when it is swallowed, iodine is not precipitated upon the mucous coat of the stomach, and will not, therefore, be so likely to produce gastric irritation. This is a good theoretical recommendation; but we are by no means confident that the difference of the two preparations in irritating properties will be found very striking in practice. The compound tincture of iodine may be given internally for all the purposes which iodine is capable of answering. The dose is from fifteen to thirty drops, to be gradually increased if necessary. W.

TINCTURA JALAPÆ. *U.S.*, *Lond.*, *Ed.*, *Dub.* *Tincture of Jalap.*

"Take of Jalap, in powder, *six ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by moistening the Jalap thoroughly with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of coarsely powdered jalap, and *two Imperial pints* of proof spirit; the *Dublin*, *five avoirdupois ounces* of the root and *two Imperial pints* of the spirit; the former macerates for a week, the latter for two weeks. The *Edinburgh College* orders *seven ounces* of jalap, in moderately fine powder, and *two Imperial pints* of proof spirit, and allows the tincture to be prepared either by digestion or percolation, as directed for tincture of cinchona.

This tincture possesses the medical virtues of jalap, and is sometimes added to cathartic mixtures in the quantity of one or two fluidrachms, to increase their activity. W.

TINCTURA KINO. *U. S., Lond., Ed. Tincture of Kino.*

"Take of Kino, in powder, *six drachms;* Diluted Alcohol *a sufficient quantity.* Mix the Kino with an equal bulk of sand, and, having introduced it into a percolator, pour Diluted Alcohol gradually upon it until eight fluidounces of filtered liquor are obtained.

"This Tincture should be renewed frequently, and kept in closely stopped bottles; as it is apt to deteriorate rapidly by exposure." *U. S.*

The *London College* takes *three ounces and a half* of powdered kino and *two Imperial pints* of rectified spirit, macerates for a week, and filters. The *Edinburgh College* takes the same ingredients in the same proportion, and digests for a week.

This tincture very frequently becomes gelatinous if kept, and at length almost entirely loses its astringency. The character of the chemical reaction which takes place, remains to be investigated. The air has some effect; for if this is entirely excluded the tincture keeps for a long time without undergoing the change. The apothecary should introduce it when prepared into very small bottles, which should be kept well corked, and only opened when wanted for use. It is in consequence of its tendency to gelatinize, that the U. S. Pharmacopœia directs it to be frequently renewed. The dose is one or two fluidrachms. It is used chiefly as an addition to cretaceous and other astringent mixtures in diarrhœa. W.

TINCTURA KRAMERIÆ. *U. S., Dub. Tincture of Rhatany.*

"Take of Rhatany, in powder, *six ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by moistening the Rhatany thoroughly with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *Dublin College* takes *eight avoirdupois ounces* of the root, and *two Imperial pints* of proof spirit; macerates for two weeks, strains, expresses, and filters.

According to F. Boudet, the tincture of rhatany sometimes gelatinizes like that of kino (*Journ. de Pharm., 3e sér.*, i. 338); and the same observation has been made by others. The same precaution, therefore, should be observed, in relation to the mode of keeping it, as recommended in reference to tincture of kino. This is a good preparation of rhatany in cases which admit of the use of small quantities of alcohol. The dose is one or two fluidrachms. W.

TINCTURA LACTUCARII. *Ed. Tincture of Lactucarium.*

"Take of Lactucarium, in fine powder, *four ounces;* Proof Spirit *two pints*

[Imperial measure]. This tincture is best prepared by percolation as directed for Tincture of Myrrh; but may also be prepared by digestion with coarse powder of Lactucarium." *Ed.*

The dose of this tincture is from thirty minims to two fluidrachms. W.

TINCTURA LIMONIS. *Dub.* TINCTURA LIMONUM. *Lond.* *Tincture of Lemon Peel.*

"Take of fresh Lemon Peel *three ounces and a half;* Proof Spirit *two pints* [Imperial measure]. Macerate for seven days; then express, and filter." *Lond.*

The *Dublin College* macerates *five avoirdupois ounces* of the fresh peel, cut thin, in *an Imperial pint* of proof spirit for two weeks, strains, expresses, and filters.

This tincture forms a grateful aromatic addition to tonic and purgative infusions, mixtures, &c. It may be used in the dose of one or two fluidrachms.

Off. Prep. Syrupus Acidi Citrici. W.

TINCTURA LOBELIÆ. *U. S.*, *Lond.*, *Ed.*, *Dub.* *Tincture of Lobelia.*

"Take of Lobelia [the herb] *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Lobelia, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of the herb, and *two Imperial pints* of proof spirit, and macerates for a week; the *Dublin*, *five avoirdupois ounces* of the former, and *two Imperial pints* of the latter, and macerates for two weeks. The *Edinburgh College* directs the same quantities as the London; and states that the tincture is best prepared by percolation as directed for tincture of capsicum, though it may also be made by digestion.

This tincture possesses the emetic and narcotic properties of lobelia, and is sometimes used in asthma, in the dose of one or two fluidrachms, repeated every two or three hours till its effects are experienced. The emetic dose is half a fluidounce. W.

TINCTURA LOBELIÆ ÆTHEREA. *Ed.*, *Lond.* *Ethereal Tincture of Lobelia.*

"Take of dry Lobelia, in moderately fine powder, *five ounces;* Spirit of Sulphuric Ether *two pints* [Imperial measure]. This Tincture is best prepared by percolation, as directed for Tincture of Capsicum; but it may also be obtained by digestion in a well closed vessel for seven days." *Ed.*

The *London College* orders *five ounces* of powdered lobelia, *fourteen fluidounces* of ether, and *twenty-six fluidounces* of rectified spirit, macerates for seven days, expresses, and filters.

The stimulant operation of the ether in this preparation can scarcely favour the relaxing and nauseating action for which lobelia is usually employed. The dose is the same as that of the alcoholic tincture. W.

TINCTURA LUPULINÆ. *U. S.*, *Dub.* TINCTURA LUPULI. *Ed.* *Tincture of Lupulin.*

"Take of Lupulin *four ounces;* Alcohol *two pints.* Macerate for fourteen days, and filter through paper." *U. S.*

The *Dublin* process corresponds closely with that of the U. S. Pharmacopœia, *five avoirdupois ounces* of the lupulin, and *two Imperial pints* of rectified spirit being used.

"Take *any convenient quantity* of Hops, recently dried; separate by friction and sifting the yellowish-brown powder attached to their scales. Then take of

this powder *five ounces*, and of Rectified Spirit *two pints* [Imperial measure], and prepare the tincture by percolation or digestion, as directed for Tincture of Capsicum." *Ed.*

This is much superior to the tincture of hops of the first United States Pharmacopœia, in the place of which it was introduced into the second edition. In the original preparation, a certain quantity of hops was directed, from which the lupulin was to be separated by beating, and then digested in alcohol. As hops contain a variable proportion of lupulin, a tincture thus made must be of unequal strength; an objection to which the tincture of hops, even as now prepared, is in some measure liable. (See *Tinctura Humuli.*) Besides, the amount of lupulin contained in any quantity of hops upon which alcohol can conveniently act, is too small in proportion to the alcohol, to afford a tincture of the due strength. The tincture of lupulin is, therefore, in all respects, preferable. The dose is one or two fluidrachms, to be given in sweetened water or some mucilaginous fluid.

W.

TINCTURA MATICO. *Dub.* *Tincture of Matico.*

"Take of Matico Leaves, in coarse powder, *eight ounces* [avoirdupois]; Proof Spirit *two pints* [Imperial measure]. Macerate for fourteen days, strain, express, and filter." *Dub.*

The dose of this tincture is from one to three fluidrachms. W.

ESSENTIA MYRISTICÆ MOSCHATÆ. *Dub.* *Essence of Nutmeg.*

"Take of [volatile] Oil of Nutmeg *one fluidounce;* Stronger Spirit *nine fluidounces.* Mix with agitation." *Dub.*

For general observations on the Dublin essences see *Essentia Anisi.* The stronger spirit here used is alcohol of the sp. gr. 0·818. The dose of this preparation is twenty or thirty drops. W.

TINCTURA MYRRHÆ. *U. S., Lond., Ed., Dub.* *Tincture of Myrrh.*

"Take of Myrrh, bruised, *four ounces;* Alcohol *three pints.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* takes *three ounces* of powdered myrrh, and *two Imperial pints* of rectified spirit, and macerates for a week. The *Dublin College* takes *four avoirdupois ounces* of bruised myrrh, *two Imperial pints* of rectified spirit, and macerates for two weeks.

"Take of Myrrh, in moderately fine powder, *three ounces and a half;* Rectified Spirit *two pints* [Imperial measure]. Pack the Myrrh very gently without any Spirit in a percolator; then pour on the Spirit, and when thirty-three fluidounces have passed through, agitate well to dissolve the oleo-resinous matter which first passes, and which lies at the bottom. This tincture is much less conveniently obtained by the process of digestion for seven days." *Ed.*

Officinal alcohol is preferable, as a solvent of myrrh, to that fluid mixed with water; because it forms a perfectly clear solution, which is not attainable with the latter menstruum. The addition of water to the tincture renders it turbid. The tincture of myrrh is scarcely ever used internally. As a local application it is employed to stimulate indolent and foul ulcers, and promote the exfoliation of bones, and, diluted with water, is applied to spongy gums, aphthous sore mouth, and ulcerations of the throat. The dose, as a stimulant expectorant and emmenagogue, is from thirty minims to a fluidrachm.

Off. Prep. Tinctura Aloës et Myrrhæ. W.

TINCTURA NUCIS VOMICÆ. *U. S.* *Tincture of Nux Vomica.*

"Take of Nux Vomica, rasped, *eight ounces;* Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by moistening the Nux Vomica thoroughly with alcohol, allowing it to stand for two days, then transferring it to a percolator, and very gradually pouring Alcohol upon it until two pints of filtered liquor are obtained." *U. S.*

Should the operator have recourse to the second of these processes, it is of the greatest importance that the nux vomica should be well powdered; and, in consequence of the difficult action of solvents on this substance, probably from the presence of bassorin, the preliminary maceration should be continued for at least a week.

The tincture is not an eligible form for administering nux vomica, as it is equally uncertain with the medicine in substance, and has the disadvantage of excessive bitterness. The alcoholic extract, or strychnia is preferable. The dose of the tincture is from five to twenty drops. It is sometimes employed externally in cases of local paralysis. W.

TINCTURA OLEI MENTHÆ PIPERITÆ. *U. S.* ESSENTIA MENTHÆ PIPERITÆ. *Dub.* *Tincture of Oil of Peppermint. Essence of Peppermint.*

"Take of Oil of Peppermint *two fluidounces;* Alcohol *a pint.* Dissolve the Oil in the Alcohol." *U. S.*

The *Dublin College* dissolves *a fluidounce* of the oil in *nine fluidounces* of its stronger spirit (alcohol, sp. gr. 0·818).

This is a very popular preparation, which has long been kept in the shops under the name of *essence of peppermint*, and was adopted for the first time in the U. S. Pharmacopœia of 1840. It affords a convenient method of hastily administering a dose of the oil of peppermint; being of such a strength that, when dropped on loaf sugar, it may be taken without inconvenience by the patient. The dose is from ten to twenty drops, which may be given as just mentioned, or mixed with sweetened water.

Off. Prep. Aqua Menthæ Piperitæ. W.

ESSENTIA MENTHÆ PULEGII. *Dub.* *Essence of European Pennyroyal.*

"Take of Oil of [European] Pennyroyal *one fluidounce;* Rectified Spirit *nine fluidounces.* Mix with agitation." *Dub.*

This preparation is seldom or never used in the United States. It may be given in the dose of from fifteen to thirty drops.

Off. Prep. Aqua Menthæ Pulegii. W.

TINCTURA OLEI MENTHÆ VIRIDIS. *U. S.* ESSENTIA MENTHÆ VIRIDIS. *Dub.* *Tincture of Oil of Spearmint. Essence of Spearmint.*

"Take of Oil of Spearmint *two fluidounces;* Alcohol *a pint.* Dissolve the Oil in the Alcohol." *U. S.*

The *Dublin College* dissolves *a fluidounce* of the oil in *nine fluidounces* of its stronger spirit (alcohol of the sp. gr. 0·818).

The remarks made upon the tincture of oil of peppermint are applicable also to the present tincture. The dose of the *essence of spearmint* is from twenty to forty drops.

Off. Prep. Aqua Menthæ Viridis. W.

TINCTURA OPII. *U. S., Lond., Ed., Dub.* *Tincture of Opium. Laudanum.*

"Take of Opium, in powder, *two ounces and a half;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper." *U. S.*

The *London College* takes *three ounces* of opium, in powder, and *two Imperial pints* of proof spirit, macerates for seven days, expresses, and filters. The *Dublin*

College macerates *three avoirdupois ounces* of coarsely powdered opium in *two Imperial pints* of proof spirit for fourteen days, strains, expresses, and filters.

"Take of Opium, sliced, *three ounces;* Rectified Spirit *one pint and seven fluidounces* [Imperial measure]; Water *thirteen fluidounces and a half.* Digest the Opium in the Water at a temperature near 212° for two hours; break down the Opium with the hand; strain, and express the infusion; macerate the residuum in the Rectified Spirit for about twenty hours, and then strain and express very strongly. Mix the watery and spirituous infusions, and filter.

"This Tincture is not easily obtained by the process of percolation; but when the Opium is of fine quality, it may be prepared thus. Slice the Opium finely; mix the Spirit and Water; let the Opium macerate in fourteen fluidounces of the mixture for twelve hours, and then break it down thoroughly with the hand; pour the whole pulpy mass and fluid into a percolator, and let the fluid part pass through; add the rest of the Spirit without packing the Opium in the cylinder, and continue the process of percolation till two pints are obtained." *Ed.*

The proportion of opium in the several officinal formulæ is so nearly the same that the resulting tinctures may be considered identical. The apparent difference between the formulæ of the London and Edinburgh Colleges and ours will vanish, when the relative value of the Imperial measure, which they employ, and the wine measure of our Pharmacopœia is estimated. The Dublin preparation is somewhat weaker than the others from the use of the avoirdupois ounce. The drying and powdering of the opium, directed in all the Pharmacopœias except the Edinburgh, is clearly a useful provision; as it ensures greater uniformity in the strength of the tincture. Crude opium contains variable proportions of moisture; and laudanum prepared from a moist specimen will obviously be weaker than that from an equal weight of the dried. The pulverization ensures the previous drying of the drug, and is thus useful independently of the greater facility which it gives to the action of the menstruum. It is troublesome, however, and is often neglected. Innovation in so important a preparation, and one in which uniformity of strength is so desirable, should be avoided, unless clearly shown to be necessary. For these reasons we object to the Edinburgh formula, and greatly prefer the old standard of the U. S., London, and Dublin Pharmacopœias.

In the United States and Great Britain, this tincture is universally known by the name of *laudanum.* As this term was formerly applied to other preparations of opium, and still continues to be so on the continent of Europe, the tincture is sometimes distinguished by the epithet *liquidum*, which, however, is seldom used in this country. *Tinctura Thebaica* is another title by which the preparation is known.

About two-thirds of the opium used in the preparation of the tincture are dissolved, the residue consisting chiefly of inert matter. Allowing the opium to be wholly exhausted of its active principles, one grain would be represented by 12·8 minims, according to the U. S. formula; but a minute quantity of morphia has been detected in the residuary matter, so that the tincture is rather weaker than the proportion of opium employed would indicate. The difference, however, is insufficient to be of any practical importance.

The tincture of opium is used for all the purposes to which opium itself is applied. (See *Opium.*) The dose, equivalent to a grain of opium, is about thirteen minims, or twenty-five drops. Mr. Phillips, in his translation of the London Pharmacopœia of 1836, states that, by evaporating the tincture, and also by determining the quantity of opium left undissolved, he found the preparation to contain one grain of opium in 19 minims; and this quantity, therefore, is given as the dose equivalent to a grain of opium. But this mode of calculation is obviously fallacious; as the portion of the drug dissolved is much

more active than that left behind by the menstruum. Indeed, so feeble is the latter, that Dr. Garrod recently gave thirty grains of the residue to a healthy adult without effect. (*Pharm. Journ. and Trans.*, xi. 252.) It should be recollected that a fluidrachm or teaspoonful of laudanum (sixty minims), will afford, on an average, about one hundred and twenty drops. Laudanum, when long kept, with occasional exposure to the air, becomes thick, in consequence of the evaporation of a portion of the alcohol, and the deposition of opium. If given in this state, it often acts with unexpected energy; and cases of death have resulted in infants from its use in doses which would have been entirely safe if the tincture had been clear.

Denarcotized laudanum may be prepared by substituting the extract of opium in half the quantity for the opium itself, and previously to the maceration in diluted alcohol, exhausting it of the narcotina by ether.*

Off. Prep. Enema Opii; Linimentum Opii. W.

TINCTURA OPII ACETATA. *U. S.* *Acetated Tincture of Opium.*

"Take of Opium, in powder, *two ounces;* Vinegar *twelve fluidounces;* Alcohol *half a pint.* Rub the Opium with the Vinegar; then add the Alcohol, and, having macerated for fourteen days, express, and filter through paper." *U. S.*

This preparation was introduced into the second edition of our Pharmacopœia as a substitute for the *Acetum Opii* or *black drop* of the original work, the advantages of which it was supposed to possess, without being liable to the same objection of uncertainty of strength. The Acetum Opii, however, having maintained its standing in the estimation of the profession, and of the public, was restored, in the edition of 1840, to its officinal rank, but so modified as to ensure a preparation as uniform as is consistent with the variable quality of the opium used. (See *page* 797.) At the same time the formula for the acetated tincture was retained, as affording a useful preparation of the drug. It was originally employed by the late Dr. Joseph Hartshorne, of Philadelphia.

The acetated tincture of opium may often be advantageously used in cases in which laudanum or opium itself produces unpleasant effects, such as nausea and vomiting, intense headache, great nervous disorder, &c.; but the introduction of the salts of morphia into use has in a great measure superseded the necessity of this preparation. The dose is ten minims, or about twenty drops, equivalent to a grain of opium. W.

* *Elixir of Opium.* Under this name have been sold different liquid preparations of opium, consisting mainly, in all probability, of an aqueous solution, with sufficient alcohol to preserve it. A formula of this kind was published by Mr. Eugene Dupuy, of New York, in the *Am. Journ. of Pharm.* (xxiii. 211). Professor Procter in the same place gives a formula, differing from that of Mr. Dupuy in the employment of ether, so as to obtain at one operation a preparation analogous to the denarcotized laudanum mentioned in the text. The following is the formula referred to:—Take of opium, in powder, *ten drachms;* ether, alcohol, each, *four fluidounces;* water *a sufficient quantity.* Macerate the opium in half a pint of water for two days and express; subject the dregs to two successive macerations, using six fluidounces of water each time, with expression; mix and strain the liquors, and evaporate to two fluidounces; agitate the liquid with ether several times during half an hour, and then separate the ether by means of a funnel; evaporate the residue to dryness, dissolve the extract in half a pint of cold water, pour the solution on a filter, and after it has passed wash the filter with sufficient water to make the filtrate measure twelve fluidounces; lastly, add the alcohol and mix. This affords a liquid preparation of about the same strength as laudanum, containing the native meconate of morphia, without narcotina, and deprived of the unpleasant odour, and perhaps other more or less offensive ingredients of opium. The dose equivalent to a grain of opium is about thirteen minims; but in drops less than that of the tincture, as the elixir is much less alcoholic. Professor Procter has found, from numerous trials made at our request, that the average number of drops equivalent to thirteen minims is seventeen.—*Note to the tenth edition.*

TINCTURA OPII AMMONIATA. *Ed. Ammoniated Tincture of Opium.*

"Take of Benzoic Acid, and Saffron, chopped, of each, *six drachms;* Opium sliced, *half an ounce;* Oil of Anise *a drachm;* Spirit of Ammonia *two pints* [Imperial measure]. Digest for seven days, and then filter." *Ed.*

This tincture is used in Scotland under the title of *paregoric elixir;* but differs both in composition and strength from the preparation known by that name in the United States. Some doubts have been entertained whether it contains morphia. It is well known that ammonia precipitates morphia from its solutions; but a great excess of ammonia redissolves the precipitate. To decide the question, Mr. Gilbert, of Nottingham, submitted several portions of the tincture to a chemical examination, and was unable to detect morphia in them. (See *Med. Exam.*, iv. 493.) But we are not informed by the experimenter, whether the tincture was prepared, as directed by the College, with the Edinburgh spirit of ammonia, which is a strong alcoholic solution of the caustic alkali, or with the London spirit, which is a comparatively feeble solution of carbonate of ammonia. In the former case the ammonia, according to Dr. Christison, is in sufficient excess to hold the morphia in solution. At best, however, the preparation is of doubtful propriety; as, if the ammoniacal spirit should not happen to have the due strength, or if the ammonia should escape or become carbonated by exposure, the strength of the tincture would be affected. It is employed in spasmodic complaints, such as hooping-cough and asthma. Eighty minims should contain about a grain of opium. W.

TINCTURA OPII CAMPHORATA. *U. S., Ed., Dub.* TINCTURA CAMPHORÆ COMPOSITA. *Lond. Camphorated Tincture of Opium. Paregoric Elixir.*

"Take of Opium, in powder, Benzoic Acid, each, ~~*a drachm;*~~ Oil of Anise *a fluidrachm;* Clarified Honey *two ounces;* Camphor *two scruples;* Diluted Alcohol *two pints.* Macerate for fourteen days, and filter through paper." *U. S.*

The *London College* takes *fifty grains* of camphor, *seventy-two grains* of powdered opium, *the same quantity* of benzoic acid, *a fluidrachm* of oil of anise, and *two Imperial pints* of proof spirit, macerates for seven days, and filters. The *Edinburgh College* directs *fifty grains* of camphor, *four scruples* of opium, *four scruples* of benzoic acid, *a fluidrachm* of oil of anise, and *two Imperial pints* of proof spirit, and digests for a week. The *Dublin College* takes *a drachm and a half* [Dub. weight] of coarsely powdered opium, *the same quantity* of benzoic acid, *a drachm* [Dub. weight] of camphor, *a fluidrachm* of the oil of anise, and *two Imperial pints* of proof spirit, and macerates for two weeks.

This is the well-known *paregoric elixir.* It is a very pleasant anodyne and antispasmodic, much used to allay cough in chronic catarrh, asthma, consumption, pertussis, &c.; to relieve nausea and slight pains in the stomach and bowels; to check diarrhœa; and, in infantile cases, to procure sleep. Half a fluidounce of the U. S. and London tincture contains rather less than a grain of opium; of the Edinburgh and Dublin, about a grain. Liquorice, which was directed in a former edition of the U. S. Pharmacopœia, was omitted in that of 1840, in consequence of giving to the preparation the dark colour of laudanum, and thus leading to mistake. The dose for an infant is from five to twenty drops, for an adult from one to two fluidrachms.*

Off. Prep. Mistura Glycyrrhizæ Composita. W.

* The following formulæ have been adopted by the Philadelphia College of Pharmacy for the preparation of the two compound tinctures of opium, so much used under the names of *Bateman's drops* and *Godfrey's cordial.* So long as these nostrums are employed, it is important that they should be prepared in a uniform manner, and of a certain

ESSENTIA PIMENTÆ. *Dub. Essence of Pimento.*

"Take of Oil of Pimento *one fluidounce;* Rectified Spirit *nine fluidounces.* Mix with agitation." *Dub.*

For general observations on the Dublin essences see *Essentia Anisi.* The dose of this preparation is from thirty to sixty drops.

Off. Prep. Aqua Pimentæ. W.

TINCTURA QUASSIÆ. *U. S., Ed. Tincture of Quassia.*

"Take of Quassia, rasped, *two ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by moistening the Quassia thoroughly with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *Edinburgh College* takes *ten drachms* of quassia, and *two Imperial pints* of proof spirit, and digests for a week.

In the edition of the U. S. Pharmacopœia of 1840, the proportion of the quassia to the menstruum was very judiciously doubled. A tonic tincture can scarcely contain too large a proportion of the active ingredient. The Edinburgh preparation is much too feeble.

This tincture may be employed as an addition to tonic infusions or mixtures in the dose of one or two fluidrachms. It is a pure and intense bitter. W.

TINCTURA QUASSIÆ COMPOSITA. *Ed. Compound Tincture of Quassia.*

"Take of Cardamom seeds, bruised, and Cochineal, bruised, of each, *half an ounce;* Cinnamon, in moderately fine powder, and Quassia, in chips, of each, *six drachms;* Raisins *seven ounces;* Proof Spirit *two pints* [Imperial measure]. Digest for seven days, strain the liquor, express strongly the residuum, and filter. This Tincture may also be obtained by percolation, as directed for Compound Tincture of Cardamom, provided the Quassia be rasped or in powder." *Ed.*

This is tonic and aromatic, and may be given in the dose of one or two fluidrachms. W.

TINCTURA QUINÆ COMPOSITA. *Lond. Compound Tincture of Quinia.*

"Take of Disulphate [Sulphate, *U. S.*] of Quinia *five drachms and a scruple;* Tincture of Orange Peel *two pints* [Imperial measure]. Digest for seven days, or until it is dissolved, and filter." *Lond.*

A fluidrachm of this preparation, containing a grain of the sulphate of quinia, may be given for a dose. W.

strength; as serious consequences may happen from diversity in the formulæ, when so active a substance as opium is the chief ingredient. Such diversity has existed to a very great extent; so much so that in one formula for Bateman's drops the quantity of opium was seven and a half grains to the pint, while in another it exceeded one hundred grains. It was in order to remedy this evil, that the College was induced to adopt the formulæ here presented.

"*Bateman's pectoral drops.* Take of Diluted Alcohol Cong. iv., Red Saunders, rasped, ℥ij. Digest for twenty-four hours, filter, and add of Opium in powder ℥ij, Catechu in powder ℥ij., Camphor ℥ij., Oil of Anise f℥iv. Digest for ten days." This preparation is about equal in strength to the camphorated tincture of opium or paregoric elixir of the U. S. Pharmacopœia, containing about two grains of opium to the fluidounce.

"*Godfrey's cordial.* Take of Tincture of Opium Oiss., Molasses (from the sugar refiners) Oxvj., Alcohol Oij., Water Oxxvj., Carbonate of Potassa ℥iiss., Oil of Sassafras f℥iv. Dissolve the Carbonate of Potassa in the Water, add the Molasses, and heat over a gentle fire till they simmer; take off the scum which rises, and add the Laudanum and Oil of Sassafras, having previously mixed them well together." This preparation contains the strength of rather more than one grain of opium in a fluidounce. (*Journ. of the Phil. Col. of Pharm.*, v. 26 and 27.)

TINCTURA RHEI. *U. S., Ed. Tincture of Rhubarb.*

"Take of Rhubarb, bruised, *three ounces;* Cardamom [seeds], bruised, *half an ounce;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Rhubarb and Cardamom, in powder, with Diluted Alcohol, allowing them to stand for forty-eight hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *Edinburgh College* takes *three ounces and a half* of rhubarb, in moderately fine powder, *half an ounce* of bruised cardamom seeds, and *two Imperial pints* of proof spirit; and prepares the tincture, like that of cinchona, either by percolation or by digestion. W.

TINCTURA RHEI COMPOSITA. *Lond., Dub. Compound Tincture of Rhubarb.*

"Take of Rhubarb, sliced, *two ounces and a half;* fresh Liquorice Root, bruised, *six drachms;* Ginger, bruised, Saffron, each, *three drachms;* Proof Spirit *two pints* [Imperial measure]. Macerate for seven days; then express, and filter." *Lond.*

The *Dublin College* employs *three avoirdupois ounces* of bruised rhubarb, *one avoirdupois ounce* of bruised cardamom seeds, *half an avoirdupois ounce* of bruised liquorice root, *two drachms* [Dub. weight] of saffron, chopped fine, and *two Imperial pints* of proof spirit; and macerates for two weeks. W.

TINCTURA RHEI ET ALOES. *U. S., Ed. Tincture of Rhubarb and Aloes.* ELIXIR SACRUM. *Sacred Elixir.*

"Take of Rhubarb, bruised, *ten drachms;* Aloes, in powder, *six drachms;* Cardamom [seeds], bruised, *half an ounce;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper." *U. S.*

The *Edinburgh College* takes *an ounce and a half* of rhubarb, in moderately fine powder, *six drachms* of Socotrine or East India aloes, in moderately fine powder, *five drachms* of bruised cardamom seeds, and *two Imperial pints* of proof spirit; mixes the dry materials, and proceeds as for the tincture of cinchona. W.

TINCTURA RHEI ET GENTIANÆ. *U. S., Ed. Tincture of Rhubarb and Gentian.*

"Take of Rhubarb, bruised, *two ounces;* Gentian, bruised, *half an ounce;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Rhubarb and Gentian, in powder, with Diluted Alcohol, allowing them to stand for forty-eight hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *Edinburgh College* takes *two ounces* of rhubarb, in moderately fine powder, *half an ounce* of gentian, finely cut or in coarse powder, and *two Imperial pints* of proof spirit; mixes the powders, and proceeds as for tincture of cinchona.

The above tinctures of rhubarb are all in a greater or less degree purgative, stomachic, and tonic; but, except in low states of the system, or in cases of individuals accustomed to the use of ardent spirits, they are too feebly cathartic in proportion to their stimulant power, to be advantageously employed, unless as adjuvants to other medicines. Combined with the neutral salts or other laxatives, or with tonic and stomachic infusions, mixtures, &c., they serve to render

them warmer and more cordial to the stomach, and often prove beneficial in flatulent colic, dyspepsia, the costiveness of cold and irritable habits, diarrhœa, and other analogous complaints. One of them is to be preferred to another, according as its peculiar composition may, in the judgment of the practitioner, appear to adapt it to the circumstances of the case under treatment. In low forms of fever, when the indication is to evacuate the bowels, and at the same time stimulate the patient, the simple tincture (*Tinctura Rhei*) may be advantageously used in doses of two or three fluidrachms, repeated at proper intervals till it operates. The ordinary dose of these tinctures, as purgatives, is from half a fluidounce to a fluidounce; as stomachics, from one to two or three fluidrachms. W.

TINCTURA RHEI ET SENNÆ. *U. S.* *Tincture of Rhubarb and Senna.*

"Take of Rhubarb, bruised, *an ounce;* Senna *two drachms;* Coriander [seeds], bruised, Fennel-seed, bruised, each, *a drachm;* Red Saunders, rasped, *two drachms;* Saffron, Liquorice [extract], each, *half a drachm;* Raisins, deprived of their seeds, *half a pound;* Diluted Alcohol *three pints.* Macerate for fourteen days, express, and filter through paper." *U. S.*

This is the stomachic so well known, and so much used in this country, under the name of *Warner's gout cordial.* It is a feeble purgative, usually acceptable to the stomach, and well adapted to cases of costiveness, with gastric uneasiness, in persons of a gouty habit, and accustomed to the free use of wine or other stimulant drink. The dose is from half a fluidounce to two fluidounces. W.

ESSENTIA ROSMARINI. *Dub.* *Essence of Rosemary.*

"Take of Oil of Rosemary *one fluidounce;* Rectified Spirit *nine fluidounces.* Mix with agitation." *Dub.*

For some general observations on the Dublin essences, see *Essentia Anisi.* This preparation is used as an addition to rubefacient liniments, and may be given internally in the dose of from thirty to sixty drops, or about half that number of minims. W.

TINCTURA SANGUINARIÆ. *U. S.* *Tincture of Bloodroot.*

"Take of Bloodroot, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Bloodroot, in powder, with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

This will prove emetic in the dose of three or four fluidrachms; but it is rather intended to act as a stimulant to the stomach, expectorant, or alterative, for which purposes it may be given in the quantity of from thirty to sixty drops. W.

TINCTURA SAPONIS CAMPHORATA. *U. S.* LINIMENTUM SAPONIS. *Lond., Ed., Dub.* *Camphorated Tincture of Soap.*

"Take of Soap [Castile soap], in shavings, *four ounces;* Camphor *two ounces;* Oil of Rosemary *half a fluidounce;* Water *four fluidounces;* Alcohol *two pints.* Mix the Alcohol and Water, digest the Soap with the mixture by means of a water-bath till it is dissolved; then filter, and add the Camphor and Oil." *U. S.*

The *London College* takes *two ounces and a half* of soap, *ten drachms* of camphor, *eighteen fluidounces* of spirit of rosemary, and *two fluidounces* of distilled water; mixes the water with the spirit, then adds the soap and camphor, and macerates, with occasional agitation, till they are dissolved. The *Edinburgh College* takes *five ounces* of Castile soap, *two ounces and a half* of camphor, *six*

fluidrachms of oil of rosemary, and *two Imperial pints* of rectified spirit; digests the soap in the spirit for three days, adds the camphor and oil, and agitates briskly. The *Dublin College* dissolves *two avoirdupois ounces* of powdered Castile soap in *sixteen fluidounces* of proof spirit with a gentle heat, then adds *an avoirdupois ounce* of camphor; and, when it is dissolved, filters through paper, or allows it to stand, and decants the clear liquor.

It is necessary, in preparing this tincture, that the soap employed should not have been made with animal oil, as otherwise the preparation will not be fluid at ordinary temperatures. The soap indicated by the U. S. Pharmacopœia is that "prepared from soda and olive oil," commonly called *Castile soap.* Made according to the directions of the U. S. Pharmacopœia of 1840, the tincture was unable to retain the soap in solution, and, therefore, coagulated more or less on cooling. This defect was corrected in the edition of 1850, by the addition of water; and a similar reformation has been made in the London and Dublin processes, the latter using proof spirit, instead of the spirit of rosemary. This preparation has been usually called *soap liniment*, a name which more properly belongs to the *Linimentum Saponis Camphoratum* of the U. S. Pharmacopœia, or common *opodeldoc.*

The camphorated tincture of soap is much used, as an anodyne and gently rubefacient embrocation, in sprains, bruises, and rheumatic or gouty pains.

Off. Prep. Linimentum Opii. W.

TINCTURA SCILLÆ. *U. S., Lond., Ed., Dub. Tincture of Squill.*

"Take of Squill *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Squill, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol, until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of recently dried squill and *two Imperial pints* of proof spirit, and macerates for seven days; the *Dublin, five avoirdupois ounces* of the former and *two Imperial pints* of the latter, and macerates for fourteen days. The *Edinburgh College* takes *five ounces* of coarsely powdered squill, and *two Imperial pints* of proof spirit, and proceeds by percolation, as for the tincture of Peruvian bark, but without pressing the pulp firmly in the percolator. The College also allows the tincture to be prepared by digestion from the sliced bulb.

This tincture possesses all the virtues of squill, and may be given for the same purposes, whenever the spirituous menstruum is not objectionable. The dose as an expectorant or diuretic is from ten to twenty minims (twenty to forty drops), and the latter quantity frequently nauseates. W.

TINCTURA SENNÆ COMPOSITA. *Lond., Dub. Compound Tincture of Senna.*

"Take of Senna *three ounces and a half;* Caraway [seeds], bruised, *three drachms and a half;* Cardamom [seeds], bruised, *a drachm;* Raisins, deprived of seeds, *five ounces;* Proof Spirit *two pints* [Imperial measure]. Macerate for seven days; then express, and filter." *Lond.*

The *Dublin College* takes *four avoirdupois ounces* of senna, *half an avoirdupois ounce* of caraway, *the same quantity* of cardamom seeds, and *two Imperial pints* of proof spirit, and macerates for fourteen days.

This tincture is the *elixir salutis* of the old Pharmacopœias. It is a warm cordial purgative, useful in costiveness attended with flatulence, and in atonic gout, especially when occurring in intemperate persons. It is also added to

cathartic infusions and mixtures. The dose is from two fluidrachms to a fluid-ounce or more. W.

TINCTURA SENNÆ ET JALAPÆ. *U. S.* TINCTURA SENNÆ COMPOSITA. *Ed.* *Tincture of Senna and Jalap.*

"Take of Senna *three ounces;* Jalap, in powder, *an ounce;* Coriander [seeds], bruised, Caraway [seeds], bruised, each, *half an ounce;* Cardamom [seeds], bruised, *two drachms;* Sugar [refined] *four ounces;* Diluted Alcohol *three pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by beating well together the Senna, Jalap, Sugar, and Aromatics, moistening them thoroughly with Diluted Alcohol, allowing them to stand for forty-eight hours, then transferring them to a percolator, and gradually pouring upon them Diluted Alcohol until three pints of filtered liquor are obtained." *U. S.*

"Take of Sugar *two ounces and a half;* Coriander, bruised, *one ounce;* Jalap, in moderately fine powder, *six drachms;* Senna *four ounces*; Caraway, bruised, and Cardamom seeds, bruised, of each, *five drachms;* Raisins, bruised, *four ounces;* Proof Spirit *two pints* [Imperial measure]. Digest for seven days, strain the liquor, express strongly the residuum, and filter the liquids. This Tincture may be more conveniently and expeditiously prepared by percolation, as directed for the Compound Tincture of Cardamom." *Ed.*

This is another form of the *elixir salutis,* and scarcely differs from the preceding in virtues. It is given for the same purposes, and in the same doses. W.

TINCTURA SERPENTARIÆ. *U. S., Lond., Ed.* *Tincture of Virginia Snakeroot.*

"Take of Virginia Snakeroot, bruised, *three ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Virginia Snakeroot, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours; then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *three ounces and a half* of the root, and *two Imperial pints* of proof spirit, and macerates for seven days; the *Edinburgh, three ounces and a half* of the root, in moderately fine powder, *a drachm* of bruised cochineal, and *two Imperial pints* of proof spirit, and proceeds either by percolation or digestion as for the tincture of Peruvian bark.

This tincture possesses the tonic and cordial properties of the root, and may be advantageously added to the infusion of Peruvian bark in low states of the system. The dose is one or two fluidrachms. W.

TINCTURA STRAMONII. *U. S., Dub.* *Tincture of Stramonium.*

"Take of Stramonium Seed, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Stramonium Seed, in powder, with Diluted Alcohol, allowing it to stand for forty-eight hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *Dublin College* takes *five avoirdupois ounces* of the bruised seeds, and *two Imperial pints* of proof spirit, and macerates for fourteen days.

This tincture may be used for all the purposes for which stramonium is given, in the dose of from ten to twenty minims (twenty to forty drops), repeated twice or thrice a day, and gradually increased till it obviously affects the system. W.

TINCTURA TOLUTANA. *U. S., Lond., Ed., Dub. Tincture of Tolu.*

"Take of Balsam of Tolu *three ounces;* Alcohol *two pints.* Macerate until the Balsam is dissolved; then filter through paper." *U. S.*

The *London College* employs *two ounces* of the balsam to *two Imperial pints* of rectified spirit; the *Edinburgh, three ounces and a half* of the balsam to *two Imperial pints* of rectified spirit; the *Dublin, two avoirdupois ounces* to *an Imperial pint.* The last mentioned College directs the balsam to be dissolved with the aid of a gentle heat, the solution to stand for subsidence, and the clear tincture to be decanted.

The tincture of tolu has the properties of the balsam, and may be employed as an addition to expectorant mixtures in chronic catarrhal affections; but the proportion of alcohol is too large to allow of its advantageous use in ordinary cases. The dose is one or two fluidrachms. In smaller quantities it is often employed to flavour cough mixtures. It is decomposed by water.

Off. Prep. Syrupus Tolutanus; Trochisci Lactucarii; Trochisci Morphiæ; Trochisci Morphiæ et Ipecacuanhæ; Trochisci Opii. W.

TINCTURA VALERIANÆ. *U. S., Lond., Ed., Dub. Tincture of Valerian.*

"Take of Valerian, bruised, *four ounces;* Diluted Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Valerian, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of bruised valerian, and *two Imperial pints* of proof spirit, and macerates for seven days; the *Dublin, five avoirdupois ounces* of the powdered root, and *two Imperial pints* of proof spirit, and macerates for fourteen days; the *Edinburgh, five ounces* of the former and *two Imperial pints* of the latter, and proceeds by percolation or digestion as for the tincture of Peruvian bark.

This tincture possesses the properties of valerian, but cannot be given in ordinary cases, so as to produce the full effects of the root, without stimulating too highly in consequence of the large proportion of spirit. The dose is from one to four fluidrachms. W.

TINCTURA VALERIANÆ AMMONIATA. *U. S., Ed.* TINCTURA VALERIANÆ COMPOSITA. *Lond. Ammoniated Tincture of Valerian.*

"Take of Valerian, bruised, *four ounces;* Aromatic Spirit of Ammonia *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Valerian, in powder, with Aromatic Spirit of Ammonia, allowing it to stand for twenty-four hours in a covered vessel, then transferring it to a percolator, and gradually pouring upon it Aromatic Spirit of Ammonia until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *five ounces* of bruised valerian, and *two Imperial pints* of aromatic spirit of ammonia, and macerates for seven days; the *Edinburgh, five ounces* of valerian, and *two Imperial pints* of spirit of ammonia, and proceeds either by percolation, or by digestion in a well closed vessel, as directed for tincture of Peruvian bark.

The ammonia in this preparation is thought to assist the solvent powers of the alcohol, while it co-operates with the valerian in medical action. The tincture is employed as an antispasmodic in hysteria and other nervous affections.

The dose is one or two fluidrachms, and should be given in sweetened water, milk, or some mucilaginous fluid. W.

TINCTURA ZINGIBERIS. *U.S., Lond., Ed., Dub. Tincture of Ginger.*

"Take of Ginger, bruised, *eight ounces;* Alcohol *two pints.* Macerate for fourteen days, express, and filter through paper.

"This Tincture may also be prepared by thoroughly moistening the Ginger, in powder, with Diluted Alcohol, allowing it to stand for twenty-four hours, then transferring it to a percolator, and gradually pouring upon it Diluted Alcohol until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *two ounces and a half* of sliced ginger, and *two Imperial pints* of rectified spirit, and macerates for seven days; the *Dublin, eight avoirdupois ounces* of coarsely powdered ginger, and *two Imperial pints* of rectified spirit, and macerates for fourteen days; the *Edinburgh, two ounces and a half* of coarsely powdered ginger, and *two Imperial pints* of rectified spirit, and proceeds either by percolation or digestion, as for tincture of Peruvian bark.

The tinctures of the London and Edinburgh Colleges are too weak with ginger to be used advantageously for any other purpose than merely to impart flavour. We greatly prefer the processes of the U. S. and Dublin Pharmacopœias, which yield preparations in which the virtues of the ginger are not completely swallowed up in the menstruum. In consequence of the mucilaginous matter contained in ginger, the tincture made with diluted alcohol, or proof spirit, is apt to be turbid. Alcohol or rectified spirit is, therefore, properly preferred. We presume that the diluted alcohol directed in the U. S. process by percolation has been inadvertently put for alcohol, as the latter is directed in the first formula. Good Jamaica ginger should be used.

The tincture of ginger is a useful carminative, and may often be beneficially added to tonic and purgative infusions or mixtures, in debilitated states of the alimentary canal. It is, however, in this country, chiefly used for the preparation of syrup of ginger, for which purpose it is necessary to employ the strong tincture of the U. S. Pharmacopœia.

Off. Prep. Extractum Rhei Fluidum; Syrupus Zingiberis. W.

TROCHISCI.

Troches.

Troches or *lozenges* are small, dry, solid masses, usually of a flattened shape, consisting for the most part of powders incorporated with sugar and mucilage. They are designed to be held in the mouth, and dissolved slowly in the saliva, and are, therefore, adapted for the administration of those medicines only which do not require to be given in very large quantities, and are destitute of any very disagreeable flavour. They are much more used, and more skillfully prepared, in Europe than in this country. Tragacanth, from the greater tenacity of its mucilage, is better suited for their formation than gum Arabic. The following directions for preparing them are taken from the *Dictionnaire des Drogues.* A mucilage of tragacanth is first prepared with cold water and strained. With this the powders, including sugar, are thoroughly mixed by rubbing upon a marble slab, and are thus formed into a paste, which is spread out by means of a roller upon the surface of the marble, previously powdered over with a mixture of sugar and starch. The thickness of the extended mass is rendered uniform by a frame upon which the ends of the roller are placed. The upper surface is now covered with a thin layer of sugar and starch, and the mass is

divided into small cakes of a particular shape by means of a punch. These cakes are placed upon paper, and, having been exposed to the air for twelve hours, are carried into a drying room moderately heated. When perfectly dry they are thrown upon a sieve to separate the sugar and starch, and are then enclosed in bottles. In this way lozenges may be prepared from almost any medicine which the physician may deem it advisable to administer in that form. The following formula will serve as a guide. Take of citric acid, in powder, a drachm; refined sugar eight ounces; oil of lemons twelve minims; mucilage of tragacanth a sufficient quantity. Form them in the manner above directed into troches of twelve grains each. A species of lozenge is made by uniting the aromatic essential oils with sugar alone; but their preparation belongs to the confectioner rather than to the apothecary. The London and Dublin Pharmacopœias have omitted troches altogether. W.

TROCHISCI ACACIÆ. *Ed.* *Troches of Gum Arabic.*

"Take of Gum Arabic *four ounces;* Starch *one ounce;* Pure Sugar *one pound.* Mix and pulverize them, and make them into a proper mass with rose-water for forming lozenges." *Ed.*

These are useful in allaying the irritation of the fauces which excites coughing, and may be employed at pleasure. W.

TROCHISCI ACIDI TARTARICI. *Ed.* *Troches of Tartaric Acid.*

"Take of Tartaric Acid *two drachms;* Pure Sugar *eight ounces;* Volatile Oil of Lemons *ten minims.* Pulverize the Sugar and Acid, add the Oil, mix them thoroughly, and with Mucilage beat them into a proper mass for making lozenges." *Ed.*

These may be used as an agreeable refrigerant and demulcent in slight colds and fevers; but in large quantities are apt to derange the stomach. W.

TROCHISCI CRETÆ. *U. S., Ed.* *Troches of Chalk.*

"Take of Prepared Chalk *four ounces;* Gum Arabic, in powder, *an ounce;* Nutmeg, in powder, *a drachm;* Sugar, in powder, *six ounces.* Rub them together until they are intimately mixed; then with water form them into a mass, to be divided into Troches, each weighing ten grains." *U. S.*

The *Edinburgh College* uses the same ingredients in the same proportions, and beats them with a little water into a proper mass for making lozenges.

These are used as a gently astringent antacid in diarrhœa. W.

TROCHISCI GLYCYRRHIZÆ. *Ed.* *Troches of Liquorice.*

"Take of Extract of Liquorice [Liquorice, U. S.], and Gum Arabic, of each, *six ounces;* Pure Sugar *one pound.* Dissolve them in a sufficiency of boiling water; and then concentrate the solution over the vapour-bath to a proper consistence for making lozenges." *Ed.*

These lozenges are useful in allaying cough, but have been superseded in great measure by refined liquorice. W.

TROCHISCI GLYCYRRHIZÆ ET OPII. *U. S.* Trochisci Opii. *Ed.* *Troches of Liquorice and Opium.*

"Take of Opium, in powder, *half an ounce;* Liquorice, in powder, Sugar, in powder, Gum Arabic, in powder, each, *ten ounces;* Oil of Anise *a fluidrachm.* Mix the powders intimately; then add the Oil of Anise, and with water form them into a mass, to be divided into Troches, each weighing six grains." *U. S.*

"Take of Opium *two drachms;* Tincture of Tolu *half an ounce;* Pure Sugar, in fine powder, *six ounces;* Powder of Gum Arabic, and Extract of Liquorice [Liquorice, U. S.], of each, *five ounces.* Reduce the Opium to a fluid extract

by formula [*page* 983 U.S. Dispensatory]; mix it intimately with the Liquorice previously reduced to the consistence of treacle; add the Tincture; sprinkle the Gum and Sugar into the mixture, and beat it into a proper mass, which is to be divided into lozenges of ten grains." *Ed.*

The U. S. formula is more easy of execution than the Edinburgh, and affords a product probably not inferior. A preparation equivalent to the above is much used in Philadelphia under the name of *Wistar's cough lozenges.* Sometimes sulphate of morphia is substituted in equivalent proportion for the opium, and occasionally a little tartar emetic is added; but these modifications of the officinal formula are not admissible without a change of title.

These troches are demulcent and anodyne, and useful in allaying cough, when the case admits the employment of opium, of which each of them, prepared according to the U.S. formula, contains about one-tenth of a grain. W.

TROCHISCI IPECACUANHÆ. *U. S. Troches of Ipecacuanha.*

"Take of Ipecacuanha, in powder, *half an ounce;* Sugar, in powder, *fourteen ounces;* Arrow-root, in powder, *four ounces;* Mucilage of Tragacanth *a sufficient quantity.* Mix the powders intimately, and with the Mucilage form them into a mass, to be divided into Troches, each weighing ten grains." *U. S.*

These are useful expectorant lozenges in catarrhal complaints. Each of them contains about one-quarter of a grain of ipecacuanha. W.

TROCHISCI LACTUCARII. *Ed. Troches of Lactucarium.*

"To be prepared with Lactucarium in the same proportion and in the same manner as the Opium Lozenge." *Ed.*

This is a very feeble preparation; each lozenge containing only between the fifth and sixth of a grain of lactucarium. W.

TROCHISCI MAGNESIÆ. *U. S., Ed. Troches of Magnesia.*

"Take of Magnesia *four ounces;* Sugar *a pound;* Nutmeg, in powder, *a drachm;* Mucilage of Tragacanth *a sufficient quantity.* Rub the Magnesia, Sugar, and Nutmeg together until they are thoroughly mixed; then with the Mucilage form them into a mass, to be divided into Troches, each weighing ten grains." *U. S.*

"Take of Carbonate of Magnesia *six ounces;* Pure Sugar *three ounces;* Nutmeg *one scruple.* Pulverize them, and with Mucilage of Tragacanth beat them into a proper mass for making lozenges." *Ed.*

These are useful in acidity of stomach, especially when attended with constipation. W.

TROCHISCI MENTHÆ PIPERITÆ. *U. S. Troches of Peppermint.*

"Take of Oil of Peppermint *a fluidrachm;* Sugar, in powder, *a pound;* Mucilage of Tragacanth *a sufficient quantity.* Rub the Oil of Peppermint with the Sugar until they are thoroughly mixed; then with the Mucilage form them into a mass, to be divided into Troches, each weighing ten grains." *U. S.*

Useful in slight gastric or intestinal pains, nausea, and flatulence; but employed more for their agreeable flavour than for their medicinal effects. W.

TROCHISCI MORPHIÆ. *Ed. Troches of Morphia.*

"Take of Muriate of Morphia *one scruple;* Tincture of Tolu *half an ounce;* Pure Sugar *twenty-five ounces.* Dissolve the Muriate of Morphia in a little hot water; mix it and the Tincture of Tolu with the Sugar; and with a sufficiency of Mucilage form a proper mass for making lozenges, each of which should weigh about fifteen grains." *Ed.*

Useful for alleviating cough, and for other purposes which are answered by minute doses of morphia, of the muriate of which each lozenge contains about one-fortieth of a grain. W.

TROCHISCI MORPHIÆ ET IPECACUANHÆ. *Ed.* *Troches of Morphia and Ipecacuanha.*

"Take of Muriate of Morphia *one scruple;* Ipecacuan, in fine powder, *one drachm;* Tincture of Tolu *half a fluidounce;* Pure Sugar *twenty-five ounces.* Dissolve the Muriate in a little hot water; mix it with the Tincture and the Ipecacuan and Sugar; and with a sufficiency of Mucilage beat the whole into a proper mass, which is to be divided into fifteen grain lozenges." *Ed.*

Expectorant and anodyne, useful especially in allaying cough. Each lozenge contains about one-fortieth of a grain of muriate of morphia, and three times as much ipecacuanha. W.

TROCHISCI SODÆ BICARBONATIS. *U.S., Ed.* *Troches of Bicarbonate of Soda.*

"Take of Bicarbonate of Soda *four ounces;* Sugar, in powder, *a pound;* Mucilage of Tragacanth *a sufficient quantity.* Rub the Bicarbonate of Soda with the Sugar until they are thoroughly mixed; then with the Mucilage form them into a mass, to be divided into Troches, each weighing ten grains." *U. S.*

"Take of Bicarbonate of Soda *one ounce;* Pure Sugar *three ounces;* Gum Arabic *half an ounce.* Pulverize them, and with mucilage beat them into a proper mass for making lozenges." *Ed.*

Antacid and antilithic, useful in heartburn and uric acid gravel. W.

UNGUENTA.

Ointments.

These are fatty substances, softer than cerates, of a consistence resembling that of butter, and such that they may be readily applied to the skin by inunction. When ointments are prepared by merely mixing medicinal substances with simple ointment or *lard*, care should be taken, if the added substance be a powder, that it be brought to the finest possible state of division, before being incorporated with the unctuous matter. If soluble in water or alcohol, it may often be advantageously rubbed with a little of one of these liquids. Gritty matter should not be allowed to enter these preparations. When an extract is added, if not uniformly soft, it should be made so by trituration with a little water or alcohol according to its nature. Many of the ointments become rancid if long kept, and should, therefore, be prepared in small quantities at a time, or only when wanted for use. The tendency to rancidity may be in a considerable degree counteracted by imbuing the unctuous vehicle with benzoin, or with poplar buds, as recommended by M. Deschamps (see *Am. Journ. of Pharm.*, xv. 260); but care should be taken that there be no therapeutical objection to the admixture. Slippery elm bark is said to have the same effect. (See *page* 741.) According to Dr. Geisler, ten drops of spirit of nitric ether, incorporated with an ounce of ointment, obviates the disagreeable fatty odour of these preparations. (*Pharm. Cent. Blatt*, A.D. 1847, p. 927, from *Arch. der Pharm.*) W.

ADEPS SUILLUS PRÆPARATUS. *Dub.* *Prepared Lard.*

"Take of Lard of Commerce *any convenient quantity.* Melt it in twice its weight of boiling water, stirring the mixture constantly; then set the mixture aside to cool, and separate the Lard when it has solidified." *Dub.*

Perfectly fresh lard is so readily obtainable in our markets that this process is unnecessary with us; but the apothecary cannot be too much upon his guard, in preparing the ointments, to have the lard entirely free from salt and rancidity. W.

UNGUENTUM ANTIMONII. *U. S.* UNGUENTUM ANTIMONIALE. *Ed.* UNGUENTUM ANTIMONII POTASSIO-TARTRATIS. *Lond.* UNGUENTUM ANTIMONII TARTARIZATI. *Dub. Antimonial Ointment. Tartar Emetic Ointment.*

"Take of Tartrate of Antimony and Potassa, in very fine powder, *two drachms;* Lard *an ounce.* Rub the Tartrate of Antimony and Potassa with a little of the Lard, then add the remainder, and mix them." *U. S.*

The *London* and *Edinburgh Colleges* mix *an ounce* of tartar emetic and *four ounces* of lard; the *Dublin, a drachm* of the former, and *seven drachms* of the ointment of white wax.

This may be most conveniently prepared with *simple ointment*, as lard is too soft to be spread on linen, and simple ointment is sufficiently so to be applied by inunction.

The peculiar eruptive effects of tartar emetic may be procured in various ways, by means either of a strong solution, or of the powder sprinkled upon the surface of some adhesive plaster, or of the ointment as above directed. The last method is, perhaps, the most convenient, and most generally resorted to. The proportion of tartar emetic may vary from one drachm with the ounce of lard, to two drachms, as in the U. S. officinal formula, or even to three drachms when a speedy effect is required, or the skin is not very susceptible to its action. A small portion of the ointment may be rubbed twice a day, or more frequently, upon the surface to be affected, or it may be applied spread upon a piece of linen. Care should be taken that the cuticle be entire, and that the application be not too long continued; as otherwise very severe inflammation, and even gangrenous ulceration, may result. We have, however, in some instances of great urgency, applied the ointment to a surface recently scarified in the operation of cupping; but, under such circumstances, it should be used with much caution. W.

UNGUENTUM AQUÆ ROSÆ. *U. S. Ointment of Rose Water.*

"Take of Rose Water *a fluidounce;* Oil of Almonds *two fluidounces;* Spermaceti *half an ounce;* White Wax *a drachm.* Melt together, by means of a water-bath, the Oil, Spermaceti, and Wax; then add the Rose Water and stir the mixture constantly until it is cold." *U. S.*

This preparation is much employed under the name of *cold cream.* It is a white, very soft, and elegant unguent, deriving a grateful odour from the rose water, which remains incorporated with the other constituents if kept enclosed in glazed vessels. It is a pleasant, cooling application to irritated and excoriated surfaces; and may be used with great advantage for chapped lips and hands, so frequent in cold weather. As the ointment is liable to become rancid when long kept, and the water to separate upon exposure, Mr. Joseph Laidley has proposed the substitution for the rose water of oil of roses and glycerin, the former in the proportion of two drops, the latter in that of four fluidrachms, the quantity of spermaceti being increased by two drachms. (*Am. Journ. of Pharm.*, xii. 119.) For some purposes the substitution is useful; but the officinal preparation is preferable for chapped hands, as the glycerin, not being absorbed, leaves an unpleasant sensation of stickiness on the skin. W.

UNGUENTUM BELLADONNÆ. *U. S., Lond. Ointment of Belladonna.*

"Take of Extract of Belladonna *a drachm;* Lard *an ounce.* Mix them." *U. S.*

The *London* formula is the same.

This is a convenient form for the external application of the extract of belladonna. Care must be taken in preparing it that the extract employed have the proper consistence; and, if dry and lumpy, it may be restored to the proper state by rubbing it with a little water in a heated mortar. W.

UNGUENTUM CANTHARIDIS. *U. S., Lond., Dub.* UNGUENTUM INFUSI CANTHARIDIS. *Ed. Ointment of Spanish Flies.*

"Take of Spanish Flies, in powder, *two ounces;* Distilled Water *half a pint;* Resin Cerate *eight ounces.* Boil down the Water with the Spanish Flies to one-half, and strain; then mix the Cerate with the strained liquor, and evaporate to the proper consistence." *U. S.*

The *London College* takes *three ounces* of the flies, in very fine powder, *twelve fluidounces* of distilled water, and *a pound* of resin cerate, and proceeds as above.

"Take of Cantharides, in moderately fine powder, Resin, and Bees'-wax, of each *one ounce;* Venice Turpentine, and Axunge [lard], of each, *two ounces;* boiling Water *five fluidounces.* Infuse the Cantharides in the Water for one night, squeeze strongly, and filter the expressed liquid. Add the Axunge, and boil till the water is dispersed. Then add the Wax and Resin; and when these have become liquid, remove the vessel from the fire, add the Turpentine, and mix the whole thoroughly." *Ed.*

"Take of Liniment of Spanish Flies *eight fluidounces;* White Wax *three ounces* [avoirdupois]; Spermaceti *one ounce* [avoird.]. Melt the Wax and Spermaceti in the Oil, with a gentle heat, and stir the mixture constantly until it concretes." *Dub.*

By these processes, the active matter of the flies is more uniformly diffused through the ointment than when they are directly incorporated, in the state of powder, with the other ingredients. The preparation is thus better calculated to meet the end proposed of maintaining the discharge from blistered surfaces, without producing undue irritation. It has been said that the virtues of the flies are impaired by boiling; but the contrary has been proved by experiment to be the case; the cantharidin being neither altered nor volatilized at the boiling temperature. (See *Cantharis.*) The Edinburgh College, therefore, gains nothing by the substitution of infusion. It is necessary, in the U.S. and London processes, after the strained decoction and cerate have been mixed, to stir constantly during the continuance of the evaporation, in order to prevent the former from sinking to the bottom. Unless with care a considerable portion of the decoction will be retained by the flies when strained, and thus loss be incurred. To prevent this, pour the concentrated decoction into a glass funnel with some cotton twist in its mouth, and, when the liquid ceases to pass, pour in water gradually and carefully until four fluidounces of the filtered decoction are obtained; then proceed to incorporate this with the cerate as directed. The Dublin preparation is more elegant than the others, the liniment ordered being an oleaginous solution of the active matter of the flies, and easily mixing with the other ingredients. It should be recollected that this ointment is intended as a dressing for blisters, not to produce vesication. The Edinburgh ointment differs from the others in containing Venice turpentine, which renders it more stimulating. *Dupuytren's ointment* employed as a local application to prevent the loss of hair, was made by macerating a drachm of flies in a fluidounce of alcohol, and incorporating one part of the tincture thus formed with nine parts of lard. W.

UNGUENTUM CANTHARIDIS. *Ed.* CERATUM CANTHARIDIS. *Lond. Ointment of the Powder of Spanish Flies.*

"Take of Resinous Ointment *seven ounces;* Cantharides, in very fine powder, *one ounce.* Melt the Ointment; sprinkle into it the Cantharides powder, and stir the mixture briskly as it concretes on cooling." *Ed.*

"Take of Spanish Flies, in very fine powder, *an ounce;* Spermaceti Cerate *six ounces.* To the Cerate softened by heat, add the Flies, and mix." *Lond.*

This ointment, like the preceding, is intended as a dressing for blistered surfaces, with a view to maintain the discharge. The flies should be very finely

powdered, in order that they may be diffused as uniformly as possible through the mass. It is unfortunate that the term *ceratum cantharidis* has been conferred upon this preparation by the London College; as the same name is properly applied in the U. S. Pharmacopœia to the preparation of flies intended to be used as a vesicatory. Neither of these ointments can be used in individuals liable to strangury from the external application of cantharides. W.

UNGUENTUM CETACEI. *Lond.* *Spermaceti Ointment.*

"Take of Spermaceti *five ounces;* White Wax *fourteen drachms;* Olive Oil *a pint* [Imperial measure], or *a sufficient quantity.* Melt them together over a slow fire, and stir them constantly until cold." *Lond.*

This ointment is employed as a mild dressing for blisters, wounds, and excoriated surfaces. It should be made in small quantities at a time, as it is apt to become rancid when long kept. W.

UNGUENTUM COCCULI. *Ed.* *Ointment of Cocculus Indicus.*

"Take *any convenient quantity* of Cocculus Indicus, separate and preserve the kernels, beat them well in a mortar, first alone and then with a little Axunge [lard]; and then add Axunge till it amounts altogether to five times the weight of the kernels." *Ed.*

This ointment is used for the destruction of Vermin, and in the cure of scabies and ringworm of the scalp. In the latter complaint it was found very useful by the late Dr. Hamilton, sen., of Edinburgh. W.

UNGUENTUM CONII. *Lond.* *Ointment of Hemlock.*

"Take of fresh Hemlock [Leaves], Lard, each, *a pound.* Boil the Hemlock in the Lard till it becomes crisp, then express through linen." *Lond.*

This ointment has been used as an anodyne application to irritable piles, painful glandular swellings and scirrhous tumours, and to cancerous and other painful ulcers; but the virtues of the hemlock are impaired by the heat necessary in its preparation. An ointment made by mixing good extract of hemlock with lard would be more efficient. W.

UNGUENTUM CREASOTI. *U. S., Lond., Ed., Dub.* *Ointment of Creasote.*

"Take of Creasote *half a fluidrachm;* Lard *an ounce.* Mix them." *U. S.*

The *London* process is the same as that of the U. S. Pharmacopœia. The *Edinburgh College* takes *a drachm* of creasote and *three ounces* of lard, melts the lard, adds the creasote, and stirs briskly till the mixture concretes on cooling. The *Dublin College* takes a fluidrachm of creasote and *seven drachms* (Dub. weight) of ointment of white wax (simple ointment), and proceeds in the same manner as the Edinburgh.

For the use of this ointment see *Creasotum.* It may sometimes be advantageously diluted with lard when found to irritate. W.

UNGUENTUM CUPRI SUBACETATIS. *U. S., Dub.* UNGUENTUM ÆRUGINIS. *Ed.* *Ointment of Subacetate of Copper.*

"Take of Subacetate of Copper, in fine powder, *a drachm;* Simple Ointment *fifteen drachms.* Add the Subacetate of Copper to the Ointment previously melted with a moderate heat, and stir them constantly till they are cold." *U. S.*

"Take of Resinous Ointment *fifteen ounces;* Verdigris, in fine powder, *one ounce.* Melt the Ointment, sprinkle into it the powder of Verdigris, and stir the mixture briskly as it cools and concretes." *Ed.*

"Take of Prepared Subacetate of Copper *half a drachm;* Ointment of White Wax [Unguentum Simplex, *U. S.*] *seven drachms and a half.* Triturate the Subacetate of Copper with the Ointment until they are intimately mixed." *Dub.*

This ointment is employed as a mild escharotic in fungous granulations, and,

more or less diluted with lard, as a stimulating application to foul and flabby ulcers, scrofulous ulcerations of the edges of the eyelids, disease of the external meatus of the ear with purulent discharge, to warts and corns, and to certain cutaneous eruptions, particularly that form of porrigo denominated *ringworm of the scalp.* W.

UNGUENTUM ELEMI. *Lond., Dub. Ointment of Elemi.*

"Take of Elemi *three ounces;* Turpentine *two ounces and a half;* Suet *six ounces;* Olive Oil *half a fluidounce.* Melt the Elemi with the Suet, and, having removed them from the fire, immediately mix them with the Turpentine and Oil, and express through linen." *Lond.*

"Take of Resin of Elemi *four ounces* [avoirdupois]; Ointment of White Wax *one pound* [avoirdupois]. Melt them together, strain through flannel, and stir the mixture constantly till it concretes." *Dub.*

This ointment is applied as a gentle stimulant to weak ulcers, and may be used for maintaining the discharge of issues and setons. It is the *linimentum arcæi* of the older pharmacy. W.

UNGUENTUM GALLÆ. *U.S., Dub. Ointment of Galls.*

"Take of Galls, in powder, *an ounce;* Lard *seven ounces.* Mix them." *U. S.*

The *Dublin College* rubs *a drachm* of galls, in very fine powder, with *seven drachms* of ointment of white wax.

This is used chiefly in piles and prolapsus ani, though it may also be advantageously applied to flabby and indolent ulcers. W.

UNGUENTUM GALLÆ COMPOSITUM. *Lond.* UNGUENTUM GALLÆ ET OPII. *Ed. Compound Ointment of Galls.*

"Take of Galls, in very fine powder, *six drachms;* Lard *six ounces;* Opium, in powder, *a drachm and a half.* Rub them together." *Lond.*

The *Edinburgh College* takes *two drachms* of galls, *a drachm* of opium, and *an ounce* of lard, and rubs them together into a uniform mass.

This combination of galls and opium is sometimes employed, preferably to the simple ointment of galls, in cases of irritable piles. From half a drachm to a drachm of camphor is sometimes added to the London ointment. W.

UNGUENTUM HYDRARGYRI. *U.S., Lond., Ed., Dub. Mercurial Ointment.*

"Take of Mercury *two pounds;* Lard *twenty-three ounces;* Suet *an ounce.* Rub the Mercury with the Suet and a small portion of the Lard until the globules disappear; then add the remainder of the Lard, and mix." *U. S.*

The *London* process is the same, with one-half of the quantity of material.

"Take of Mercury *two pounds;* Axunge [lard] *twenty-three ounces;* Suet *one ounce.* Triturate the Mercury with the Suet and a little of the Axunge till globules are no longer visible; then add the rest of the Axunge, and mix the whole thoroughly. This ointment is not well prepared so long as metallic globules may be seen in it with a magnifier of four powers. The Mercurial Ointment with the proportions here directed may be diluted at pleasure with twice or thrice its weight of axunge." *Ed.*

"Take of Pure Mercury, Prepared Lard, of each, *a pound.* Rub them together until metallic globules cease to be visible to the naked eye." *Dub.*

The Pharmacopœias unite at present in recognising but one mercurial ointment, which contains equal weights of mercury and fatty matter. When the physician wishes a weaker preparation, he may direct the ointment to be diluted with such a proportion of lard as may answer his purposes. The Edinburgh College, in allowing dilution of the ointment in certain fixed proportions, should have given names, by which the weaker preparations might be designated.

In the preparation of mercurial ointment, care is requisite that the mercury should be completely extinguished. The trituration is best performed in a marble mortar, as it is difficult to keep iron so clean as not to impart more or less oxide to the ointment. The mercury is known to be extinguished, when a portion of the mass, rubbed upon paper or the back of the hand, exhibits no metallic globules under a magnifying glass of four powers. The operation cannot be considered as satisfactorily accomplished when the globules are invisible merely to the naked eye. To facilitate the process, which is very tedious, the addition of various substances has been proposed, calculated to hasten the disappearance of the metal. Turpentine and sulphur have been employed, but are inadmissible; the former because it renders the ointment too irritating, the latter because it forms with the mercury an inactive sulphuret. Their presence in the ointment may be detected by the peculiar odour which they respectively emit when exposed to heat. Sulphur, moreover, gives the ointment a darker colour than it has when pure. The addition of a little sulphuric ether, at intervals, during the trituration, is said greatly to abbreviate the process. (*Am. Journ. of Pharm.*, xvii. 80.) Rancidity in the lard employed facilitates the extinguishment of the mercury, but is liable to the same objection as turpentine, though in a much less degree. M. Fossembras found that the addition of rancid fat was required in the proportion of only ten drachms to a pound of the ointment, in order to enable eight pounds to be prepared in an hour. (*Journ. de Pharm.*, 3*e sér.*, v. 75.) M. Guibourt recommends the addition of one-sixteenth of old mercurial ointment. M. Simonin proposes the use of lard which has been exposed in thin layers to a damp air for fifteen days. This facilitates the extinguishment of the metal, but it probably renders the preparation more irritant by the chemical alteration of the lard. The following plan of preparing the ointment was proposed by M. Chevallier. A pound of mercury, and half a pound of fresh lard previously melted, are introduced into a stone or glass bottle, shaken till the mixture acquires the consistence of very thick syrup, then poured into a mortar, and incorporated by constant stirring with an additional half pound of lard. In this manner, according to Chevallier, a perfect ointment may be made in half an hour. When prepared with lard alone, the ointment is apt, in hot weather, to become so soft as to allow the metal to separate. Hence the addition of suet in the processes of the U. S., London, and Edinburgh Pharmacopœias; and even a larger proportion might be employed when the ointment is prepared for use in the summer season.

Upon the whole, it may be considered doubtful whether any of the expedients for saving labour and time in the preparation of the ointment are wholly unobjectionable. Dr. Christison states that the better plan is not to complete the process by a continuous trituration, but to operate for a short time every day, and allow the ointment in the mean time to be exposed to the air. But so much labour is required in the process, that the ointment is preferably made by machinery on the large scale. The fatty matters, kept in the fluid state by a heat of about 100°, are triturated with the metal by means of two iron balls, which are driven rapidly round in a circular iron trough by steam power. The extinguishment of the mercury is thus effected in about twelve hours.

A new method of preparing mercurial ointment, proposed by Orosi, is to precipitate metallic mercury, in the pulverulent form, from a solution of corrosive sublimate, by an excess of protochloride of tin, with the addition of muriatic acid; and, having poured off the supernatant fluid, washed the precipitate with warm water, and dried it between bibulous paper, to incorporate it with the prescribed proportion of lard. To prevent the precipitated mercury from running into globules, it is recommended to cover with fat the interior of the vessel in which the precipitation takes place. (*Ranking's Abstract*, i. 350.)

Mercurial ointment has when newly prepared a bluish colour, which becomes darker by age. It has been thought to contain the mercury in the state of protoxide; but most of the metal can be separated by methods not calculated to reduce the oxide; and it is now generally admitted that by far the greater part of it exists in a state of minute division, not of chemical combination. It has been shown, however, that the metal is slightly oxidized; and the change of colour which the ointment undergoes with age is attributable to further oxidation. If the ointment be kept long melted in a narrow vessel, metallic mercury subsides, and an oily liquid floats upon the surface. After this has been filtered so as to separate everything undissolved, it is blackened by sulphuretted hydrogen, and yields oxide of mercury to acetic acid. Dr. Christison states that he has examined various samples of the ointment, and never failed to detect oxide of mercury; and he has inferred from his observations, that the oxide amounts to rather more than one per cent. (*Christison's Dispensatory.*) But the proportion is variable according to the age and mode of preparation of the ointment. It scarcely admits of a doubt, that the oxide of mercury formed enters into chemical combination with the lard, or one of its oily acids. Mr. Donovan advanced the idea that the medicinal activity of the ointment depended exclusively on this compound of the lard with the mercurial oxide. An ointment made by merely mixing lard and black oxide of mercury has not the same effect, because there is no chemical union between the ingredients. But, upon exposing such a mixture to a temperature of 350°, and continually agitating it for two hours, he found that every ounce of lard dissolved and combined with twenty-one grains of oxide, and the resulting compound was proved to be equally effectual with the common ointment, and capable of being introduced into the system in one-third of the time. It has been proposed to substitute an ointment thus prepared for that made according to the officinal directions, as being more manageable, and of more uniform strength. Care, however, would be required in preparing it to avoid a temperature either too high or too low; as the former might decompose the oxide, and the latter would be insufficient to effect its union with the lard. There would be danger, also, that the lard might be rendered irritant by the influence of the heat. Dr. F. Von Bærensprung has rendered it extremely probable that metallic mercury, no matter in what state of division it may be, is unable to enter the blood-vessels, and that whatever effects on the system are produced by the ointment, or any similar preparation, or even by the vapours of mercury, are owing to the previous oxidation of the metal. (See *Chem. Gaz.*, Sept. 1, 1850, p. 321.)

From experiments by a committee of the College of Pharmacy, of New York, it appears that the ointment contained in jars becomes somewhat unequal in consequence of the settling of the metallic ingredient. The inference is that, after long standing, the contents of the jar should be triturated so as to restore an equable strength before being dispensed. (*Am. Journ. of Pharm.*, xvi. 2.)

Medical Uses. Mercurial ointment, when rubbed upon the surface of the body, produces, in consequence of its absorption, the general effects of mercury upon the system. It is resorted to either alone, when circumstances prevent or discourage the internal use of mercury, or conjointly with the internal use of the medicine, to produce a more speedy or powerful effect in urgent cases. It may also be advantageously employed as a resolvent in local affections; as in the case of venereal buboes, and of chronic glandular swellings, upon which it may be made to operate directly by being applied in the course of the absorbents passing through the enlarged glands. The proper quantity to be employed at one time, with a view to salivation, is about a drachm, which should be applied night and morning, by means of friction, to the inner surface of the thighs, legs, or arms, and continued till the system is affected.

In urgent cases, or in local affections, it may also be rubbed on other parts of the body, or applied to blistered surfaces. The friction should on each occasion be continued till the whole of the ointment is absorbed. When frequently rubbed upon the same part, it is apt to produce a disagreeable eruption which interferes with its continued application. Camphor is sometimes added, in order to render it more easy of absorption; but, without producing this effect, it increases the liability of the ointment to irritate the skin, and is of no other advantage than to soften its consistence when too firm from a large proportion of suet. Mercurial ointment has been employed, with some success, to prevent the maturation of the smallpox pustule, and the consequent pitting. For this purpose it may be applied to the face or other part, thickly spread on patent lint or muslin, care being taken to prevent the access of the air to the covered part. To be successful it must be applied before the third or fourth day of the eruption. The ointment has been recommended also in erysipelas and chilblains. Iodide of potassium rubbed with mercurial ointment is said to promote the separation of the mercury in the form of globules (*Journ. de Pharm.*, 3*e sér.*, x. 356); but the effect does not take place if the iodide is thoroughly dried and well powdered, and the ointment added to it by small portions at a time. (*Ibid.*, x. 421.)

The ointment diluted with twice or three times its weight of lard is sometimes employed as an application to ulcers, and to certain cutaneous eruptions.

Off. Prep. Ceratum Hydrargyri Comp.; Linimentum Hydrargyri. W.

UNGUENTUM HYDRARGYRI AMMONIATI. *U. S.* Unguentum Hydrargyri Ammonio-chloridi. *Lond.* Unguentum Precipitati Albi. *Ed.* *Ointment of Ammoniated Mercury. Ointment of White Precipitate.*

"Take of Ammoniated Mercury *a drachm;* Simple Ointment *an ounce and a half.* Mix them." *U. S.*

The processes of the *British Colleges* are essentially the same as the above.

This ointment is employed chiefly in cutaneous eruptions, such as psora, porrigo, and herpes. W.

UNGUENTUM HYDRARGYRI IODIDI. *Lond.* *Ointment of Iodide of Mercury.*

"Take of Iodide of Mercury *an ounce;* White Wax *two ounces;* Lard *six ounces.* To the Wax and Lard melted together add the Iodide, and rub together." *Lond.*

UNGUENTUM HYDRARGYRI IODIDI RUBRI. *Dub.* *Ointment of Red Iodide of Mercury.*

"Take of Red Iodide of Mercury *one drachm;* Ointment of White Wax *seven drachms.* Incorporate the Iodide of Mercury and Ointment by careful trituration in a mortar." *Dub.*

Both the above ointments are employed as dressings to scrofulous ulcers; the ointment of the red iodide being preferred, on account of its much greater activity, when the ulcers are very indolent. W.

UNGUENTUM HYDRARGYRI NITRATIS. *U. S.*, *Lond.* Unguentum Citrinum. *Ed.* Unguentum Hydrargyri Nitratis *vel* Unguentum Citrinum. *Dub.* *Ointment of Nitrate of Mercury. Citrine Ointment.*

"Take of Mercury *an ounce;* Nitric Acid *fourteen fluidrachms;** Fresh Neats-foot Oil *nine fluidounces;* Lard *three ounces.* Dissolve the Mercury in

* In the last edition of this work, the old quantity of *eleven* fluidrachms of nitric acid was inadvertently retained, instead of *fourteen*, as directed in the present U. S. Pharmacopœia, which, by adopting a weaker acid, rendered an increase of the quantity necessary.

the Acid; then heat together the Oil and Lard, in an earthen vessel, to 200°; lastly, add the mercurial solution, and stir with a wooden spatula constantly so long as effervescence continues, and afterwards occasionally until the ointment stiffens." *U. S.*

"Take of Mercury *two ounces;* Nitric Acid *four fluidounces* [Imperial measure]; Lard *a pound;* Olive Oil *eight fluidounces* [Imp. measure]. First dissolve the Mercury in the Acid; then, while the solution is hot, mix it with the Lard and Oil previously melted together." *Lond.*

"Take of Pure Nitric Acid *eight fluidounces and six fluidrachms* [Imperial measure]; Mercury *four ounces;* Axunge [lard] *fifteen ounces;* Olive Oil *thirty-two fluidounces.* Dissolve the Mercury in the Acid with the aid of a gentle heat. Melt the Axunge in the Oil with the aid of a moderate heat in a vessel capable of holding six times the quantity; and, while the mixture is hot, add the solution of mercury, also hot, and mix them thoroughly. If the mixture do not froth up, increase the heat a little till this take place. Keep this Ointment in earthenware vessels, or in glass vessels secluded from the light." *Ed.* Dr. Christison, in his Dispensatory, states that, in this formula, in order to meet the intentions of its framers, the quantity of Olive Oil should be *thirty-eight fluidounces and a half,* and of Nitric Acid (sp. gr. from 1·380 to 1·390) *nine fluidounces and a half.*

"Take of Pure Mercury *one ounce* [avoirdupois]; Pure Nitric Acid *one fluidounce;* Distilled Water *half a* [*fluid*] *ounce;* Prepared Lard *four ounces* [avoird.]; Olive Oil *eight fluidounces.* Mix the Acid with the Water, and dissolve the Mercury in the mixture, with the aid of a gentle heat. Melt the Lard with the Oil, and, while the mixture is hot, add to it the solution of mercury also hot; let the temperature of the mixture next be raised so as to cause effervescence, and then, withdrawing the heat, stir the mixture with a porcelain spoon, until it concretes on cooling." *Dub.*

The chemical changes which take place in the preparation of this ointment are not precisely known. They differ somewhat according to the circumstances under which the operation is performed; for example, according to the proportion and strength of the acid, the nature of the fatty matter, and the degree of heat employed. The mercury, in the first step of the process, is oxidized at the expense of a portion of the acid, nitrous fumes escape, and the undecomposed acid unites with the oxidized metal, forming binitrate of the deutoxide of mercury if heat be employed, and a mixture of this with nitrate of the protoxide, if the process be conducted at a low temperature. When the mercurial solution is added to the fatty matter, a reaction takes place, which probably results in the production of the yellow subnitrate of the deutoxide of mercury, of one or more of the fatty acids, as the oleic, margaric, and stearic, and of elaïdin or elaïdic acid, or both. (See *page* 495.) It is also highly probable that portions of these fatty acids combine with the oxide of mercury. But the degree to which these changes take place is influenced greatly by the temperature to which the mixture is exposed. If this be low, there is little or no escape of gas; if elevated, there is a copious evolution of nitrous fumes. In the former case the changes are obviously less considerable than in the latter.

As formerly prepared, this ointment, though at first beautifully yellow and of the proper consistence, soon began to change, acquiring in time a dirty greenish and mottled colour, and becoming so hard and friable as to be unfit for use unless mixed with lard. These results were ascribed to various causes, and as many different modifications of the process were proposed in order to obviate them. The U.S. process is based upon the fact, that the olive oil of the British processes is hardened by nitrous acid or the nitrate of mercury, while the same effect is not produced upon neats-foot oil. As at first published, the process was defective in the direction to add the mercurial solution to the

mixed oleaginous fluid when it begins to stiffen on cooling. When this direction was complied with, at least with the acid of the ordinary strength, the preparation had a brown colour and semi-liquid consistence; but, with some modifications such as have been introduced into the revised formula of the Pharmacopœia of 1850, the process yields an excellent ointment, which, though it sometimes assumes a greenish colour on exposure, retains permanently a soft unctuous consistence. We have had specimens of the ointment in our possession for several years, which have retained a uniform yellowish colour, and a perfectly good unctuous consistence. It is said that the three ounces of lard of this formula may be advantageously replaced by the same quantity of neats-foot oil. (*Am. Journ. of Pharm.*, iv. 197.) It is probable that other animal oils will answer the same purpose; and it is asserted that a good preparation may be made with lard or butter alone. The drying vegetable oils do not appear, like olive oil, to be converted by nitrous acid or the nitrate of mercury into elaïdin; and it was a fair inference that they might be employed advantageously in the preparation of citrine ointment. Accordingly, Dr. Fessenden, of North Carolina, states, in his inaugural essay, that he substituted linseed oil for the neats-foot oil of the U. S. process, and succeeded in obtaining a perfectly good and durable ointment. It is now stated that the failure of many operators who have followed the former British officinal processes, has been owing not so much to the character of the particular oil employed, as to deficiency of strength in the nitric acid, and the want of a due degree of heat. Mr. Alsop asserts that, if the nitric acid be of the sp. gr. 1·5, or if the quantity of a weaker acid be increased so as to compensate for its deficiency in strength, and if the fatty matters be mixed with the mercurial solution at an elevated temperature, a permanently soft and golden-coloured ointment will result. (*Pharm. Transactions*, Sept. 1841.) It is probable that the discoloration which is so apt to take place in the preparation is owing to the deoxidizing influence of the fatty matter upon the mercurial oxide. Now if, by a sufficient excess of acid and an elevated temperature, the fats be well oxidized during the process, they will have less affinity for oxygen afterwards, and consequently less ability to take it from the oxide of mercury. That they are oxidized at the expense of the nitric acid when heat is used, is proved by the abundant extrication of nitrous fumes during the operation.

But in applying heat, when the fatty matter and mercurial solution are mixed, care must be taken that it be not too great. Gas is extricated at 180°, and at 212°, escapes so abundantly that the mixture boils over unless the vessel be very large. (*Alsop.*) Besides, if the heat is too great, a portion of the mercury is reduced, and the colour of the ointment impaired. When large quantities of materials are operated upon, the reaction which occurs produces of itself a sufficient heat; but in ordinary cases the temperature should be kept at about 190° by means of a water-bath, and if it exceed 205° should be reduced. It should always be sufficient to produce a copious extrication of gas. The ointment should be prepared in a glass, porcelain, or well-glazed earthen vessel; and a glass rod or wooden spatula should be employed for stirring the mixture.

In the present U. S., Edinburgh, and Dublin formulæ, the provision in relation to the application of heat is incorporated; and either of them will yield a good ointment with due care in the manipulations. For some useful practical hints upon this point the reader is referred to a communication by Mr. Joseph Laidlaw in the *Am. Journ. of Pharm.* (xxii. 119). It is due to Mr. Duncan, a chemist and druggist of Edinburgh, to state that he appears to have been the first to ascertain the value of heat in the preparation of this ointment.

Medical Uses. This ointment is much and very advantageously employed, as

a stimulant and alterative application, in porrigo or tinea capitis, impetigo larvalis or crusta lactea, psoriasis and pityriasis, certain forms of chronic eczema, psorophthalmia and inflammation of the eye and eyelids connected with porrigo of the face or scalp, and various other ulcerative and eruptive affections. It should be diluted with lard, unless in cases which require a very stimulant application. Some care is requisite in its use, to avoid the risk of salivation. When hard and friable, it must be rubbed up with fresh lard before it can be applied.

An ointment prepared with lard and nitric acid, called *Alyon's* ointment, after the person who first prepared it, was formerly much used in cases similar to those in which the citrine ointment is now employed. The *ointment of nitric acid* of the former Edinburgh and Dublin Pharmacopœias, discarded in the last edition of those works, was of this character.

Off. Prep. Unguentum Hydrargyri Nitratis Mitius. W.

UNGUENTUM HYDRARGYRI NITRATIS MITIUS. *Lond.* *Milder Ointment of Nitrate of Mercury.*

"Take of Ointment of Nitrate of Mercury *an ounce;* Lard *seven ounces.* Rub them together." *Lond.*

This is a mere dilution of the citrine ointment, and might well have been left to extemporaneous prescription. The London College states that it should be used recently prepared. W.

UNGUENTUM HYDRARGYRI OXIDI RUBRI. *U. S.* Unguentum Hydrargyri Nitrico-oxidi. *Lond.* Unguentum Oxidi Hydrargyri. *Ed.* Unguentum Hydrargyri Oxydi Rubri. *Dub.* *Ointment of Red Oxide of Mercury.*

"Take of Red Oxide of Mercury, in very fine powder, *a drachm;* Simple Ointment *an ounce.* Add the Oxide of Mercury to the Ointment previously softened over a gentle fire, and mix them." *U. S.*

"Take of Nitrico-oxide of Mercury *an ounce;* White Wax *two ounces;* Lard *six ounces.* To the Wax and Lard, melted together, add the Nitrico-oxide, in very fine powder, and rub them together." *Lond.*

"Take of Red Oxide of Mercury *one ounce;* Axunge [lard] *eight ounces.* Triturate them into a uniform mass." *Ed.*

"Take of Red Oxide of mercury *one drachm;* Ointment of White Wax *seven drachms.* Reduce the Oxide to a very fine powder, and mix it intimately with the Ointment by trituration." *Dub.*

The red oxide of mercury here referred to is that prepared from the nitrate, and usually called *red precipitate.* It is highly important that the oxide should be thoroughly pulverized before being mixed with the lard; as otherwise it might prove very injurious in cases of ophthalmia, in which it is sometimes used.

This ointment loses its fine red colour when long kept, probably in consequence of the conversion of the red oxide into the black, or its reduction to the metallic state. It is best to prepare it only in small quantities at a time. We have been informed that, if the preparation be made by mixing the red oxide with poplar-bud ointment, it will keep a long time without change. According to R. H. Stabler, of Alexandria, Va., an equally effectual method is to mix two drops of liquor potassæ with each ounce of the ointment when prepared. (*Am. Journ. of Pharm.*, xxiii. 123.) It is a highly useful stimulating ointment, much employed in indolent and foul ulcers, in porrigo of the scalp, psorophthalmia, and chronic conjunctival ophthalmia, especially when attended with thickening of the inner membrane of the eyelids, or with specks upon the cornea. It may be diluted with lard if found too stimulating. W.

UNGUENTUM IODINII. *U. S. Ointment of Iodine.*

"Take of Iodine *a scruple;* Iodide of Potassium *four grains;* Water *six minims;* Lard *an ounce.* Rub the Iodine and Iodide first with the Water until liquefied, and then with the Lard until thoroughly mixed." *U. S.*

The object of the iodide of potassium and water is simply to bring the iodine into a state in which it may be thoroughly and equably incorporated with the lard. They have been found to answer better in practice than the alcohol formerly used.

This ointment, when rubbed upon the skin, imparts to it an orange colour, which, however, slowly disappears with the evaporation of the iodine. It is useful as a local application in goitre, scrofulous swellings of the glands, and other chronic tumefactions, operating probably through the medium of absorption. When continued for some time, it occasionally produces a pustular eruption upon the portion of skin to which it is applied. Dr. Cerchiari strongly recommends it in cases of enlarged tonsils, after the disappearance of inflammation. It should be applied to the tonsils morning and evening by means of a camel's hair pencil. In two months, according to the author, the enlargement disappears. (*Am. Journ. of Pharm.*, viii. 83.) The ointment should be prepared only as wanted for use; for it undergoes change if kept, losing its deep orange-brown colour, and becoming pale upon the surface. W.

UNGUENTUM IODINII COMPOSITUM. *U. S., Lond., Dub.* UNGUENTUM IODINEI. *Ed. Compound Ointment of Iodine.*

"Take of Iodine *half a drachm;* Iodide of Potassium *a drachm;* Alcohol *a fluidrachm;* Lard *two ounces.* Rub the Iodine and Iodide of Potassium first with the Alcohol and then with the Lard until they are thoroughly mixed." *U. S.*

The *London College* uses the same ingredients, in the same proportions; but directs that the iodide should be powdered as finely as possible, the iodine dissolved in the alcohol, and the two then rubbed together. The *Edinburgh College* directs *a drachm* of iodine and *two drachms* of the iodide of potassium to be rubbed together, *four ounces* of lard to be gradually added, and the trituration to be continued till a uniform ointment is obtained. The *Dublin College* rubs *half a drachm* of pure iodine and *a drachm* of iodide of potassium well together, adds gradually *fourteen drachms and a half* of simple ointment, and triturates till a uniform ointment is produced.

This preparation is employed for the same purposes as the preceding, from which it differs chiefly in being somewhat stronger with iodine; as the iodide of potassium is probably not peculiar in its effects, and the spirit is employed only to facilitate the admixture. W.

UNGUENTUM MEZEREI. *U. S. Ointment of Mezereon.*

"Take of Mezereon, sliced transversely, *four ounces;* Lard *fourteen ounces;* White Wax *two ounces.* Moisten the Mezereon with a little Alcohol, and beat it in an iron mortar until reduced to a fibrous mass; then digest it, by means of a salt-water bath, with the Lard and Wax previously melted together, for twelve hours; strain with strong expression, and allow the strained liquid to cool slowly, so that any undissolved matters may subside. From these separate the medicated ointment." *U. S.*

This is equivalent to the *pommade épispastique au garou* of the French Codex, which is prepared from the bark of *Daphne Gnidium.* The ointment may also be made, as proposed by Guibourt, by mixing two drachms of the alcoholic extract of mezereon with nine ounces of lard and one of wax. It is used as a stimulating application to blistered surfaces in order to maintain the discharge, and to obstinate, ill-conditioned, and indolent ulcers. W.

UNGUENTUM OPII. *Lond.* *Ointment of Opium.*

"Take of Opium, in powder, *a scruple;* Lard *an ounce.* Rub them together." *Lond.*

A form in which opium may be applied by inunction. W.

UNGUENTUM PICIS. *Lond.* *Ointment of Pitch.*

"Take of Pitch, Wax, Resin, each, *eleven ounces;* Olive Oil *a pint.* Melt them together, and express through linen." *Lond.*

This is the *ointment of black pitch* of the former London Pharmacopœia. It may be used for the same purposes as tar ointment, but is less efficient. W.

UNGUENTUM PICIS LIQUIDÆ. *U. S., Lond., Ed., Dub.* *Tar Ointment.*

"Take of Tar, Suet, each, *a pound.* Add the Tar to the Suet previously melted with a moderate heat, and stir them constantly till they are cold." *U. S.*

The *London College* melts together *a pound*, each, of tar and suet, and strains through linen. The *Edinburgh College* takes *five ounces* of tar and *two ounces* of bees' wax, and, having melted the wax with a gentle heat, adds the tar, and stirs the mixture briskly while it concretes. The *Dublin College* melts *four avoirdupois ounces* of yellow wax, adds *half a pint* [Imperial measure] of tar, and stirs the mixture.

This ointment is highly useful as a stimulant application in various scaly and scabby eruptions, particularly in psoriasis and lepra, and in that form of porrigo usually called tinea capitis, or scaldhead. In the last-mentioned affection, it should be applied night and morning; and in bad cases the patient should constantly wear a cap, thickly coated internally with the ointment. W.

UNGUENTUM PLUMBI ACETATIS. *Ed., Dub.* CERATUM PLUMBI ACETATIS. *Lond.* *Ointment of Acetate of Lead.*

"Take of Simple Ointment *twenty ounces;* Acetate of Lead, in fine powder, *one ounce.* Mix them thoroughly." *Ed.*

The *London College* melts *five ounces* of white wax in *eighteen fluidounces* of olive oil; then adds gradually *five drachms* of powdered acetate of lead previously rubbed with *two fluidounces* of olive oil; and stirs with a spatula till they are incorporated. The *Dublin College* mixes *an ounce* of acetate of lead with *a pound* of ointment of white wax, previously melted with a gentle heat; using the avoirdupois weights in the process.

This is an excellent ointment in burns, and other excoriated or ulcerated surfaces, particularly blisters in an inflamed state. W.

UNGUENTUM PLUMBI CARBONATIS. *U. S., Ed., Dub.* *Ointment of Carbonate of Lead.*

"Take of Carbonate of Lead, in very fine powder, *two ounces;* Simple Ointment *a pound.* Add the Carbonate of Lead to the Ointment previously softened over a gentle fire, and mix them." *U. S.*

The *Edinburgh College* prepares this ointment by mixing thoroughly *one ounce* of carbonate of lead with *five ounces* of simple ointment. The *Dublin College* employs *three ounces* of the carbonate and *a pound* of the ointment, using the avoirdupois weights.

This ointment is used for the same purposes as the preceding. W.

UNGUENTUM PLUMBI COMPOSITUM. *Lond.* *Compound Ointment of Lead.*

"Take of Lead Plaster *three pounds;* Olive Oil *eighteen fluidounces;* Prepared Chalk *six ounces;* Diluted Acetic Acid *six fluidounces.* Dissolve the

Plaster in the Oil with a slow fire, then add first the Chalk and afterwards the Acid, constantly stirring until they become cold." *Lond.*

Employed as a dressing for flabby indolent ulcers. W.

UNGUENTUM PLUMBI IODIDI. *Lond., Dub. Ointment of Iodide of Lead.*

"Take of Iodide of Lead *an ounce;* Lard *eight ounces.* Rub them together." *Lond.*

The *Dublin College* rubs together *a drachm* of the iodide and *seven drachms* of simple ointment.

Employed as a discutient in chronic glandular swellings, and enlargements of the joints. W.

UNGUENTUM POTASSII IODIDI. *U. S., Lond., Dub. Ointment of Iodide of Potassium.*

"Take of Iodide of Potassium, in fine powder, *a drachm;* Boiling Water *a fluidrachm;* Lard *an ounce.* Dissolve the Iodide of Potassium in the Water, and mix the solution with the Lard." *U. S.*

The *London* process is the same as the above, using double the quantity of materials. The *Dublin College* uses *a drachm* of the iodide, *half a* [*fluid*] *drachm* of distilled water, and *seven drachms* of simple ointment, and proceeds in the same manner.

The preparation is apt to become discoloured by time in consequence of the liberation of iodine. It is said that this may be prevented by mixing two drops of the *Liquor Potassæ* with each ounce of the freshly prepared ointment. (*Am. Journ. of Pharm.*, xxiii. 123.)

This ointment is employed for the discussion of goitres, scrofulous tumours, and other indolent swellings; and is sometimes preferred to the ointment of iodine, as it does not, like that, discolour the skin. W.

UNGUENTUM SAMBUCI. *Lond. Elder Ointment.*

"Take of Elder [flowers], Lard, each, *two pounds.* Boil the Elder in the Lard till it becomes crisp; then express through linen." *Lond.*

Elder flowers impart odour to lard without adding to its virtues. An ointment, prepared in like manner from the leaves, has a green colour, and is popularly employed as a cooling application in England. W.

UNGUENTUM SIMPLEX. *U. S., Ed.* UNGUENTUM CERÆ ALBÆ. *Dub. Simple Ointment.*

"Take of White Wax *a pound;* Lard *four pounds.* Melt them together with a moderate heat, and stir them constantly till they are cold." *U. S.*

The *Dublin* process corresponds with the above. The *Edinburgh College* orders *five fluidounces and a half* of olive oil, and *two ounces* of white wax.

This is emollient, and is occasionally employed as a mild dressing to blistered or excoriated surfaces, but more frequently as a vehicle for more active substances. It is the basis of several officinal ointments. W.

UNGUENTUM STRAMONII. *U. S. Ointment of Stramonium.*

"Take of Extract of Stramonium Leaves *a drachm;* Lard *an ounce.* Rub the Extract with a little water until uniformly soft, and then with the Lard." *U. S.*

This is a more certain preparation than that of the former editions of the U. S. Pharmacopœia, which was made by boiling the fresh leaves in lard.

The ointment of stramonium is a useful anodyne application in irritable ulcers, painful hemorrhoids, and some cutaneous eruptions. W.

UNGUENTUM SULPHURIS. *U. S., Lond., Ed., Dub. Sulphur Ointment.*

"Take of Sulphur *a pound;* Lard *two pounds.* Mix them." *U. S.*

The *London College* employs the same proportions as the U. S. Pharmacopœia; the *Edinburgh*, *four ounces* of lard, and *one ounce* of sublimed sulphur; and the *Dublin*, *a pound* of sublimed sulphur and *four pounds* of prepared lard.

Sulphur ointment is a specific for the itch. It should be applied every night till the complaint is cured; and it is recommended that only one-fourth of the body should be covered at a time. We have usually directed it to be applied over the whole surface, and have found no inconvenience to result. Four applications are usually sufficient to effect a cure. It is thought by some that powdered roll sulphur is more efficacious than the sublimed. Sulphur ointment, applied freely over the variolous eruption, in its early stage, is said to prevent the maturation of the pustules and consequent pitting. (See *Am. Journ. of Med. Sci.*, *N. S.*, ii. 196.) The disagreeable odour of the ointment may be in some measure concealed by a little oil of lemons, or oil of bergamot. W.

UNGUENTUM SULPHURIS COMPOSITUM. *U. S.*, *Lond.* *Compound Sulphur Ointment.*

"Take of Sulphur *an ounce;* Ammoniated Mercury, Benzoic Acid, each, *a drachm;* Oil of Bergamot, Sulphuric Acid, each, *a fluidrachm;* Nitrate of Potassa *two drachms;* Lard *half a pound.* To the Lard, previously melted with a moderate heat, add the other ingredients, and stir them constantly till they are cold." *U. S.*

This ointment is essentially different from that which is directed, under the same name, by the *London College*. Though, perhaps, not more efficient than the simple sulphur ointment in the cure of itch, it has a less unpleasant smell, and may be advantageously applied to the cure of other eruptive affections, such as tinea capitis and crusta lactea.

"Take of Sulphur *four ounces;* White Hellebore, in powder, *ten drachms;* Nitrate of Potassa, in powder, *two scruples;* Soft Soap *four ounces;* Lard *a pound.* Rub them together." *Lond.*

This is thought to be more efficacious than the simple sulphur ointment; but the white hellebore renders it also more irritating. W.

UNGUENTUM SULPHURIS IODIDI. *U. S.*, *Lond.* *Ointment of Iodide of Sulphur.*

"Take of Iodide of Sulphur *half a drachm;* Lard *an ounce.* Rub the Iodide with a little of the Lard, then add the remainder, and mix them." *U. S.*

The *London* process is identical with the above.

This is admirably adapted, as a local remedy, to the treatment of most chronic cutaneous eruptions, unattended with inflammation; but it is especially useful in psoriasis, lepra, porrigo, and the very advanced stages of eczema and impetigo, when they have become dry. W.

UNGUENTUM TABACI. *U. S.* *Tobacco Ointment.*

"Take of fresh Tobacco, cut in pieces, *an ounce;* Lard *a pound.* Boil the Tobacco in the Lard over a gentle fire till it becomes friable; then strain through linen." *U. S.*

In the first edition of the U. S. Pharmacopœia, this ointment, under the name of "Tobacco Liniment," was directed to be prepared with common dried tobacco; but in this condition the leaves do not yield their virtues to lard. The error was corrected in the second edition. Though the tobacco plant is not an object of general culture in the Northern States, it may readily be produced in gardens, in quantities sufficient to supply any demand for the fresh leaves which can possibly arise.

Fresh narcotic vegetables yield their active principles, and chlorophylle or green colouring matter to oleaginous substances, when heated with them; and ointments have long been prepared in this manner. In the pharmacy of the

continent of Europe, olive oil is frequently employed as the solvent, and the resulting preparations are called *olea infusa*. Several of these are ordered by the French Codex, as the oils of henbane, stramonium, tobacco, &c. Lard is preferred in British and American pharmacy, as affording preparations of a more convenient consistence. The boiling takes place at a lower temperature than that necessary for the evaporation of the lard or oil, and is owing to the escape of the watery parts of the plants. It should be continued till all the water is driven off; as this, if allowed to remain, would render the ointment more liable to spontaneous decomposition; and, besides, the colouring matter of the narcotic is not freely extracted till after the dissipation of the water.

Tobacco ointment is useful in irritable ulcers, and various cutaneous eruptions, particularly *tinea capitis;* but great care must be taken, especially in children, not to employ it in such quantities as to endanger the production of the constitutional effects of the narcotic. W.

UNGUENTUM VERATRI ALBI. *U.S. Ointment of White Hellebore.*

"Take of White Hellebore [root], in powder, *two ounces;* Oil of Lemons *twenty minims;* Lard *eight ounces.* Mix them." *U. S.*

This ointment is sometimes employed with advantage in the itch. It is less disagreeable, but also less certain than the sulphur ointment. It should be employed with caution in children. W.

UNGUENTUM ZINCI OXIDI. *U.S.* UNGUENTUM ZINCI. *Lond., Ed.* UNGUENTUM ZINCI OXYDI. *Dub. Ointment of Oxide of Zinc.*

"Take of Oxide of Zinc *an ounce;* Lard *six ounces.* Mix them." *U. S., Lond.*

The *Edinburgh College* employs *six ounces* of simple liniment, and *one ounce* of oxide of zinc; the *Dublin, two ounces* of the oxide, and *twelve ounces* of ointment of white wax (simple ointment). By the latter the ointment is melted before the addition of the oxide.

This is employed as a mild astringent application in chronic ophthalmia with a relaxed state of the vessels, in cutaneous eruptions, and in sore nipples and other instances of excoriation or ulceration. It has taken the place of the discarded *unguentum tutiæ*, or *tutty ointment*, prepared from tutty or the impure oxide of zinc, by mixing it with five parts of simple ointment. W.

VERATRIA.

Veratria.

VERATRIA. *U.S., Lond., Ed. Veratria.*

"Take of Cevadilla, bruised, *two pounds;* Alcohol *three gallons;* Sulphuric Acid, Solution of Ammonia, Purified Animal Charcoal, Magnesia, each, *a sufficient quantity.* Boil the Cevadilla in a gallon of the Alcohol, in a retort with a receiver attached, for an hour, and pour off the liquor. To the residue add another gallon of the Alcohol, together with the portion recently distilled, again boil for an hour, and pour off the liquor. Repeat the boiling a third time with the remaining Alcohol, and with that distilled in the previous operation. Press the Cevadilla, mix and strain the liquors, and by means of a water-bath distil off the Alcohol. Boil the residue three or four times in water acidulated with Sulphuric Acid, mix and strain the liquors, and evaporate to the consistence of syrup. Add Magnesia, in slight excess, shake the mixture frequently, then express, and wash what remains. Repeat the expression and washing two or three times, and, having dried the residue, digest it with a gentle heat several

times in alcohol, and strain after each digestion. Distil off the alcohol from the mixed liquors, boil the residue for fifteen minutes in water with a little Sulphuric Acid and Purified Animal Charcoal, and strain. Having thoroughly washed what remains, mix the washings with the strained liquor, evaporate with a moderate heat to the consistence of syrup, and then drop in as much Solution of Ammonia as may be necessary to precipitate the Veratria. Lastly, separate and dry the precipitate." *U. S.*

The *London College* has transferred veratria to its Materia Medica list.

"Take *any convenient quantity* of Cevadilla; pour boiling water over it in a covered vessel, and let it macerate for twenty-four hours; remove the Cevadilla, squeeze it, and dry it thoroughly with a gentle heat. Beat it now in a mortar, and separate the seeds from the capsules by a brisk agitation in a deep narrow vessel. Grind the seeds in a coffee-mill, and form them into a thick paste with Rectified Spirit. Pack this firmly in a percolator, and pass Rectified Spirit through it till the Spirit ceases to be coloured. Concentrate the spirituous solutions by distillation so long as no deposit forms; and pour the residuum while hot into twelve times its volume of cold water. Filter through calico, and wash the residuum on the filter so long as the washings precipitate with ammonia. Unite the filtered liquid with the washings, and add an excess of ammonia. Collect the precipitate on a filter, wash it slightly with cold water, and dry it first by imbibition with filtering paper, and then in the vapour-bath. A small additional quantity may be got by concentrating the filtered ammoniacal fluid and allowing it to cool." *Ed.*

In the U. S. process the first step is to obtain a tincture of cevadilla. In the Edinburgh process, the use of alcohol is preceded by measures calculated to bring the seeds into a proper state for its action. This is not satisfactorily effected by mere bruising. The seeds are not thus separated from the capsules; and, on account of their elasticity, they cannot be conveniently comminuted in a mortar. The mode of proceeding given in the Edinburgh Pharmacopœia was suggested by Christison, and is said by him to answer the purpose. In the U. S. process, the tincture, when made, is evaporated to the consistence of an extract. This contains the veratria combined with some vegetable acid, probably the gallic, as it exists in the seeds. From the extract the alkali is dissolved by the acidulated water, which at the same time converts it in great measure into a sulphate, a small portion possibly remaining in the solution combined with an excess of the native acid. The magnesia combines with the acids and throws down the veratria, which is then taken up by alcohol, and again yielded in a purer state by evaporation. To purify it still further, it is redissolved in water by the agency of sulphuric acid, is submitted to the action of animal charcoal, and is finally precipitated by ammonia. In the Edinburgh process, the tincture is concentrated until it begins to let fall a precipitate, and is then poured into water, which throws down the resin and oil with a portion of the colouring matter, and retains the salt of veratria. This is then decomposed by ammonia, and the precipitated veratria is slightly washed with cold water to free it from adhering impurities. If much water is employed in the washing, a considerable portion of the veratria is lost, in consequence of being in some degree soluble in that menstruum in its ordinary impure state.*

* Mr. James Beatson, Manufacturing Chemist of the U. S. Naval Laboratory at New York, recommends the following method of preparing veratria as less complicated and troublesome than the officinal, and quite satisfactory in its results. Take 73 pounds (avoirdupois) of cevadilla, rub it upon a coarse wire sieve so as to separate the seeds from the capsules, and reduce the former to a coarse powder by a Swift's drug mill. Pass the capsules also through the mill, separate the finer portion, and mix it with the ground seeds. Moisten the mixture with alcohol, and allow it to stand 12 hours; then introduce it

The U. S. process is essentially that recommended by M. Couerbe. The veratria obtained by it, though not pure, is sufficiently so for medical use. A drachm of it, in this state, may be procured from a pound of cevadilla. Besides veratria, M. Couerbe states that principles, which he calls respectively *sabadillia* and *veratrin*, are also contained in this product. These are separated in the following manner. Into the solution of impure sulphate of veratria obtained in the above process, nitric acid is to be introduced by drops. This occasions an abundant precipitate, from which the clear liquor is to be decanted. A weak solution of potassa is then to be added to the liquor, and the precipitate which it produces is to be washed with cold water, and treated with boiling alcohol. The substance obtained by evaporating the alcohol yields the *sabadillia* to boiling water, which deposits it upon cooling; a substance, called by M. Couerbe *resini-gum* of sabadillia, remaining in solution. If the residue of the substance, treated as just mentioned with boiling water, be submitted to the action of ether, it yields to this liquid the proper *veratria*, which may be obtained entirely pure by the spontaneous evaporation of the ether. The matter remaining undissolved is the resinous substance which M. Couerbe calls *veratrin*. *Sabadillia* is white, crystallizable, insupportably acrid, fusible by heat, readily soluble in hot water, which deposits it upon cooling, very soluble in alcohol, and wholly insoluble in ether. It is capable of saturating the acids. (*Journ. de Pharm.*, xix. 527.) According to Simon, sabadillia is a compound of resinate of soda and resinate of veratria. Fr. Hübschmann confirms the views of Couerbe as to the separate existence of sabadillia. He obtained it by treating the matter considered as veratria with ether, which removed the pure veratria, and left the sabadillia. The latter does not irritate the nostrils like veratria. (*Am. Journ. of Pharm.*, xxv. 133.)

Veratria, when pure, is white, pulverulent, uncrystallizable, inodorous, extremely acrid, fusible by heat, scarcely soluble in cold water, soluble in a thousand parts of boiling water which it renders sensibly acrid, dissolved freely by alcohol, less so by ether, and capable of neutralizing the acids, with several of which, particularly the sulphuric and muriatic, it forms crystallizable salts.

In the impure state in which it is obtained by either of the above officinal processes, it is a grayish or brownish-white powder, without odour, and of a bitter, acrid taste, producing a sense of tingling or numbness in the tongue, and exciting violent sneezing and coryza when admitted into the nostrils. The composition of veratria is expressed, according to Couerbe, by the formula $NC_{34}H_{22}O_6$. It may be recognised by its sensible properties, incapability of being crystallized, combustibility, fusibility, peculiar solubilities, alkaline reaction, the intense red colour it assumes upon contact with concentrated sulphuric acid, the yellow solution it forms with nitric acid, and the white precipitates which its solution in dilute acetic acid yields with ammonia and the infusion of galls. It is entirely dissipated by a red heat. It is said sometimes to be sophisticated with lime, which is easily detected by incineration, and may be separated by dissolving the powder in diluted alcohol, precipitating by sulphuric acid, filtering, evaporating the alcohol, and precipitating the veratria by ammonia. (*Chem.*

into a displacement apparatus, and pour upon it 30 gallons of alcohol. When a convenient quantity of the liquid has passed, submit it to distillation, and return the distilled alcohol to the displacement apparatus; and proceed in the same way until the cevadilla is thoroughly exhausted. Collect all the alcoholic liquor from the exhausted seeds, and continue the distillation until the tincture has a syrupy consistence. Pour this while hot into eight times its volume of cold water, throw the whole on a calico filter, and wash until the washings cease to indicate the presence of veratria. Mix the washings with what first passed through the filter, and add liquor ammoniæ in excess (about 4 pounds). Wash the precipitated veratria with cold water, and dry it with a very gentle heat. Mr. Beatson obtained by this process eleven and a quarter ounces of pure veratria, but faintly tinged with colouring matter. (*Am. Journ. of Pharm.*, xxvi. 5.)—*Note to the tenth edition.*

Gaz., Feb, 1845, p. 73.) It may be used either in the uncombined state, or united with acids; as in both forms it produces essentially the same effects.

Medical Properties and Uses.—Veratria is locally irritant, and exerts a peculiar influence on the nervous system. Rubbed upon the skin it excites a sensation of warmth and a peculiar tingling, which, when the application is continued for a considerable length of time, extends, according to Turnbull, over the whole surface of the body. Sometimes an evanescent blush is produced, and still more rarely an eruption upon the skin; but, according to the same author, no marks of inflammation are in general evinced. Upon the denuded cutis, however, veratria and its salts are powerfully irritating; in the mouth and fauces produce an almost insupportable sense of acrimony; and snuffed up the nostrils excite violent sneezing. Magendie states that, when taken internally in the dose of a quarter of a grain, they promptly produce abundant alvine evacuations, and in larger doses provoke more or less violent vomiting. Other experimenters have observed similar effects. Dr. Turnbull, on the contrary, says that he has very seldom found them to purge, even when largely administered, and that not unfrequently constipation comes on during their employment. According to this author, their first effect, when given in moderate doses, is a feeling of warmth in the stomach, gradually extending itself over the abdomen and lower part of the chest, and ultimately to the head and extremities. If the medicine is continued, this feeling of warmth is followed by a sense of tingling, similar to that produced by the external use of the medicine, which manifests itself in different parts of the body, and sometimes over the whole surface, and is frequently accompanied by perspiration and some feeling of oppression. Occasionally also diuresis is produced. A still further continuance of the medicine, or the use of large doses, excites nausea and vomiting. It occasions no narcotic effects. In over-doses it is a violent poison.

The diseases in which veratria has been employed are chiefly gout, rheumatism, and neuralgia. M. Piedagnel has used it with great supposed advantage in acute articular rheumatism, which he has found generally to get well under its use in seven or eight days. (See *Am. Journ. of Med. Sci.*, N. S., xxvi. 496.) Dr. Turnbull has found it useful also in dropsy, and in diseases of the heart, particularly those of a functional character. He thinks he has also seen it do good in structural diseases of that organ, but chiefly by acting as a diuretic, and thereby removing effusion in the pericardium. Veratria has also been employed in various nervous affections, as paralysis, hooping-cough, epilepsy, hysteria, and disorders dependent upon spinal irritation. For internal use the salts of veratria are preferred. From one-twelfth to one-sixth of a grain may be given in the form of pill, and repeated every three hours till the effects of the medicine are experienced. Dr. Turnbull prefers the tartrate, as less disposed to irritate the stomach. The sulphate or acetate, however, may be used. Any one of these salts may be readily prepared by treating veratria with water acidulated with the acid to perfect neutralization, and then evaporating to dryness.

But veratria is much more employed externally than by the stomach, and is applicable in this way to all the complaints already mentioned. It may be used either dissolved in alcohol, or rubbed up with lard or other unctuous substance in the proportion of from ten to twenty grains or more to the ounce. Of the ointment thus prepared, Dr. Turnbull directs a portion of the size of a large nut to be rubbed upon the skin over the part affected, night and morning, from five to fifteen minutes, or until the more urgent symptoms are relieved. Veratria may be used in this way to the amount of from four to eight grains in the day. Care must be taken that the cuticle is sound over the parts to which it is applied. When the skin is irritable, smaller quantities than those above mentioned must be used. W.

VINA MEDICATA.

Medicated Wines.

The advantages of wine as a pharmaceutic menstruum are that, in consequence of the alcohol it contains, it dissolves substances insoluble in water, and, to a certain extent, resists their tendency to spontaneous change; while, at the same time, it is less stimulant than rectified or proof spirit, both from its smaller proportion of alcohol, and from the modified state in which this fluid exists in its composition. The acid which it usually contains, serves in some instances to increase its solvent power. But most wines, particularly the light varieties, are liable to undergo decomposition; and even the strongest acquire such a liability from the principles which they extract from vegetable substances; so that medicated wines, though they keep much better than infusions or decoctions, are inferior in this respect to the tinctures. The proportion of alcohol, moreover, is not constant; and the preparations, therefore, made with them, are of unequal strength. From these causes, few medicated wines are at present retained. In the choice of wine, the purest and most generous should be selected. Sherry, as directed by the U. S. and British Pharmacopœias, Teneriffe, or Madeira should be preferred. The medicated wines, in consequence of their liability to change, should be prepared in small quantities, without heat, and should be kept in well stopped bottles in a cool place.

The *London College* directs that "medicated wines should be prepared in covered glass vessels, and frequently agitated during the maceration." W.

VINUM ALOËS. *U. S., Lond., Ed. Wine of Aloes.*

"Take of Aloes, in powder, *an ounce;* Cardamom [seeds], bruised, Ginger, bruised, each, *a drachm;* White Wine [sherry] *a pint.* Macerate for fourteen days, with occasional agitation, and filter through paper." *U. S.*

"Take of Socotrine or Hepatic Aloes, in powder, *two ounces;* Canella, in powder, *four drachms;* Sherry Wine *two pints* [Imperial measure]. Macerate for seven days, and filter." *Lond.*

"Take of Socotrine or East India Aloes *an ounce and a half;* Cardamom Seeds, ground, Ginger, in coarse powder, of each, *a drachm and a half;* Sherry *two pints* [Imperial measure]. Digest for seven days, and strain through linen or calico." *Ed.*

The wine of aloes is a warm stomachic purgative, useful in constipation dependent on a want of due irritability of the alimentary canal, and in complaints connected with this state of the bowels. It has long been used in chlorosis, amenorrhœa, dyspepsia, gout, paralysis, &c. It is said to leave behind it a more lax condition of the bowels than most other cathartics. The dose as a stomachic is one or two fluidrachms, as a purgative from half a fluidounce to two fluidounces. W.

VINUM COLCHICI RADICIS. *U. S.* VINUM COLCHICI. *Lond., Ed. Wine of Colchicum Root.*

"Take of Colchicum Root, well bruised, *a pound;* White Wine [sherry] *two pints.* Macerate for fourteen days, with occasional agitation; then express strongly, and filter through paper.

"Wine of Colchicum Root may also be prepared by macerating as above, then transferring to a percolator, and, after the liquor has ceased to pass, pouring so much wine upon the residue that the filtered liquor obtained may measure *two pints.*" *U. S.*

"Take of dried Meadow-saffron Cormus, sliced, *eight ounces;* Sherry Wine *two pints* [Imperial measure]. Macerate for seven days, and filter." *Lond.*

The *Edinburgh College* directs the same quantities of materials as the London, and orders digestion for seven days, straining, strong expression, and filtering.

This is intended to be a saturated vinous tincture of colchicum. As the colchicum root imported into the United States is of variable strength, the only method by which an active preparation can be ensured, is to employ a large quantity of the bulb in proportion to that of the menstruum. If the former should happen to be in excess, no other injury could result than a slight pecuniary loss; while a deficiency in the strength of the preparation would frequently be of serious detriment in urgent cases of disease. We have never been disappointed in obtaining the effects of colchicum from the wine which we knew to have been prepared according to the directions of the U. S. Pharmacopœia; while that which has been made with a smaller quantity of the bulb has often failed in our hands. A wine prepared from the fresh bulb is occasionally imported from England, and is thought by some to be more efficacious than our officinal preparation. The dose of the officinal wine is from ten minims to a fluidrachm, to be repeated three or four times a day, or more frequently in severe cases, till its effects are experienced. In gout it is frequently given in connexion with magnesia and its sulphate; and in neuralgic cases we have found much advantage from combining it with the solution of sulphate of morphia, especially when we have desired to give it a direction rather to the skin than the bowels. It has been employed externally with asserted advantage in rheumatism. In overdoses it may produce fatal effects. Death is said to have occurred in one instance from two drachms of the wine; but much more would probably in general be requisite to produce this result. W.

VINUM COLCHICI SEMINIS. *U.S.* *Wine of Colchicum Seed.*

"Take of Colchicum Seed, bruised, *four ounces;* White Wine [sherry] *two pints.* Macerate for fourteen days, with occasional agitation; then express, and filter through paper." *U. S.*

As the seeds of colchicum are less liable to injury than the bulb, and are, therefore, of more uniform strength, there is not the same necessity for preparing a saturated tincture. This wine corresponds in strength with the tincture of colchicum seed. (See *Tinctura Colchici Seminis.*) In the account of the seeds given in the first part of this work (*page* 275), it is stated, on the authority of Dr. Williams, who introduced the seeds into use, that their active properties reside in their coating, and that it is, therefore, not advisable to bruise them in preparing the wine or tincture. But this has been shown to be an error by the experiments of Mr. Bonnewyn, who found a larger proportion of colchicia in a tincture of the bruised than in one of the unbruised seeds. (See *Am. Journ. of Pharm.*, xxvi. 120.) The dose is one or two fluidrachms. Two fluidounces have proved fatal. W.

VINUM ERGOTÆ. *U.S.* *Wine of Ergot.*

"Take of Ergot, bruised, *two ounces;* White Wine [sherry] *a pint.* Macerate for fourteen days, with occasional agitation; then express, and filter through paper." *U. S.*

The large proportion of fixed oil in ergot interferes with the solvent action of the menstruum, unless the grains are finely powdered. It is, therefore, best to employ the ergot in this process well powdered, instead of merely bruised, as officinally directed.

The dose of this wine is for a woman in labour two or three fluidrachms; for other purposes, one or two fluidrachms, to be repeated several times a day, and gradually increased if necessary. W.

VINUM GENTIANÆ. *Ed.* *Wine of Gentian.*

"Take of Gentian, in coarse powder, *half an ounce;* Yellow Bark, in coarse powder, *one ounce;* Bitter-orange Peel, dried and sliced, *two drachms;* Canella, in coarse powder, *one drachm;* Proof Spirit *four fluidounces and a half;* Sherry *one pint and sixteen fluidounces* [Imperial measure]. Digest the root and barks for twenty-four hours in the Spirit; add the Wine, and digest for seven days more; strain and express the residuum strongly, and filter the liquors." *Ed.*

This is a stomachic bitter, sometimes employed to promote appetite and invigorate digestion. The dose is from four to eight fluidrachms. W.

VINUM IPECACUANHÆ. *U. S., Lond., Ed., Dub.* *Wine of Ipecacuanha.*

"Take of Ipecacuanha, bruised, *two ounces;* White Wine [sherry] *two pints.* Macerate for fourteen days, with occasional agitation; then express, and filter through paper.

"Wine of Ipecacuanha may also be prepared by moistening the Ipecacuanha, in coarse powder, thoroughly with Wine, allowing it to stand for twenty-four hours, then transferring it to a percolator, and pouring Wine gradually upon it until two pints of filtered liquor are obtained." *U. S.*

The *London College* takes *two ounces and a half* of the bruised root, and *two Imperial pints* of sherry wine, and macerates for seven days; the *Edinburgh*, the same ingredients, in the same proportions, and digests for a week; the *Dublin, two ounces and a half* [avoirdupois] of aloes, and *two Imperial pints* of sherry wine, and macerates for two weeks.

The preparations of the different Pharmacopœias are virtually of the same strength. Wine of ipecacuanha possesses all the medical properties of the root, and may be used as a substitute when it is desirable to administer the medicine in the liquid form. As it is milder, without being less efficacious than antimonial wine, it is in some instances preferable as an emetic in infantile cases, especially when the antimonial, as not unfrequently happens, is disposed to irritate the bowels. Under the same circumstances, it may be used as an expectorant and diaphoretic; and the effects of the Dover's powder may be obtained by combining it with laudanum or other liquid preparation of opium. The dose as an emetic for an adult is a fluidounce; as an expectorant and diaphoretic, from ten to thirty minims. A fluidrachm may be given as an emetic to a child one or two years old, and repeated every fifteen minutes till it operates. W.

VINUM OPII. *U. S., Lond., Ed., Dub.* *Wine of Opium. Sydenham's Laudanum.*

"Take of Opium, in powder, *two ounces;* Cinnamon, bruised, Cloves, bruised, each, *a drachm;* White Wine [sherry] *a pint.* Macerate for fourteen days, with occasional agitation; then express, and filter through paper." *U. S.*

The *London College* takes *two ounces and a half* of extract of opium, *two drachms and a half* of bruised cinnamon, *the same quantity* of bruised cloves, and *two Imperial pints* of sherry wine; and macerates for seven days. The *Edinburgh College*, to the same quantity of cinnamon and cloves, adds *three ounces* of opium, and *two Imperial pints* of sherry wine, and digests for a week. The *Dublin College* takes *three avoirdupois ounces* of opium, and *two Imperial pints* of sherry wine, and macerates for fourteen days.

The wine made according to the directions of the U. S. Pharmacopœia is a saturated vinous tincture of opium. It contains about the same proportions of the ingredients as the *laudanum of Sydenham*, from which it differs only in wanting a drachm of saffron. The spices which it contains are thought to adapt it to certain states of the stomach or system, in which the simple tincture of opium is found to produce unpleasant effects; but the same end may be obtained

by an extemporaneous addition of some aromatic oil to the latter. Mr. Ware recommends it as a local application to the eye, in the latter stages of ophthalmia, when the vessels of the conjunctiva still remain turgid with blood. Two or three drops are introduced into the eye every morning till the redness disappears. The dose of the wine of opium is the same with that of the tincture.* W.

VINUM RHEI. *U. S., Ed., Dub. Wine of Rhubarb.*

"Take of Rhubarb, bruised, *two ounces;* Canella, bruised, *a drachm;* Diluted Alcohol *two fluidounces;* White Wine [sherry] *a pint.* Macerate for fourteen days, with occasional agitation; then express, and filter through paper.

"Wine of Rhubarb may also be prepared by mixing the Rhubarb and Canella, in coarse powder, with the Diluted Alcohol, allowing the mixture to stand for twenty-four hours, then transferring it to a percolator, and pouring Wine gradually upon it until eighteen fluidounces of filtered liquor are obtained." *U. S.*

The *Edinburgh College* takes *five ounces* of rhubarb, in coarse powder, *two drachms* of canella, in coarse powder, *five fluidounces* of proof spirit, and *one pint and fifteen fluidounces* [Imperial measure] of sherry wine, and digests for seven days. The *Dublin College* takes *three avoirdupois ounces* of the rhubarb, *two drachms* [Dub. weight] of the canella, and *two Imperial pints* of sherry wine, and macerates for two weeks.

This is a warm cordial laxative, applicable to debilitated conditions of the system or alimentary canal requiring evacuation of the bowels. The dose is from one to four fluidrachms or more, according to the amount of effect required, and the condition of the patient. W.

VINUM TABACI. *U. S., Ed. Wine of Tobacco.*

"Take of Tobacco, cut in pieces, *an ounce;* White Wine [sherry] *a pint.* Macerate for fourteen days, with occasional agitation; then express, and filter through paper." *U. S.*

The *Edinburgh College* takes *three ounces and a half* of tobacco and *two Imperial pints* of sherry wine, and digests for seven days.

The dose of the wine of tobacco, as a diuretic, is from ten to thirty minims. It is very seldom used. W.

VINUM VERATRI ALBI. *U. S.* VINUM VERATRI. *Lond. Wine of White Hellebore.*

"Take of White Hellebore [root], bruised, *four ounces;* White Wine [sherry] *a pint.* Macerate for fourteen days with occasional agitation; then express, and filter through paper." *U. S.*

The *London College* takes *eight ounces* of the sliced root, and *two Imperial pints* of sherry wine, and macerates for seven days.

It has been supposed that the wine of white hellebore, in consequence of the veratria which it contains, would act in the same manner with colchicum in the cure of gout and rheumatism; but it is uncertain and occasionally violent in its operation, and is very little used. The dose is ten minims two or three times a day, to be gradually increased till the peculiar effects of the medicine are experienced. W.

* *Rousseau's laudanum* is a tincture of opium made with very weak alcohol, which may be classed with propriety along with the above preparation. It is made according to the following formula. "Take of white honey *twelve ounces;* warm water *three pounds.* Having dissolved the honey, set the solution aside in a warm place; and, as soon as fermentation begins, add of selected opium *four ounces,* previously dissolved in *twelve ounces* of water. Allow the mixture to stand for a month at the temperature of 24° Reaumur (86° F.); then strain, filter, and evaporate to *ten ounces;* finally strain, and add *four ounces and a half* of alcohol of 20° B. Seven drops contain about a grain of opium." (*Pharmacop. Univers.,* ii. 265.)

ZINCUM.

Preparations of Zinc.

ZINCI ACETAS. *U. S., Dub. Acetate of Zinc.*

"Take of Acetate of Lead *a pound;* Zinc, granulated, *nine ounces;* Distilled Water *three pints.* Dissolve the Acetate of Lead in the Water and filter. Then add the Zinc to the solution, and agitate the mixture occasionally in a stopped bottle, for five or six hours, or until the liquid yields no precipitate with a solution of iodide of potassium. Filter the liquor, evaporate it with a moderate heat to one-fifth, acidulate it slightly with acetic acid, and set it aside to crystallize. Pour off the liquid, and dry the crystals on bibulous paper. Should the crystals be coloured, dissolve them in a pint and a half of distilled water, and, having heated the solution to ebullition, drop into it, while boiling, Precipitated Carbonate of Zinc, in successive portions, until a small quantity of the liquid, being filtered, passes colourless. Then filter the liquid, acidulate it slightly with acetic acid, and evaporate that crystals may form." *U. S.*

"Take of Acetate of Lead *one pound* [avoirdupois]; Sheet Zinc *four ounces* [avoird.]; Distilled Water *two pints and a half* [Imp. meas.]; Solution of Chlorinated Lime *a sufficient quantity.* Dissolve the Acetate of Lead in the Water, and, having placed the solution in a cylindric jar, immerse in it the Zinc rolled into a coil. After the lapse of twenty-four hours decant the liquid, and having reduced it by evaporation to fifteen ounces, drop into it, while boiling hot, the Solution of Chlorinated Lime, until a reddish precipitate ceases to form. It is now to be cleared by passing it through a filter, then acidulated by the addition of a few drops of acetic acid, and evaporated down to ten fluidounces, when, upon cooling, crystals will form. These, and any additional crystals obtained by the concentration of the mother liquor, should be dried on blotting-paper placed on a porous brick, and then preserved in a well stopped bottle." *Dub.*

In the *U. S.* process the lead is wholly precipitated by the zinc, which forms with the acetic acid the acetate of zinc in solution. In order to be sure that the solution is entirely free from lead, it is tested with iodide of potassium, which will produce a yellow precipitate in case any of the lead remains unprecipitated. The crystals of acetate of zinc, as first obtained, are apt to be coloured with iron. Should this be the case, a boiling solution of them in distilled water is treated by the addition of successive portions of precipitated carbonate of zinc, until a small quantity of the liquid, being filtered, passes colourless. The zinc of the carbonate of zinc precipitates the iron, and takes its place in the solution; and the iron is known to be all removed, when a portion of the solution is found, upon trial, to filter clear. This mode of purifying the acetate of zinc from iron was suggested by Professor Procter, and was adopted in the U. S. Pharmacopœia of 1850, in place of the mode by means of a solution of chlorinated lime, which he found to separate the iron imperfectly. The necessary carbonate of zinc may be obtained extemporaneously, by converting one-thirtieth of the coloured solution of the acetate into carbonate by precipitating it with carbonate of potassa in slight excess, as originally proposed by Prof. Procter. The precipitated carbonate, first washed from acetate of potassa, is added in the state of magma to the coloured solution boiling hot. During the evaporation of the solution of the acetate of zinc, a small portion of the acetic acid is lost; and hence the necessity of acidulating with a few drops of acetic acid before crystallizing. In the *Dublin* process the acetate of lead is decomposed in the same way precisely as in the U. S. formula; but the solution of acetate of zinc is not tested for lead, and the imperfect method of the former U. S.

Pharmacopœia for separating the iron by a solution of chlorinated lime is adopted. This precipitant, so far as it acts, sesquioxidizes the iron, and renders it insoluble, by its chlorine uniting with the hydrogen of water, and liberating oxygen. In relation to the acetate of zinc, see a paper by Mr. Ambrose Smith, contained in the *Amer. Journ. of Pharm.*, vol. vii. p. 14.

Properties, &c. Acetate of zinc, when carefully crystallized, is in colourless hexagonal plates, which effloresce in a dry air. As found in the shops it is in white micaceous crystals. It is very soluble in water, moderately soluble in rectified spirit, and has an astringent, metallic taste. The solution yields white precipitates with ferrocyanuret of potassium and hydrosulphate of ammonia. The precipitate, thrown down by ammonia from the pure salt, is entirely redissolved by an excess of the precipitant; but if sesquioxide of iron be present, it will be left undissolved. Acetate of zinc is decomposed by the mineral acids, with the escape of acetous vapours. It consists of one eq. of acetic acid 51, one of protoxide of zinc 40·3, and seven of water 63=154·3.

Medical Properties. Acetate of zinc is used as an external remedy only, for the most part as an astringent collyrium in ophthalmia, and as an injection in gonorrhœa, after the acute stage in these affections has passed. The strength of the solution, usually employed, is one or two grains to a fluidounce of distilled water. B.

CALAMINA PRÆPARATA. *U. S., Lond., Ed. Prepared Calamine.*

"Take of Calamine *a convenient quantity.* Heat it to redness, and afterwards pulverize it; then reduce it to a very fine powder in the manner directed for Prepared Chalk." *U. S.*

The *London* and *Edinburgh* Colleges place prepared calamine in the list of Materia Medica, with these definitions: "Native carbonate of zinc, calcined, reduced to a very fine powder, and elutriated." *Lond.* "Levigated impure carbonate of zinc." *Ed.* The Dublin College has dismissed it.

The object of this process is to bring the native carbonate of zinc, or calamine, to the state of an impalpable powder. It is first calcined, to render it more readily pulverizable, and then levigated and elutriated. During the calcination, water and more or less carbonic acid are driven off; so that little else remains than the oxide of zinc, and the earthy impurities originally existing in the mineral. Calamine, as sold in the English shops, is often a spurious article, composed principally of sulphate of baryta, as ascertained by Mr. R. Brett. (See *Calamina*, p. 150.)

Properties, &c. Prepared calamine is in the form of a pinkish or flesh-coloured powder, of an earthy appearance. Sometimes it is made up into small masses. It is almost wholly soluble in dilute sulphuric acid; emitting very few or no bubbles of carbonic acid. Potassa or ammonia, added to this solution, throws down a precipitate (mixed oxide and subsulphate), which is redissolved when either precipitant is added in excess. It is used only as an external application, being employed as a mild astringent and exsiccant in excoriations and superficial ulcerations. For this purpose it is usually dusted on the part, and hence the necessity for its being in very fine powder. It is often employed in the form of cerate. (See *Ceratum Calaminæ.*)

Off. Prep. Ceratum Calaminæ. B.

ZINCI CARBONAS PRÆCIPITATUS. *U. S.* Zinci Carbonas. *Dub. Precipitated Carbonate of Zinc. Carbonate of Zinc.*

"Take of Sulphate of Zinc, Carbonate of Soda, each, *a pound;* Boiling Water *a gallon.* Dissolve the Sulphate of Zinc and Carbonate of Soda, severally, in four pints of the Water. Then mix the solutions, and, having stirred the mixture, set it by that the powder may subside. Lastly, having poured off the

supernatant liquid, wash the Precipitated Carbonate of Zinc with hot water until the washings are nearly tasteless, and dry it with a gentle heat." *U. S.*

"Take of Solution of Chloride of Zinc *one pint* [Imp. meas.]; Crystallized Carbonate of Soda of Commerce *two pounds* [avoirdupois]; boiling Distilled Water *six pints* [Imp. meas.]. To the Carbonate of Soda, dissolved in the Water, add the Solution of Chloride of Zinc, in successive portions, and boil until gas ceases to be evolved. Collect the precipitate on a calico filter, and, having poured on distilled water until the washings cease to cause turbidity, when dropped into a solution of nitrate of silver containing free nitric acid, dry the product, first on blotting-paper placed on a porous brick, and finally by a steam or water heat." *Dub.*

This is a new officinal of the U. S. and Dublin Pharmacopœias. In view of the impurities and frequent falsification of the native carbonate of zinc, the revisers of the former work conceived that it would be advantageous to adopt as officinal the pure artificial carbonate, but without discarding the old preparation. This is retained under the changed name of *Calamina;* while its former officinal name of *Zinci Carbonas* is applied to the present preparation. In the *U. S.* formula a double decomposition takes place between the salts employed, resulting in the formation of sulphate of soda in solution, and carbonate of zinc which precipitates. Carbonate of soda is preferable to carbonate of potassa for decomposing the sulphate; since the former gives rise to sulphate of soda, which is more easily washed away than sulphate of potassa, derived from the latter. In the *Dublin* process the reacting salts are chloride of zinc and carbonate of soda, with the result of forming chloride of sodium in solution, and carbonate of zinc. Here the salt to be washed away is chloride of sodium, which, on account of its being less soluble, is not so easily removed as sulphate of soda. The washings are tested with nitrate of silver, until they no longer indicate the presence of a chloride. Boiling water is properly used in both processes, in order to obtain a pulverulent precipitate, which is readily washed. If cold solutions are used, a gelatinous precipitate is formed, which is washed with difficulty.

Properties, &c. Precipitated carbonate of zinc is in the form of a very soft, loose, white powder, resembling magnesia alba. It dissolves in dilute sulphuric acid with effervescence, forming a solution having the characters of a solution of sulphate of zinc. If adulterated with chalk, it will be only partly soluble in this acid. Precipitated carbonate of zinc is often sold under the incorrect name of flowers of zinc, a name which properly belongs only to the oxide, as obtained by combustion. When obtained from boiling solutions of sulphate of zinc and carbonate of soda, it has the composition $8ZnO,3CO_2+6HO$. (*Schindler.*) Lefort makes its composition the same. (*Journ. de Pharm.*, 3*e sér.*, xi. 329.) The basic character of the salt is explained by the fact that effervescence of carbonic acid always takes place on mixing the solutions. It is employed medicinally for the same purposes as prepared calamine, and is coming gradually into use. The U. S. Pharmacopœia orders a cerate made from it, as a substitute for calamine cerate. (See *Ceratum Zinci Carbonatis.*)

Off. Prep. Ceratum Zinci Carbonatis; Zinci Oxidum. B.

ZINCI CHLORIDUM. *U. S., Lond., Dub. Chloride of Zinc. Butter of Zinc.*

"Take of Zinc, in small pieces, *two ounces and a half;* Nitric Acid [sp. gr. 1·42], Prepared Chalk, each, *a drachm;* Muriatic Acid *a sufficient quantity.* To the Zinc, in a glass or porcelain vessel, add gradually sufficient Muriatic Acid to dissolve it; then strain, add the Nitric Acid, and evaporate to dryness. Dissolve the dry mass in water, add the Chalk, and, having allowed the mixture to stand for twenty-four hours, filter, and again evaporate to dryness." *U. S.*

"Take of Hydrochloric Acid *a pint* [Imp. meas.]; Distilled Water *two pints* [Imp. meas.]; Zinc, broken into pieces, *seven ounces;* Mix the Acid with the Water, and add to them the Zinc; and, when the effervescence is nearly finished, apply heat until bubbles are no longer given out. Pour off the solution, filter, and evaporate until a dry salt remains. Having fused this in a lightly covered crucible by a nearly red heat, pour it out on a flat and clean stone. Lastly, when it has become cold, break it into pieces, and keep it in a well-stopped vessel." *Lond.*

"Take of Solution of Chloride of Zinc *any convenient quantity.* Evaporate it down in a porcelain capsule so far, that, upon suffering the residual liquor to cool, it solidifies. Subdivide the product rapidly into fragments, and enclose them in a well-stopped bottle." *Dub.*

In the U. S. process the chloride of zinc is first formed in solution by dissolving zinc in muriatic acid. The nitric acid added has the effect to sesquioxidize any iron which may have existed as an impurity in the zinc employed. By evaporating to dryness and redissolving in water, most of the sesquioxide of iron is left behind. Lastly, in order to remove any remains of iron, a small portion of chalk is added, which precipitates it as a sesquioxide; and the mixture, after standing, is filtered and evaporated to dryness. This process is the same as that of the French Codex. The *London* differs from the U. S. process in dispensing with the use of nitric acid and chalk, and in fusing the dry salt formed. The *Dublin* College uses the solution of chloride of zinc, prepared by a distinct formula, and evaporates it to such an extent that the salt solidifies on cooling. As this preparation is used chiefly as a caustic, we should prefer the London process, in which the salt is fused. In relation to this chloride, the reader is referred to a paper by Mr. B. J. Crew in the *Am. Journ. of Pharm.*, May, 1853, p. 203.

M. Rhighini prepares this chloride by double decomposition between solutions of chloride of barium and sulphate of zinc. Sulphate of baryta is precipitated, and chloride of zinc remains in solution, from which it is obtained in white flaky crystals by due evaporation.

Properties, &c. Chloride of zinc is a grayish-white, translucent, deliquescent substance, having the softness of wax. When pure it is wholly soluble in water, alcohol, and ether; but, as prepared by the U. S. formula, it contains some oxychloride, which is left undissolved by water. According to M. Lassaigne, the commercial chloride of zinc sometimes contains as much as twelve per cent. of arseniate of zinc, which, being insoluble in an aqueous solution of chloride of zinc, will be left undissolved, when the chloride is treated with water. (*Phillips's Trans. of the Lond. Pharm.*, 1851, p. 375.) Its solution yields with nitrate of silver a white precipitate (chloride of silver) insoluble in nitric acid; and with ammonia and potassa a white precipitate, which is dissolved by those reagents when added in excess. The carbonates of potassa and soda also throw down a white precipitate, which is not dissolved by an excess of the precipitants. When exposed to heat chloride of zinc first melts and then sublimes. When pure it gives white precipitates with ferrocyanuret of potassium and hydrosulphate of ammonia. A blue precipitate with the former test would indicate iron, a black one with the latter, lead. It consists of one eq. of zinc 32·3, and one of chlorine 35·42=67·72.

Medical Properties and Uses. This chloride was introduced into medicine by Papenguth, and subsequently recommended by Prof. Hancke, of Breslau, and Dr. Canquoin, of Paris. Internally it has been given as an alterative and antispasmodic in scrofula, epilepsy, chorea, and, combined with hydrocyanic acid, in facial neuralgia. Its chief employment, however, has been as an escharotic, applied to cancerous affections, and to ulcers of an anomalous and intractable character. When thus used, it acts not merely by destroying the diseased struc-

ture, but by exciting a new and healthier action in the surrounding parts. As a caustic it has the advantage of not giving rise to constitutional disorder from absorption, an effect which is sometimes produced by the arsenical preparations.

Dr. Canquoin prepares the chloride of zinc as an escharotic, by thoroughly and quickly mixing it with wheat flour and water into a paste of four different strengths, containing severally an ounce of the chloride incorporated with two, three, four, and five ounces of flour; fifteen drops of water being added for every ounce of flour, or sufficient to form the paste. It is applied in cakes from a twelfth to a third of an inch in thickness, and produces an eschar more or less deep (from a line to an inch and a half), according to the thickness of the paste, the length of the application, and the nature of the part acted on. The strongest paste is applied to lardaceous and fibro-cartilaginous structures; the second to carcinomatous tumours, and very painful cancers which have not much thickness, and the third to cancerous affections in persons who have a dread of violent pain. These preparations, applied to the skin denuded of its cuticle by means of a blister, excite in a few minutes a sensation of heat, and afterwards violent burning pain. The eschar, which is white, thick, and very hard, falls off, by the aid of an emollient poultice, between the eighth and twelfth days. To destroy thick cancerous tumours, having an uneven surface, and situated in fleshy parts, Dr. Canquoin uses a caustic formed of one part of chloride of zinc, half a part of chloride of antimony, and two and a half parts of flour, made into a paste with water. In all cases, the caustic is to be reapplied, after the falling off of the eschar, until the whole morbid structure is destroyed. M. Bonnet has applied the paste of chloride of zinc to the treatment of aneurism. He announces the complete cure of one case of subclavian aneurism from a penetrating wound, by a continued series of applications of the paste. Every two or three days, the superficial layers of the slough were removed by a bistoury. At the end of the second month, the eschar began to detach itself without any hemorrhage, and the clot came away with the eschar. Chloride of zinc has also been used successfully by M. Bonnet, in conjunction with M. Gensoul, in the treatment of aneurism by anastomosis. (*Med. Times and Gaz.*, July 23, 1853.) Instead of flour, Dr. Alex. Ure, of Glasgow, mixes the chloride with pure anhydrous sulphate of lime in impalpable powder. He states that this has the advantages of furnishing a porous medium from which the escharotic gradually exudes into the morbid structure, and of forming afterwards, by acquiring a firmer consistence, an impervious case for the eschar. Mr. Calloway, of Guy's Hospital, has employed the chloride of zinc with considerable success in the treatment of nævi materni. He rubs it at intervals on the part, until the skin becomes slightly discoloured. Mr. Guthrie has used it with advantage for penetrating the hard case of new bone which forms over a sequestrum, in order to expose the latter, and permit its convenient extraction.

Chloride of zinc, with a view to its escharotic effect, may be formed extemporaneously by means of *galvanism*, on the plan recommended by an English physician, Dr. Thomas Smith. A simple galvanic circle is formed by riveting a disc of zinc, of the size of the eschar desired, to a disc of silver of equal size; the pair being excited by a piece of spongio-piline, placed on the silver, and moistened with a solution of common salt. The little battery is then fixed upon the skin by means of strips of adhesive plaster. Once in twelve hours it must be removed, and washed in salt and water, and then reapplied. By the electrolysis of the salt, chlorine is liberated, which combines with the zinc, and converts it to a certain extent into the chloride. This, acting on the skin, exercises its caustic effect; and at the end of twelve days a white eschar is formed. This mode of forming an issue has, according to Dr. Smith, the advantage of being less painful than those usually employed.

For internal exhibition, the most convenient form is a solution in the spirit of ether, in the proportion of half an ounce to three fluidounces. Of this from four to eight drops may be given twice a day. Dr. Lloyd, of London, has found chloride of zinc useful as an injection in the acute stage of gonorrhœa, made of the strength of about two grains to three fluidounces of distilled water, and employed once in five or six hours.

In over-doses chloride of zinc acts as a corrosive poison. It produces burning pain in the gullet and stomach, nausea and vomiting, cold sweats, depression of the pulse, and cramps of the legs. According to Dr. T. Stratton, surgeon R. N., who treated two cases of poisoning with this chloride at Montreal, the best antidotes are the carbonated alkalies, which act by converting the poison into carbonate of zinc. In case the alkalies are not at hand, a solution of common soap must be immediately and freely given. (*Med. Exam.*, Feb. 1849, from the *Brit. Am. Journ. of Med. and Phys. Sci.*) Dr. Letheby reports a fatal case of poisoning by this chloride occurring in a child in August 1849. The form of chloride swallowed was Burnett's disinfecting fluid. (See *page* 1282.) Its local effect was that of a corrosive on the lips, mouth, and fauces. Among the constitutional effects were paralysis of the voluntary muscles, coldness of the surface, dilated pupil, and coma. B.

ZINCI CHLORIDI LIQUOR. *Dub. Solution of Chloride of Zinc.*

"Take of sheet zinc *one pound* [avoirdupois]; Muriatic Acid of Commerce, Water, of each, *two pints and a half* [Imp. meas.], or *as much as may be sufficient;* Solution of Chlorinated Lime *one fluidounce* [Imp. meas.]; Prepared Chalk *one ounce* [avoird.]. To the zinc, introduced into a porcelain capsule, gradually add the Muriatic Acid, applying heat until the metal is dissolved. Filter the liquid through calico, and, having added to it the Solution of Chlorinated Lime, concentrate at a boiling temperature, until it occupies the bulk of one pint [Imp. meas.]. Permit the solution now to cool down to the temperature of the air, place it in a bottle with the Chalk, and, having first added Distilled Water, so that the bulk of the whole may be a quart [two pints, Imp. meas.], shake the mixture occasionally for twenty-four hours. Finally, filter, and preserve the product in a well stopped bottle. The specific gravity of this liquor is 1·593." *Dub.*

This is a new officinal solution of the Dublin Pharmacopœia of 1850. It is made, in the usual way, by dissolving zinc in muriatic acid. The chlorinated lime is added to the liquid, in order to convert any iron which may be present into sesquichloride, from which it is afterwards precipitated by the chalk. The use of this precipitant introduces into the preparation a small proportion of chloride of calcium, which has no injurious effect. The two pints and a half of water, taken in the formula, are not used in the process. They were probably intended for the dilution of the muriatic acid, which acts better on the zinc when diluted. The preparation is completed by bringing it to a determinate bulk by the addition of distilled water, and by filtration to separate the precipitated iron and any excess of chalk.

Solution of chloride of zinc is a dense, colourless liquid, having a burning nauseous taste even when dilute. It contains 175 grains of zinc in a fluidounce, and has the sp. gr. 1·593. This solution is equivalent to Burnett's disinfecting fluid, noticed below. It is a powerful disinfectant, and, when applied to cancerous and other offensive ulcers, duly diluted with water, destroys their fetor so long as the dressings are kept moist with it. This solution is recommended by M. Gaudriot in gonorrhœa in both sexes, as having remarkable remedial powers. For men he uses an injection, composed of from twenty-four to thirty-six drops in four fluidounces of water. A small quantity only is injected about

an inch up the urethra, two or three times a day. For women he employs a vaginal suppository, formed of five drops of the solution, half a grain of sulphate of morphia, and three drachms of a paste consisting of a drachm and a half of starch, a drachm of mucilage of tragacanth, and half a drachm of sugar. The suppository is introduced every day, or every second day.

Burnett's disinfecting fluid, like the Dublin officinal solution, is an aqueous solution of chloride of zinc. It contains 200 grains of zinc in each Imperial fluidounce, and has the sp. gr. 2. It is, therefore, considerably stronger than the Dublin solution. It is so called after Sir William Burnett, who introduced it into use, in 1840, as a powerful deodorizing and disinfecting agent in neutralizing noxious effluvia, and in arresting animal and vegetable decomposition. Diluted with water it forms Sir William's patent preservative against the dry rot. The concurrent testimony of a number of observers shows that it acts as an excellent disinfectant for ships, hospitals, dissecting rooms, water-closets, privies, &c. (See Extracts from British Navy Reports on chloride of zinc as a disinfectant, in the *Lond. Med. Times and Gaz.*, Oct. 1853, p. 341.) Injected into the blood-vessels, it preserves bodies for dissection, without impairing their colour or texture, and is said not to injure the knives employed; but the accuracy of the latter statement is doubted by some. The advantage is claimed for it, that, while it destroys putrid odours, it has no smell of its own. For preserving anatomical subjects, one part of the disinfecting fluid to eighteen of water will form a solution of the proper strength. For disinfecting purposes on a large scale, a pint of the fluid may be mixed with four gallons of water.

Off. Prep. Zinci Carbonas; Zinci Chloridum. B.

ZINCI OXIDUM. *U. S., Lond. Ed.* Zinci Oxydum. *Dub. Oxide of Zinc.*

"Take of Precipitated Carbonate of Zinc *a pound.* Expose it to a strong heat in a shallow vessel, so as to drive off the carbonic acid." *U. S.*

The *Dublin College* exposes the carbonate in a covered clay crucible to a very low red heat, until a portion of it, taken from the centre, ceases to effervesce on being dropped into dilute sulphuric acid.

"Take of Sulphate of Zinc *a pound;* Sesquicarbonate of ammonia *six ounces and a half;* Distilled Water *three gallons* [Imp. meas.]. Dissolve the Sulphate and Sesquicarbonate, separately, in twelve pints [Imp. meas.] of Water; then mix. Wash the precipitate repeatedly with water, and afterwards expose it for two hours to a strong heat." *Lond.*

The *Edinburgh* formula is essentially the same as the London.

At present all the Pharmacopœias, noticed in this work, prepare the oxide of zinc from the carbonate,—the carbonate ready formed in the U. S. and Dublin formulæ, and made as a step of the London and Edinburgh processes. By referring to the article on precipitated carbonate of zinc, *page* 1278, it will be found that this carbonate is obtained in the U. S. process from sulphate of zinc, in the Dublin from the chloride, in both cases by the decomposing influence of carbonate of soda. In the London and Edinburgh processes the carbonate is obtained extemporaneously from the sulphate of zinc, by means of carbonate of ammonia. Of these methods for forming carbonate of zinc, that of the U. S. Pharmacopœia is to be preferred. M. Lefort found it to furnish a carbonate which is washed with facility, and convertible by calcination into a pure oxide, readily reduced to an impalpable and very light powder. (*Journ. de Pharm.*, 3*e sér.*, xi. 329.) The methods of the British Colleges are ineligible, on account of the comparative cost of the materials employed. The carbonate of zinc, in whatever way obtained, is exposed to heat to drive off the carbonic acid and water, in order to obtain the oxide. According to Mohr, a full red heat is not necessary for this purpose; a temperature between 536° and 572° being sufficient.

Oxide of zinc may be obtained by the combustion of the metal; and in this way it was formerly prepared by the Dublin College. Zinc melts at 773°, and immediately becomes covered with a film of gray oxide. When the temperature reaches nearly to redness, it takes fire and burns with an intense white light, generating the oxide in the form of very light and white flocculi, resembling carded wool, which quickly fill the crucible, and are in part driven into the atmosphere by the current of air. Mr. G. D. Midgley, of London, has recently called attention to the production of oxide of zinc by combustion, and has given a description of the apparatus, by which he is enabled to prepare from one to two hundred weight of the oxide at one operation. It consists of a large muffle, heated to redness in a suitable furnace, and supplied with zinc from time to time as the combustion proceeds. The necessary draught of air is conveyed from the muffle by a tube, passing through the top of the furnace, and terminating in a vessel containing water, in which the portion of oxide carried up by the current is retained. The resulting oxide is freed from particles of metallic zinc by being passed through a sieve. (See *Am. Journ. of Pharm.*, April, 1849.)

Properties, &c. Oxide of zinc is an inodorous, tasteless, white powder, insoluble in water and alcohol. As obtained by the London formula it is yellowish-white. It dissolves readily in acids without effervescence; and in potassa, soda, and ammonia, but not in their carbonates. When heated moderately it beomes yellow; but upon cooling it regains its white colour, unless iron is present, when a yellowish tint remains. At a low white heat it fuses, and at a full white one sublimes. When prepared by combustion, it was formerly called *pompholix, nihil album, lana philosphica*, and *flowers of zinc*. This oxide is often impure. Much of that sold in the shops effervesces with acids, owing to the presence of carbonate of zinc, or of the carbonate used to precipitate it. Its neutral solution in acids should give a white precipitate with ferrocyanuret of potassium and hydrosulphate of ammonia. If the precipitate with the former test is bluish-white, iron is indicated; if black with the latter, lead is shown. When prepared by the old officinal process, namely, by precipitating sulphate of zinc with caustic ammonia, it contained the subsulphate, the acid of which may be detected by dissolving the oxide in nitric acid, and precipitating by nitrate of baryta. If the oxide contain white lead or chalk, it will not be entirely soluble in dilute sulphuric acid, but an insoluble sulphate of lead or of lime will be left behind. If iron be present, brownish-red flocks of sesquioxide are left undissolved, when the muriatic solution of the oxide of zinc is treated with ammonia in excess. Oxide of zinc consists of one eq. of zinc 32·3, and one of oxygen 8=40·3.

Medical Properties and Uses. Oxide of zinc is tonic and antispasmodic. It has been given in chorea, epilepsy, hooping-cough, spasm of the stomach dependent on dyspepsia, and other similar affections. Externally, it is employed as an exsiccant to excoriated surfaces, sometimes by sprinkling it on the affected part, but generally in the form of ointment. (See *Unguentum Zinci Oxidi.*) The dose is from two to eight grains or more, repeated several times a day, and given in the form of pill.

Oxide of zinc is extensively used at present (1854) in painting, as a substitute for white lead, over which it has the advantage of not being discoloured by sulphuretted hydrogen. It has, moreover, the merit of not producing injurious effects on the workmen, at all comparable to those caused by white lead.

Off. Prep. Unguentum Zinci Oxidi. B.

ZINCI SULPHAS. *U.S., Lond., Ed., Dub. Sulphate of Zinc. White Vitriol.*

"Take of Zinc, in small pieces, *four ounces;* Sulphuric Acid *six ounces;* Distilled Water *four pints.* To the Zinc and Water, previously introduced into a

glass vessel, add by degrees the Sulphuric Acid, and, when the effervescence has ceased, filter the solution through paper; then boil it down till a pellicle begins to form, and set it aside to crystallize." *U. S.*

In the *London* Pharmacopœia of 1851, this salt has been transferred to the list of Materia Medica.

"This salt may be prepared either by dissolving fragments of Zinc in Diluted Sulphuric Acid till a neutral liquid be obtained, filtering the solution, and concentrating sufficiently for it to crystallize on cooling—or by repeatedly dissolving and crystallizing the impure Sulphate of Zinc of commerce, until the product when dissolved in water does not yield a black precipitate with tincture of galls, and corresponds with the characters laid down for Sulphate of Zinc in the list of the Materia Medica." *Ed.*

"Take of Zinc, laminated, or in small fragments, *four ounces* [avoirdupois]; Oil of Vitriol of Commerce *three fluidounces* [Imp. meas.]; Distilled Water *one quart* [two pints, Imp. meas.]; Nitric Acid of Commerce, Dilute Sulphuric Acid, of each, *a fluidrachm* [Imp. meas.]; Prepared Chalk *two drachms* [Dub. weight]. Place the Zinc, Oil of Vitriol, and a pint of the Water in a porcelain capsule, and, when gas ceases to be developed, boil for ten minutes. Pass then the solution through a calico filter, and, having added to it the Nitric Acid, evaporate to dryness. Let the dry salt be dissolved in the remainder of the Water, and let the solution when cold be shaken several times for six hours in a bottle with the Chalk, and then cleared by passing it through a filter. It is now, after having been acidulated with the Dilute Sulphuric Acid, to be evaporated till a pellicle begins to form on its surface, and then set to crystallize. The crystals thus obtained should be dried on blotting paper without heat, and then preserved in a bottle. By further concentrating the solution from which the crystals have been separated, an additional product will be obtained." *Dub.*

By these processes crystallized sulphate of zinc is obtained. *Strong* sulphuric acid has very little action on zinc; but, when it is *diluted*, water is instantly decomposed, and, while its hydrogen escapes with rapid effervescence, its oxygen combines with the zinc; and the oxide formed, uniting with the acid, generates the sulphate of the oxide of zinc. Thus it is perceived that *hydrogen* is a collateral product of the process. The proportion of the zinc to the strong acid is as 4 to 6 in the U. S. process, and as 4 to 5·53 in the Dublin. The equivalent numbers give the ratio of 4 to 6·06; which indicates that the U. S. numbers approach very nearly to the true proportion. If the materials be mixed at once, without any precaution, the effervescence of hydrogen is apt to be excessive, and to cause the overflowing of the liquid. This is avoided by the direction of the U. S. formula, to commence the solution of zinc with a very dilute acid, which, as the action slackens, is made by degrees stronger and stronger, by the addition, at intervals, of small portions of fresh acid. The formula of the Ed. Pharmacopœia embraces directions for obtaining the salt either by direct combination, or by purifying the white vitriol of commerce from iron by repeated crystallizations. The Dublin formula is peculiar in using a little nitric acid and prepared chalk. The acid has the effect of sesquioxidizing any iron which may be present, and the chalk of precipitating it. The boiling and evaporation to dryness have the effect of producing a portion of basic sulphate of zinc, which is converted into neutral sulphate before crystallizing by the addition of a little dilute sulphuric acid.

Preparation on the Large Scale. Impure sulphate of zinc, as it occurs in commerce, is called *white vitriol*. It is manufactured by roasting *blende* (native sulphuret of zinc) in a reverberatory furnace. This mineral, besides sulphuret of zinc, contains small quantities of the sulphurets of iron, copper, and lead; and by roasting is converted, in consequence of the oxidation of its constituents,

into sulphate of zinc, mixed with the sulphates of iron, copper, and lead. The roasted matter is then lixiviated; and the solution obtained, after having been allowed to settle, is concentrated by evaporation; so that, on cooling, it may concrete into a white crystalline mass, resembling lump sugar. In this state it always contains sulphate of iron, and sometimes a small portion of sulphate of copper. It may be purified from these metals by dissolving it in water, and boiling the solution with oxide of zinc, which converts the sulphates of iron and copper, by precipitating their bases, into sulphate of zinc. The purified solution is then decanted or filtered, and, after due evaporation, allowed to crystallize. It has generally been proposed to purify the white vitriol of commerce by digesting its solution with metallic zinc, under the impression that this is capable of precipitating all the foreign metals; but, according to Berzelius, though it will precipitate copper readily, it has no action on iron.

Properties, &c. Sulphate of zinc is a colourless, transparent salt, having a disagreeable, metallic, styptic taste, and crystallizing usually in small four-sided prisms. Its crystals have considerable resemblance to those of sulphate of magnesia. It effloresces slightly in dry air, and, though neutral in composition, is still capable of reddening vegetable blues. It dissolves in two and a half times its weight of cold water, and in less than its weight of boiling water, and is insoluble in alcohol. When heated, it dissolves in its water of crystallization, which gradually evaporates; and, by a prolonged ignition, the whole of the acid is expelled, and the oxide of zinc left. Potassa, soda, and ammonia throw down a white precipitate of mixed oxide and subsulphate, which is redissolved by the alkali when added in excess. If iron be present it is precipitated also, but not redissolved. The alkaline carbonates precipitate the metal in the state of white carbonate. Pure sulphate of zinc is precipitated white by ferrocyanuret of potassium and hydrosulphate of ammonia. What is thrown down by chloride of barium or acetate of lead (sulphate of baryta or sulphate of lead) is not dissolved by nitric acid. The precipitate thrown down from a solution of 100 grains of the salt by carbonate of ammonia yields, after exposure to a strong heat, 27·9 grains of oxide of zinc. (*Lond. Pharm.*) If copper be present, ammonia will produce a blue tinge; if iron, the ferrocyanuret of potassium will cause a bluish-white precipitate instead of a white one. Cadmium and arsenic may be detected by acidulating the solution with sulphuric acid, and passing a stream of sulphuretted hydrogen through it; when, if either of these metals be present, it will be thrown down as a yellow sulphuret. Sulphate of zinc is incompatible with alkalies and alkaline carbonates, hydrosulphates, lime-water, the soluble salts of lead, and astringent infusions.

The impure commercial variety of sulphate of zinc, called white vitriol, is in the form of irregular white masses, having some resemblance to lump sugar. The lumps usually exhibit, here and there on the surface, yellow stains, produced by the sesquioxide of iron. It is less soluble than the pure salt, on account of its containing less water of crystallization.

Composition. Crystallized sulphate of zinc consists of one eq. of sulphuric acid 40, one of oxide of zinc 40·3, and seven of water 63=143·3. The white vitriol of commerce contains but three eqs. of water.

Medical Properties and Uses. This salt is tonic, astringent, and, in large doses, a prompt emetic. As a tonic, it is supposed to be well suited to cases of debility, attended with irritation, being less heating than sulphate of iron. In dyspepsia it has been used with advantage in very minute doses, as, for instance, a quarter of a grain, repeated several times a day; but if its good effects are not soon apparent, it should be laid aside. In obstinate intermittents, it is a valuable resource, and may be given alone or conjoined with cinchona or sulphate of quinia. But it is in spasmodic diseases, such as epilepsy, chorea, pertussis, &c., that it

has been principally employed. Dr. Paris speaks of its efficacy in high terms, in spasmodic cough, especially when combined with camphor or myrrh, and "in affections of the chest attended with inordinate secretion." As an astringent it is chiefly employed externally. In this mode of application, its solution constitutes a good styptic to bleeding surfaces, and is frequently resorted to as an injection in fluor albus and the advanced stages of gonorrhœa, and as a collyrium in ophthalmia. In some conditions of ulcerated sorethroat, it forms a useful gargle. It has been employed also in solution with success as a remedy for nasal polypi, in the proportion of two scruples, gradually increased to an ounce of the salt, to seven fluidounces of water, applied by means of lint and by injection. Before the discovery of tartar emetic, sulphate of zinc was almost exclusively employed to produce vomiting; but at present its use as an emetic is restricted principally to the dislodging of poisons, for which purpose its property of operating rapidly renders it particularly suitable. The dose, as a tonic, is from one to two grains; as an emetic, from ten to thirty grains. To children affected with hooping-cough, it may be given in doses of from an eighth to a quarter of a grain two or three times a day. When used as a collyrium, injection, or gargle, or as a wash for indolent ulcers, from one to three grains, or more may be dissolved in a fluidounce of water. For medical purposes the crystallized salt should be used, and in no case the impure white vitriol of commerce.

Sulphate of zinc, in an over-dose, acts as an irritant poison. Besides vomiting and incessant retching, there are produced anxiety, distressing restlessness, and extreme prostration. Few cases are on record of fatal poisoning by this salt; the patient being generally relieved by a prompt expulsion of the poison by vomiting. Four cases, however, have been latterly reported in an Italian journal, two of which were fatal. In one of the fatal cases, an ounce and a half had been swallowed by mistake for Epsom salt. The proper treatment consists in the administration of large quantities of bland drinks, the use of opium to allay irritation, and the employment of the usual antiphlogistic remedies, in case symptoms of inflammation should arise.

Off. Prep. Liquor Aluminis Compositus; Zinci Carbonas Præcipitatus; Zinci Oxidum; Zinci Valerianas. B.

ZINCI VALERIANAS. *Dub. Valerianate of Zinc.*

"Take of Valerianate of Soda *two ounces and a half* [avoirdupois]; Sulphate of Zinc *two ounces and seven drachms* [avoird.]; Distilled Water *one quart* [two pints, Imp. meas.]. Dissolve the Valerianate of Soda in one-half, and the Sulphate of Zinc in the remaining half of the Water, and, having raised both solutions to 200°, mix them, and skim off the crystals which are produced. Let the solution be now evaporated at a temperature not exceeding 200°, until it is reduced to the bulk of four [fluid]ounces, removing, as before, the crystals from the surface, in proportion as they form, and placing them with those already obtained. The salt thus procured is to be steeped for an hour in as much cold distilled water as is just sufficient to cover it, and then transferred to a paper filter, on which it is to be first drained, and then dried at a heat not exceeding 100°." *Dub.*

In the formation of this new officinal of the Dublin Pharmacopœia of 1850, a double decomposition takes place between the reacting salts, resulting in the production of sulphate of soda and valerianate of zinc. Upon mixing the hot solutions, crystals of the sparingly soluble valerianate of zinc form on the surface of the liquid; and, during the progress of its concentration to one-tenth, more of them are successively produced. These are then washed with cold distilled water to separate adhering sulphate of soda, drained on a filter, and dried.

Properties. This salt is in white, pearly scales, which have a faint odour of valerianic acid, and an astringent, metallic taste. It dissolves in 160 parts of

cold water, and in 60 of alcohol, of the sp. gr. 0·833. The solutions, which have an acid reaction, become turbid on the application of heat, but clear again on cooling. The salt, as obtained by the Dublin formula, is anhydrous; but, when formed by exactly saturating carbonate of zinc, made into a paste with water, with valerianic acid, it contains twelve eqs. of water, and, when dried at 122°, perfectly resembles the anhydrous salt. (*G. C. Wittstein.*) Sometimes acetate of zinc, impregnated with oil of valerian, is fraudulently substituted for this salt. The butyrate of zinc has been sold in Paris for the valerianate, and is so similar to the latter as not to be distinguished by its physical properties. The two salts, however, may be chemically discriminated, by adding a concentrated solution of the acid of the suspected salt, obtained by distillation with sulphuric acid, to a concentrated solution of acetate of copper. If the acid be the butyric, its addition to the solution of the acetate disturbs the transparency of the latter, by the formation of a bluish-white precipitate; while, if it be the valerianic, no change is produced. (Larocque and Huraut, *Journ. de Pharm.*, 3*e sér.*, ix. 430.)

Medical Properties. Valerianate of zinc was proposed as a remedy, on theoretical grounds, by Prince Louis-Lucien Bonaparte. Upon trial it was found to possess antispasmodic properties. By some of the Italian physicians it has been extolled as a remedy in neuralgic affections. Dr. Namias, of Venice, employed it with advantage in anomalous nervous affections, attended with palpitation of the heart, constriction of the throat, and pain in the head. Dr. Francis Devay, of Lyons, found it useful in epilepsy, and in the nervous affections which accompany chlorosis. The dose is one or two grains, repeated several times a day, and given in the form of pill. (See a paper on this valerianate by Prof. Procter, in the *Am. Journ. of Pharm.*, for April, 1845.) B.

APPENDIX.

I. DRUGS AND MEDICINES NOT OFFICINAL.*

In the progress of the medical art, numerous remedies have at different times risen into notice and employment, which, by the revolutions of opinion incident to our science, or by the discovery of more efficient substitutes, have so far fallen into disrepute as to have been discarded from general practice, and no longer to hold a place in the officinal catalogues. Of these, however, some are still occasionally employed by practitioners and referred to by writers, and may retain a popularity as domestic remedies, or among empirics, which they have lost with the medical profession generally. The attention of physicians must, therefore, frequently be called to them in the course of practice; and it is highly desirable to possess some knowledge of their properties and effects, in order to be enabled to judge of their agency in any particular case, and at the same time to avoid the suspicion of incompetence which might attach to the exhibition of entire ignorance in relation to them. The remark is true also of other substances, which, though at no time ranked among regular medicines, are yet habitually employed in families, and the influence of which, either remediate or otherwise, must often enter into our estimate of the causes which produce or modify disease. New medicines, moreover, are frequently brought forward, which, without having obtained the sanction of the medical authorities, are occasionally prescribed, and therefore merit notice. To supply, to a certain extent, the requisite means of information in regard to these extra-officinal remedies, is the object of the following brief notices, among which are also included accounts of substances not employed as medicines, but usually kept in the drug stores for various purposes connected with the arts, or with domestic convenience. In a work intended for the use as well of the apothecary and druggist, as of the physician and medical student, the introduction of such accounts is obviously proper, if kept in due subordination to the more important object of teaching the properties of medicines, and the modes of preparing them. The authors regret that the limits which practical convenience appears to require in a Dispensatory, do not admit of a more complete enumeration of the various drugs and medicines of the kind above alluded to, or of ampler details in relation to those actually treated of, than will be found in the following pages. They have endeavoured, however, in the selection of objects, to choose those which are likely most frequently to engage the attention of the medical and pharmaceutical professions, and, in the extent of the descriptions, to consult as far as possible the relative importance of facts, of which they could not detail the whole. In relation to the nomenclature employed, it may be proper to observe that all those vegetable remedies, which, not being generally kept in the shops, have no current commercial name, are described under the scientific title of the plant producing them; while other substances are designated by the names which ordinary usage has assigned them.

* By the term officinal medicines, here as well as elsewhere in this work, are meant such as are embraced in the United States and British Pharmacopœias.

ACETATE OF COPPER. *Cupri Acetas. Crystals of Venus.* This salt is prepared by dissolving verdigris, with the assistance of heat, in vinegar or dilute acetic acid. The solution, after having been sufficiently concentrated, is transferred to suitable vessels, where it crystallizes on cooling. Acetate of copper is a slightly efflorescent salt, crystallizing in rhomboidal prisms, and having a rich deep-blue colour and strong styptic taste. It dissolves in water without residue, a character which serves to distinguish it from verdigris. It consists of one eq. of acetic acid, one of protoxide of copper, and one of water. Its popular name of *distilled verdigris* is inappropriate; as no distillation is practised in its preparation. This salt is used for colouring maps. It was formerly the chief source of acetic acid. It has no medical uses, and has been very properly abandoned by the Dublin College as an officinal preparation in its Pharmacopœia of 1850.

ACETATE OF MAGNESIA. *Magnesiæ Acetas.* This salt has been proposed as a purgative by M. Renault, of Paris. It has the merit of extreme solubility both in water and alcohol. Though without much taste, it is inferior in that respect to citrate of magnesia, for which it is proposed as a substitute. It is prepared for therapeutic use by saturating 120 parts of carbonate of magnesia with acetic acid, and evaporating the resulting liquid, after filtration, to 300 parts. The product is a syrupy acetate of magnesia, which is to be mixed with three times its weight of syrup of oranges, to form the preparation of M. Renault. Of this about four ounces is the dose. The objection to this liquid acetate of magnesia is, that, owing to its attraction for moisture, it cannot be preserved of uniform strength for mixing with the syrup of oranges. (*Journ. de Pharm.*, 3*e sér.*, xiii. 260.)

ACETIC ETHER. *Æther Aceticus.* This ether may be formed by several processes, the chief of which are the following:—1. Mix 100 parts of alcohol (sp. gr. 0·83) with 63 parts of concentrated acetic acid, and 17 parts of strong sulphuric acid, and distil 125 parts into a receiver, kept cold with wet cloths. 2. Distil to dryness, a mixture of 3 parts of acetate of potassa, 3 of alcohol, and 2 of sulphuric acid, and mix the distilled product with one-fifth of sulphuric acid, and distil a second time an amount of ether equal to the alcohol employed. 3. Distil 2 parts of effloresced acetate of lead with 1 part of alcohol, and a little more than 1 part of sulphuric acid. In the last two processes, the acetic acid is set free by the action of the sulphuric acid on the acetate employed. Acetic ether is colourless, of a very grateful odour, and a peculiar, agreeable taste. Its specific gravity is 0·866, and its boiling point 160°. It undergoes no change by being kept. By contact of flame it burns readily, diffusing an acid odour. It dissolves in seven and a half parts of water, and unites in all proportions with alcohol. It consists of one eq. of acetic acid 51, and one of oxide of ethyle (ether) 37=88 ($C_4H_5O,C_4H_3O_3$).

Acetic ether is occasionally used in medicine as a stimulant and antispasmodic. The dose is from fifteen to thirty drops, sufficiently diluted with water. It is sometimes employed externally, by friction, as a resolvent, and for rheumatic pains.

ACHILLEA MILLEFOLIUM. *Milfoil. Yarrow.* This is a perennial herb, common to the old and new continents, though supposed to have been introduced into this country from Europe. It abounds in old fields, along fences, and on the borders of woods and of cultivated grounds, throughout the United States. It is from a foot to eighteen inches high, and is distinguished by its doubly pinnate minutely divided leaves, from which it derived the name of milfoil, and by its dense corymb of whitish flowers, which appear throughout the summer, from June to September. The whole herb is medicinal. Both the flowers and leaves have an agreeable, though feeble aromatic odour, which continues after drying, and a bitterish, astringent, pungent taste. The aromatic properties are strongest in the flowers, the astringency in the leaves. The plant owes its virtues to a volatile oil, a bitter extractive, and tannin. It contains also a peculiar acid, denominated *achilleic acid.* The oil, which may be obtained separate by distillation with water, has a beautiful azure-blue colour, and the peculiar flavour of milfoil. The active principles are extracted both by water and alcohol. The medical properties of the herb are those of a mild aromatic tonic and astringent. In former times it was much used as a vulnerary, and was also given internally for the suppression of hemorrhages, and of profuse mucous discharges. It has been recommended in intermittents, and as an antispasmodic in flatulent colic, and nervous affections; but is at present little used. It has recently been highly recommended by M. Richart, of Soissons, in low forms of exanthematous fevers with difficult eruption, in colic, painful menstruation, and infantile convulsions. He uses the infusion at once as a drink, an injection, and fomentation. (See *Journ. de Pharm. et de Chim.*, xviii. 62.) In some parts of Sweden it is said to be employed as a substitute for hops in the preparation of beer, which it is thought to render more intoxicating. It is most conveniently administered in the form of infusion. The volatile oil has been given in the dose of twenty or thirty drops.

ACTÆA SPICATA. *Baneberry. Herb Christopher.* This is a perennial, herbaceous, European plant, growing in the woods of mountainous regions, and attaining a height of two feet or more. The root is of a dark-brown colour, and bears some resemblance to that of Helleborus niger, for which it is said to be occasionally substituted. Its odour, in the recent state, is sweetish and rather nauseous, but is in great measure dissipated by drying. The taste is bitterish, and somewhat acrid. In its operation on the system, the root is purgative and sometimes emetic, and is capable, in over-doses, of producing dangerous effects. It is unknown in this country. We have, however, a native species of Actæa—*A. Americana* of Pursh—of which there are two varieties—*alba* and *rubra*—distinguished by the colour of their berries, which in the former are white, and in the latter red. They are sometimes called *white* and *red cohosh*, a name derived from the language of the Aborigines. By some botanists they are treated of as distinct species, under the names of *Actæa alba*, and *Actæa rubra*. They grow in the rich deep mould of shady and rocky woods, from Canada to Virginia. They are said to have been much esteemed by the Indians. Their medical properties are probably similar to those of the *A. spicata*. The name *baneberry*, given to different species of Actæa, was derived from the reputed poisonous properties of their berries.

ADANSONIA DIGITATA. *Baobab.* A tree of enormous magnitude, belonging to the Linnæan class and order Monadelphia Polyandria, and to the natural family Sterculiaceæ (Lindley). It is a native of Africa, extending quite through that continent from Senegal to Abyssinia, and has been introduced into the West Indies. The leaves and bark of this tree abound in mucilage, and have little smell or taste; yet extraordinary virtues have been ascribed to them. Adanson found the leaves very useful as a preventive of fevers, and they are employed habitually by the native Africans with a view to their diaphoretic property. Dr. Duchassaing, of Guadaloupe, has published a statement of his experience with the bark in the miasmatic diseases of the West Indies. Out of 93 cases, chiefly of intermittent fever, he failed only in three. M. Pierre has subsequently employed the remedy with success in intermittent fever at Bourgogne, in France. (*Arch. Gén. de Med.*, 3*e sér.*, xxiii. 535.) The bark has the advantage over cinchona of being almost without taste, and quite acceptable to the stomach. It produces no other observable physiological effect than some increase of appetite, increased perspiration, and perhaps diminished frequency of the pulse. An ounce may be boiled in a pint and a half of water to a pint, and the whole taken in a day. (*Journ. de Pharm.* 3*e sér.*, xiii. 412 and 421.) The fruit, which contains a subacid not disagreeable pulp, is used by the Africans in dysentery and other bowel complaints.

ADIANTUM PEDATUM. *Maidenhair.* An indigenous fern, the leaves of which are bitterish and aromatic, and have been supposed to be useful in chronic catarrhs and other pectoral affections. A European species, known by the same vulgar name, is the *A. Capillus Veneris*, which has similar properties, though feebler, and has been much used as a pectoral, on the continent of Europe, from very early times. It is given in the form of infusion, sweetened with sugar or honey; and a syrup prepared from it is popular in France, under the name of *sirop de capillaire.* The name of maidenhair has also been given to *Asplenium Trichomanes*, the leaves of which have a mucilaginous, sweetish, somewhat astringent taste, and have been used for the same purposes with those of the plants above mentioned. Another species of Asplenium, *A. Adiantum nigrum*, has been substituted for the genuine maidenhair; but neither of them has the aromatic flavour of that fern.

ÆSCULUS HIPPOCASTANUM. *Horsechestnut.* The horsechestnut is a native of Asia, and was introduced about the middle of the sixteenth century into Europe, where, as well as in this country, it is now extensively cultivated as an ornamental tree. The fruit and bark have been used in medicine. The *fruit* abounds in starch, but has a rough, disagreeable, bitter taste, which renders it unfit for food, though it is said to be eaten with avidity by horses, oxen, hogs, and sheep. It may be deprived, in great measure, of the bitter principle by maceration in an alkaline solution. It is asserted that the starch may be readily obtained in a state of purity, and that it excels as an article of diet that procured from the potato. (*Dict. de Mat. Med.*) The bitter principle is denominated *esculin*, and, according to Rochleder, may be obtained by precipitating with acetate of lead a decoction of the rind, filtering, treating the filtered liquor with sulphuretted hydrogen, again filtering, evaporating to the consistence of syrup, and setting the residue aside in a cool place. In a few days, the liquid is converted into a mass of crystals, which are to be expressed, and purified by repeated crystallization from alcohol, and afterwards from boiling water. If now washed on a filter with cold water till they have lost one-third of their weight, they are rendered as pure as it is possible to obtain them. Esculin is in shining white prismatic crystals, inodorous, bitter, but slightly soluble in cold water, more soluble in boiling water, and very readily so in boiling alcohol, and in alkaline solutions. Its solution is precipitated by subacetate of lead. It consists of carbon, hydro-

gen, and oxygen. (See *Journ. de Pharm.*, 3e *sér.*, xxiii. 474, and xxiv. 292.) The powdered kernel of the fruit, snuffed up the nostrils, produces sneezing, and has been used with advantage as a sternutatory in complaints of the head and eyes. The *bark* of the horsechestnut has attracted much attention on the continent of Europe, as a substitute for cinchona. That of the branches from three to five years old is considered best. It should be collected in the spring. It has little odour, but an astringent and bitter, though not very disagreeable taste. It contains, among other ingredients, bitter extractive and tannin, and imparts its virtues to boiling water. By numerous physicians it has been found very efficacious in the treatment of intermittent fever; but it has entirely failed in the hands of many others, and certainly cannot be considered comparable to the Peruvian bark in its power over that complaint. It is at present seldom used, and never in this country. It has been given in substance, decoction, and extract. From half an ounce to an ounce of the powder may be given in the course of twenty-four hours. The decoction is prepared and administered in the same manner as that of Peruvian bark.

AGARIC. *Touchwood. Spunk. Tinder.* This is the product of different species of a genus of mushrooms denominated *Boletus*. Several species are used as food, several are poisonous, and two at least have been ranked among officinal medicines in Europe. The *Boletus laricis* which grows upon the larch of the old world, is the *white agaric* or *purging agaric* of medical writers. It is of various sizes, from that of the fist to that of a child's head, or even larger, hard and spongy, externally brownish or reddish; but, as found in commerce, is deprived of its exterior coat, and consists of a light, white, spongy, somewhat farinaceous, friable mass, which, though capable of being rubbed into powder upon a sieve, is not easily pulverized in the ordinary mode, as it flattens under the pestle. It has a sweetish very bitter taste, and consists, according to Braconnot, of 72 parts of resinous matter, 2 of bitter extractive, and 26 of *fungin*, a nutritious animalized principle, constituting the base of the fleshy substance of mushrooms. It contains also benzoic acid and various saline compounds. In the dose of four or six grains it is said to act powerfully as a cathartic; but Lieutaud asserts that it may be given in the quantity of thirty grains or a drachm without sensibly purging. M. Andral has found it useful in checking the night-sweats of phthisis. He uses it in doses of eight grains, and gradually increases to a drachm during the day, without any observable inconvenience to the digestive functions. In this country it is scarcely employed, though we have met with it in the shops. That which is most esteemed is said to be brought from Siberia; but it is probably produced wherever the European larch grows. Dr. Wm. M. McPheeters has published, in the *St. Louis Med. and Surg. Journ.* (x. 421), an account of several cases, in which he tried a specimen of Boletus laricis, brought from the Rocky Mountains, in almost all of which it proved decidedly cathartic. The dose was 25 grains, which it was sometimes necessary to repeat.

The Boletus igniarius, or *agaric of the oak*, like the species just described, is compared in shape to the horse's hoof. Its diameter is from six to ten inches. It is soft like velvet when young, but afterwards becomes hard and ligneous. It usually rests immediately upon the bark of the tree, without any supporting footstalk. On the upper surface it is smooth, but marked with circular ridges of different colours, more or less brown or blackish; on the under, it is whitish or yellowish, and full of small pores; internally it is fibrous, tough, and of a tawny-brown colour. It is composed of short tubular fibres compactly arranged in layers, one of which is added every year. The best is that which grows on the oak, and the season for collecting it is August or September. It has neither taste nor smell. Among its constituents, according to Bouillon-Lagrange, are extractive, resin in very small proportion, azotized matter also in small quantity, chloride of potassium, and sulphate of lime; and in its ashes are found iron, and phosphate of lime and magnesia. It is prepared for use by removing the exterior rind or bark, cutting the inner part into thin slices, and beating these with a hammer until they become soft, pliable, and easily torn by the fingers. In this state it was formerly much used by surgeons for arresting hemorrhage, being applied immediately, with pressure, to the bleeding vessel. It probably acts mechanically, like any other soft porous substance, by absorbing the blood and causing it to coagulate, and is not relied on in severe cases. In the obstinate hemorrhage which occasionally takes place from leech bites, especially those of the European leech, it may be used advantageously, though perhaps not more so than well-prepared lint. It has been sometimes applied to the purposes of moxa.

When prepared agaric is steeped in a solution of nitre, and afterwards dried, it becomes very readily inflammable, and is employed as tinder. Some recommend the substitution of chlorate of potassa for nitre. The preparation is usually known by the name of *spunk*, and is brought to us from Europe. Spunk or tinder, the *amadou* of the French, is in flat pieces, of a consistence somewhat like that of very soft rotten buckskin leather,

of a brownish-yellow colour, capable of absorbing liquids, and inflammable by the slightest spark. It is said to be prepared from various other species of Boletus, as *B. ungulatus*, *B fomentarius*, *B. ribis*, &c.

AGAVE AMERICANA. *American Agave. American Aloe. Maguey.* An evergreen succulent plant, indigenous in Florida, Mexico, and other parts of tropical America. This and other species of Agave bear a considerable resemblance, in appearance, to the plants of the genus Aloe, with which they are sometimes confounded. From the root and leaves of the American agave, when cut, a saccharine juice flows out, which may be converted by evaporation into syrup and even sugar, and by fermentation into a vinous liquor. According to M. Lenoble, this juice when fresh has an herbaceous somewhat nauseous odour and acrid taste, and reddens litmus paper. It is said to be laxative, diuretic, and emmenagogue. Dr. G. Perin, assistant surgeon in the U. S. army, has found the juice an admirable remedy in scurvy, being more prompt and efficacious even than lime-juice. He gave two fluidounces three times a day. (*N. Y. Journ. of Med.*, N. S., vii. 181.) The expressed juice, evaporated to the consistence of a soft extract, has the property of forming a lather with water, and is employed in some places as a substitute for soap. The fibres of the old leaves, separated by bruising and maceration in water, are used for forming thread. M. Lenoble found in the leaves an acrid volatile oil, a gum-resinous principle, lignin, salts of potassa and lime, and silica; and thinks that a vinegar or ointment of the leaves might be advantageously used as an epispastic application. (*Journ. de Pharm. et de Chim.*, xv. 350.) The *Agave Virginica*, which grows in our Southern States, and is known in South Carolina by the name of *rattlesnake's master*, has a very bitter root, which is used in the form of tincture, in flatulent colic, and as a counter-poison in the bites of serpents. (Robert King Reid, *Inaug. Thes* , A. D. 1849.)

AGRIMONIA EUPATORIA. *Common Agrimony.* This species of agrimony is a perennial herb, inhabiting Asia, Europe, and North America, and in this country, found in fields and on the borders of woods, and flowering during the summer months. Its stem, which rises from one to three feet in height, is hairy, furnished with interruptedly pinnate leaves, and terminated by a long simple spike of yellow flowers. Both the herb and root have been employed. The former has a weak but agreeable aromatic odour, and a rough, bitterish, somewhat aromatic taste. The fragrance is strongest in the flowers. The root has similar properties; but its taste is more bitter and astringent. A volatile oil may be obtained from the plant by distillation. Agrimony is a mild corroborant and astringent. The herb has been employed in relaxed conditions of disease, as in passive hemorrhages, and chronic affections of the mucous membranes. It has been recommended, also, as a deobstruent in jaundice and visceral obstructions, and as an alterative in diseases of the skin. In Europe it is popularly used, in the form of gargle, in affections of the throat. The Indians of North America and the Canadians are reported to have employed the root with advantage in fevers. The plant may be given in substance, infusion, or decoction. The dose of the powder is a drachm or more.

AJUGA CHAMÆPITYS. *Ground Pine. Chamæpitys.* A low, creeping, annual, labiate plant, a native of Europe, and found also in some parts of the United States. The leaves, which bear some resemblance to those of the pine in shape, have a strong, peculiar, resinous, not disagreeable odour, and a bitter, balsamic taste. They yield by distillation with water a small proportion of volatile oil, resembling that of turpentine. They are said to be stimulant, diuretic, and aperient; and have been given in rheumatism, gout, palsy, and amenorrhœa. The dose of the leaves in powder is one or two drachms; but their infusion in wine is considered the best preparation.

The *Ajuga reptans* or *common bugle*, and the *A. pyramidalis*, perennial plants of Europe, have also been used in medicine. They are nearly inodorous, but have a somewhat astringent, bitterish, and saline taste. Their virtues are probably those of a mild astringent and tonic. They have been recommended in pulmonary consumption, hæmoptysis and other hemorrhages, and in hepatic obstructions, and have enjoyed considerable reputation as vulneraries; but they are at present nearly obsolete.

ALBUMINATE OF IRON AND POTASSA, SYRUP OF. This syrup, proposed by M. Lassaigne, is made as follows.—Dissolve 100 parts of the white of eggs in 100 of distilled water, and precipitate the filtered solution with 36 parts of a solution of the sulphate of sesquioxide of iron, marking 5° of the areometer. Then add 2 parts of alcoholic potassa, previously dissolved in 50 parts of water. This, by agitation, will gradually dissolve the precipitate caused by the ferruginous solution, forming a deep orange-yellow liquid. The liquid is then converted into a syrup by dissolving in it one and a half times its weight of coarsely powdered sugar, and filtered. The syrup has a slightly alkaline and sweetish taste, totally devoid of inky flavour. Each fluidounce contains about six grains of anhydrous sesquioxide of iron. Mr. A. J. Cooley has proposed to make a simple *albuminate*

of iron, by dissolving the freshly precipitated oxides of iron in a filtered solution of albumen.

ALCHEMILLA VULGARIS. *Ladies' Mantle.* A perennial European herb, growing in meadows, on the banks of rivulets, and in the borders of woods. The whole plant has an astringent bitterish taste, which is strongest in the root. It was formerly employed in diarrhœa, and other complaints requiring the use of astringents. By the ancients it was highly esteemed; and extraordinary powers were ascribed to it by the alchemists, from whom, according to Linnæus, it derived its generic title.

ALCORNOQUE. Under this name, a bark was introduced into Europe from South America, more than fifty years since, and for a short time attracted considerable attention. It has been conjecturally referred by different writers to different plants, but its precise origin is unknown. It is in large thick pieces, composed of two layers, of which the external is reddish, cracked, granular, spongy, and two or three lines in thickness, the internal lamellated, woody, and possessed of the property of imparting a yellow colour to the saliva when chewed. It is inodorous. The outer layer is of an astringent, somewhat bitter taste, and was thought to have febrifuge powers; the inner is much more bitter, and is decidedly emetic. The bark was brought into notice chiefly as a remedy in phthisis; but, having been found useless in that complaint, has fallen into entire neglect. It was given in the form of powder, in the dose of thirty grains; or half an ounce of it was boiled in a pint of water down to half a pint, and two or three tablespoonfuls of the decoction were administered every two hours. In these doses it acted as an emetic. The bark known in Spain by the name of *alcornoque* is derived from the cork tree (Quercus Suber), and has sometimes been confounded in European pharmacy with that derived from South America. It has the properties of the ordinary oak barks.

ALISMA PLANTAGO. *Water Plantain.* A perennial herbaceous plant, common to Europe and the United States, and growing in streams, pools, ditches, and other standing waters. The *root* has when fresh an odour like that of Florentine orris, but loses it when dried. Its taste is acrid and nauseous. It acquired at one time considerable credit as a preventive of hydrophobia, for which purpose it was said to have been used with great advantage in Russia; but subsequent experiments have proved its total inefficacy. The Calmucks are said to use it for food. The *leaves* are rubefacient, and will sometimes even blister when applied to the skin. They have been recommended in gravel and complaints of the bladder, in the dose of a drachm.

ALKANET. This is the root of *Anchusa tinctoria* or *dyers' alkanet*, an herbaceous perennial plant, growing in the Grecian Archipelago and the South of Europe. It is said in some medical works to be cultivated abundantly in the South of France; but another plant is probably referred to—the *Lithospermum tinctorium* of Linnæus and De Candolle, the *Anchusa tinctoria* of Lamarck—which is a native of that country, and the root of which is considered as the true alkanet by the French writers. Alkanet, as found in the shops, is in pieces three or four inches long, from the thickness of a quill to that of the little finger, somewhat twisted, consisting of a dark-red, easily separable bark, and an internal ligneous portion, which is reddish externally, whitish near the centre, and composed of numerous distinct, slender, cohering fibres. As it comes to us it is usually much decayed internally, very light, and of a loose almost spongy texture. The fresh root has a faint odour, and a bitterish astringent taste; but when dried it is nearly inodorous and insipid. Its colouring principle, which abounds most in the cortical part, is soluble in alcohol, ether, and the oils, to which it imparts a fine deep red; but is insoluble in water. It may be obtained by first exhausting the root with water, and then treating it with a weak solution of the carbonate of potassa or soda, from which the colouring principle may be precipitated by an acid. According to Pelletier, by whom it was discovered, it possesses acid properties, forming with the alkalies and earths neutral compounds, which are of a blue colour, and soluble in alcohol and ether. He calls it *anchusic acid*, and states that it may be sublimed unchanged. (*Journ. de Pharm.*, xix. 105.) The tincture of alkanet has its colour deepened by the acids, changed to blue by the alkalies, and again restored by neutralizing the latter substances. It may, therefore, be used as a test. The extract obtained by evaporating the tincture is dark-brown.

Alkanet root is somewhat astringent, and was formerly applied to the treatment of several diseases; but it is now employed exclusively for colouring oils, ointments, and plasters, which are beautifully reddened by one-fortieth of their weight of the root. It is said also to be used in the preparation of spurious port wine.

ALLIARIA OFFICINALIS. *Erysimum Alliaria.* Linn. *Hedge Garlic.* A perennial European herb, having an alliaceous odour when rubbed, and a bitterish, somewhat acrid taste. When eaten it communicates its smell to the breath. Mr. Wertheim obtained from the

root a volatile oil, apparently identical with that of mustard. (*Ann. der Chem. und Pharm.*, liii. 52.) The herb and seeds are esteemed diuretic, diaphoretic, and expectorant, and have been given in humoral asthma, chronic catarrh, and other complaints in which garlic is useful. The herb has also been recommended as an external application in gangrenous affections, and to promote suppuration.

ALNUS GLUTINOSA. *Common European Alder.* A European tree, twenty-five feet or more in height, growing in swamps, on the sides of streams, and in other damp places. The bark and leaves are very astringent, and somewhat bitter. The former has been used in intermittent fever, the latter as a topical remedy in wounds and ulcers. The bruised leaves are sometimes applied to the breast for the purpose of repelling the milk. The cones also are said to be astringent, and to form a useful gargle in complaints of the throat. All these parts of the tree are used in dyeing, and the leaves and bark in tanning. The *Alnus serrulata*, or common *American alder*, has analogous properties.

AMBERGRIS. *Ambra grisea.* This substance, which is found floating on the sea, or thrown by the waves upon the shores of various countries, particularly in the southern hemisphere, is now generally believed to be produced in the intestines of the *Physeter macrocephalus* or spermaceti whale, and perhaps in those of some other fish. It is in roundish or amorphous pieces, usually small, but sometimes of considerable magnitude; and masses have been found weighing 50, 100, and even 200 pounds. These pieces are often composed of concentric layers. They are of various colours, usually gray, with brownish, yellow, and white streaks, often dark-brown or blackish on the external surface. They are opaque, lighter than water, and of a consistence like that of wax. Ambergris has a peculiar aromatic agreeable odour, is almost tasteless, softens with the warmth of the hand, melts under 212°, is almost completely volatilizable by heat, and is inflammable. It is insoluble in water, but is readily dissolved, with the aid of heat, by alcohol, ether, and the volatile and fixed oils. It consists chiefly of a peculiar fatty matter analogous to cholesterin, and denominated by Pelletier and Caventou *ambrein.* This may be obtained by treating ambergris with heated alcohol, filtering the solution, and allowing it to stand. Crystals of ambrein are deposited. It differs from most other fatty matters in not forming soaps with the alkalies. When pure it has little or no odour. Ambergris is often adulterated; but does not then exhibit its ordinary fusibility and volatility. It was long regarded as a cordial and antispasmodic, somewhat analogous to musk; and has been recommended in typhoid fevers, and various nervous diseases. It formerly entered into many officinal preparations, and is still retained in some of the European Pharmacopœias. It is, however, feeble as a remedy, and is much more used in perfumery than in medicine. The dose is from five grains to a drachm.

AMMONIO-TARTRATE OF IRON. *Ferri Ammonio-tartras.* This salt was first employed by Mr. Aiken, of London. According to Professor Procter, of this city, it is best prepared by dissolving to saturation, freshly precipitated hydrated sesquioxide of iron in a solution of bitartrate of ammonia. The bitartrate may be made by saturating fifty drachms of tartaric acid, dissolved in a gallon of water, with carbonate of ammonia, and then adding fifty drachms of the acid to the solution formed. This is heated, by means of a water-bath, with the fresh hydrated sesquioxide, derived from fifty-three and a third drachms of U. S. subcarbonate of iron, dissolved in muriatic acid and precipitated by ammonia. The sesquioxide is dissolved, and a deep reddish-brown solution results, which is evaporated to dryness by means of a water-bath. This double salt, when prepared in small quantities, is in brilliant scales, dark-brown in mass, but garnet-red by transmitted light. When obtained in considerable quantities, it forms angular grains, resembling kino. It is very soluble in water, and has a strongly saccharine taste. Its aqueous solution undergoes no change by a boiling temperature. According to an analysis by Prof. Procter, it consists of two eqs. of tartaric acid, one of sesquioxide of iron, one of ammonia, and four of water. (*Am. Journ. of Pharm.*, xii. 275.) This salt has the general properties of the other ferruginous compounds. Its advantages are its ready solubility, palatable taste, and permanency. The dose is five grains or more, given in pill or solution.

ANACARDIUM OCCIDENTALE. Linn. *Cassuvium pomiferum.* Lam. *Cashew-nut.* A small and elegant tree, growing in the West Indies, and other parts of tropical America. A gum exudes from the bark, which bears some resemblance to gum Arabic, but is only in part soluble in water, and consists of true gum and bassorin. It is the *gomme d'acajou* of the French writers. The fruit is a fleshy, pear-shaped receptacle, supporting at its summit, a hard, shining, ash-coloured, kidney-shaped nut, an inch or more in length, and three-quarters of an inch broad, consisting of two shells, with a black juice between them, and of a sweet oily kernel. The receptacle is red or yellow, and of an agreeable subacid flavour with some astringency. It is edible, and affords a juice which has been recommended in uterine complaints and dropsy. This juice is converted by fermentation into

a vinous liquor, which yields a spirit by distillation, used in making punch, and said to be powerfully diuretic. The nuts are well known under the name of *cashew-nuts*. The black juice, contained between their outer and inner shell, is extremely acrid and corrosive, producing, when applied to the skin, severe inflammation, followed by blisters or desquamation. It has been examined chemically by Stoedeler, who found in it two peculiar principles, one having acid properties, which he calls *anacardic acid*, and the other a yellow, oleaginous liquid, named *cardol*. (See *Journ. de Pharm.*, 3e *sér.*, xiii. 459.) The juice is used in the West Indies for the cure of corns, warts, ringworms, and obstinate ulcers, and is said to be sometimes applied to the face by females in order to remove the cuticle, and produce a fresher and more youthful aspect. In a case of external poisoning which came under our notice, in a lady who was exposed to the fumes of the nut while roasting, the face was so much swollen that for some time not a feature was discernible. The kernel, when fresh, has a sweet, agreeable taste, and is eaten like chestnuts, either raw or roasted. It is also used as an ingredient of puddings, &c., and forms an excellent chocolate when ground with cocoa. By age it becomes rancid. The black juice of the nut and a milky juice which flows from the tree by incision, are sometimes used for marking linen, upon which they leave a nearly indelible brown or black stain.

ANAGALLIS ARVENSIS. *Scarlet Pimpernel.* An annual plant, growing in Europe and this country, with small, delicate, procumbent stems, furnished with opposite branches, opposite ovate leaves, and small scarlet flowers, which are supported upon axillary, solitary peduncles, and appear in June and July. It is inodorous, and has a bitterish, somewhat acrid taste. The ancients esteemed it a counter-poison, and in modern times it has been used as a preventive of hydrophobia; but at present no faith is placed in its alexipharmic powers. It is, nevertheless, not wholly inactive; as Orfila found three drachms of an extract prepared from it sufficient to destroy a dog, with marks of inflammation of the bowels. It has been recommended as a local application in old and ill-conditioned ulcers, and has been given internally in visceral obstructions, consumption, dropsy, epilepsy, mania, &c. But too little is known of its precise properties, to authorize its indiscriminate employment in these complaints. Another species, considered by Linnæus as a mere variety of the A. arvensis, is *A. cærulea*, distinguished by its blue flowers. The medical properties of the two, so far as is known, are the same.

ANCHUSA OFFICINALIS. *Bugloss.* This species of Anchusa is a native of Europe, and unknown in the United States. It is a biennial plant, from one to three feet high, and was formerly much esteemed as a medicine. The root, leaves, and flowers were officinal. These are inodorous and nearly tasteless. The root is mucilaginous and slightly sweetish, and the flowers very feebly bitter. The plant has no claim whatever to the credit, formerly attached to it, of possessing cordial and exhilarating properties. It was used by the ancients in hypochondriacal affections, but, as it was given in wine, the elevation of spirits was probably due to the vehicle. In France, the *Anchusa Italica*, which is there known as *buglosse*, is employed for the same purposes and in the same manner as Borago officinalis.

ANDROMEDA ARBOREA. *Sorrel-tree.* A beautiful indigenous tree, growing in the valleys of the Alleghany mountains, from Pennsylvania to Florida. The leaves have a very pleasant acid taste, which has given rise to the common name of the tree. They are used by hunters to allay thirst, and form in decoction a grateful refrigerant drink in fevers. The other species of Andromeda are shrubs, and some of them ornamental. Dr. Barton, in his "Collections," states that a decoction of *A. Mariana* is employed in the Southern States, as a wash in a disagreeable ulceration of the feet to which the negroes are liable. The powder upon the leaves and buds of *A. speciosa* is said to be a powerful errhine.

ANEMONE PRATENSIS. *Meadow Anemone.* This plant enjoyed at one time considerable credit from the recommendation of Störck, who believed that he had found it useful in amaurosis and other complaints of the eye, in secondary syphilis, and in cutaneous eruptions. Dr. J. de Ramm found it also very useful in hooping-cough. *A. Pulsatilla* (*pulsatilla*), an analogous species, has been employed for similar purposes; and favourable reports have been made of its efficacy in obstinate diseases of the skin, and in hooping-cough. The preparation employed was an extract of the herbaceous part of the plant, which was given by Störck in the dose of one or two grains daily, gradually increased to twenty grains or more. In large doses it was found frequently to produce nausea and vomiting, or griping and looseness of the bowels, and sometimes acted as a diuretic. It is, we believe, a favourite remedy with the homœopathists. The species of Anemone above mentioned are European plants, and are not cultivated in this country. We have several native species. One of them, *A. nemorosa*, which is common to Europe and the United States, is said to act as a poison to cattle, producing bloody urine and convulsions. It is stated also to have proved, when applied to the head, a speedy cure for tinea capitis. Most of the species are, in the recent state, acrid and rubefacient, resembling in this respect

other Ranunculaceæ. They contain a peculiar crystallizable principle, named *anemonin*, convertible into *anemonic acid*, by the action of alkalies. (*Ann. der Pharm.*, xxxii. 276.) It is deposited by water distilled from the fresh herb upon standing, and resembles camphor. According to J. Müller, it is formed by a metamorphosis of the acrid matters which are distilled with the water. (*Pharm. Cent. Blatt*, Sept. 11, 1850, p. 618.)

ANIMÉ. *Gum Animé.* The substance known at present by the name of *anime* is a resin supposed to be derived from the *Hymenæa Courbaril*, a tree of South America; though this origin is denied by Hayne. According to Dr. W. Hamilton, the resin exudes from wounds in the bark, and is found also underneath the surface of the ground, between the principal roots. (*Pharm. Journ. and Trans.*, vi. 522.) It is in small, irregular pieces, of a pale lemon-yellow colour, sometimes inclining to reddish, more or less transparent, covered with a whitish powder, brittle and pulverizable, with a shining fracture, a weak but agreeable odour, and a mild resinous taste. It softens in the mouth, adheres to the fingers when in the state of powder, and readily melts with heat, diffusing its agreeable odour in an increased degree. It consists of two distinct resins, one soluble, the other insoluble in cold alcohol, and of a small proportion of volatile oil. There is a variety of a darker colour, less transparent, and exhibiting small cavities in the interior; in other respects resembling the preceding. Another variety of anime is the East Indian, supposed to be derived from *Vateria Indica;* but this never reaches us as a distinct article of commerce. Anime formerly entered into the composition of various ointments and plasters; but is now used only as incense, or in the preparation of varnishes. The Brazilians are said to employ it internally in diseases of the lungs.

ANNOTTA. *Orleana.* The colouring substance called *annotta*, *arnotta*, or *roucou*, is the reddish pulp surrounding the seeds in the fruit of *Bixa Orellana*, a middling-sized tree growing in Guiana, and other parts of South America. The pulp is separated by bruising the fruit, mixing it with water, then straining through a sieve, and allowing the liquid to stand till the undissolved portion subsides. The water is then poured off, and the mass which remains, having been sufficiently dried, is formed into flat cakes or cylindrical rolls, and sent into the market. Annotta is of a brownish-red colour, usually rather soft, but hard and brittle when dry, of a dull fracture, of a sweetish peculiar odour, and a rough, saline, bitterish taste. It is inflammable, but does not melt with heat. It softens in water, to which it imparts a yellow colour, but does not dissolve. Alcohol, ether, the oils, and alkaline solutions dissolve the greater part of it. It contains a peculiar crystallizable colouring principle, to which M. Preisser, its discoverer, gave the name of *bixin*. (See *Journ. de Pharm.*, 3*e sér.*, v. 258.) The chief uses to which annotta is applied are for dyeing silk and cotton orange-yellow, and for colouring cheese. The colour, however, which it imparts to cloth is fugitive. It has been given internally as a medicine; but is not now used, and probably exercises little influence upon the system. In pharmacy it is used to colour plasters, and has occasionally been substituted for saffron. It is said to be sometimes largely adulterated; and red ochre, powdered bricks, and colcothar have been employed for the purpose. If these substances be present, they will be left behind when the annotta is burned.

ANTHRAKOKALI. This preparation, introduced by Dr. Polya, is of two kinds, the simple and the sulphuretted. The *simple anthrakokali* is formed by adding 160 parts of porphyrized mineral coal to 192 parts of a concentrated and boiling solution of caustic potassa, contained in an iron vessel, the whole being well stirred together. When the mixture is completed, the vessel is taken from the fire, and the stirring continued until the whole is converted into a homogeneous black powder. The *sulphuretted anthrakokali* is prepared in a similar manner, 16 parts of sulphur being mixed with the mineral coal before it is added to the caustic potassa solution. Dr. Polya recommends these preparations both internally and externally, in scrofula, chronic rheumatism, rheumatic tumours of the joints, and certain herpetic affections. The dose is a grain and a half three or four times a day, mixed with two or three times its weight of powdered liquorice root. For external use, sixteen grains may be rubbed with an ounce of lard, to form an ointment, to be used by friction night and morning. (*Journ. de Pharm.*, xxvi. 545, and 3*e sér.*, ii. 153.)

ANTHRISCUS CEREFOLIUM. De Cand. *Chærophyllum sativum.* Lam. *Scandix Cerefolium.* Linn. *Chervil.* An annual European plant, cultivated in gardens as a potherb, and supposed by some physicians to possess medicinal powers. It has a strong agreeable odour, especially when rubbed, and a pungent, slightly bitterish taste. These properties it owes to a volatile oil, which may be separated by distillation with water. It is said to be deobstruent, diuretic, and emmenagogue, and has been recommended by different authors in consumption, scrofula, dropsy, cutaneous and scorbutic affections, and as an external application to swollen breasts, bruises, and other local complaints or injuries. It is, however, very feeble, and is more used as an addition to broths than as a medicine.

ANTIRRHINUM LINARIA. Linn. LINARIA VULGARIS. Lindley. *Common Toad-flax.* This is a perennial herbaceous plant, from one to two feet high, with numerous narrow linear leaves, and a terminal crowded spike of large yellow flowers. It is a native of Europe, but has been introduced into this country, and now grows in great abundance along the road sides, through the Middle States. It is readily distinguishable by the shape of its leaf, and its conspicuous yellow flowers, which appear in succession from June to October. The herb is the part used. It should be collected when in flower, dried quickly, and kept excluded from the air. When fresh it has a peculiar, heavy, rather disagreeable odour, which is in a great measure dissipated by drying. The taste is herbaceous, weakly saline, bitter, and slightly acrid. This plant is said to be diuretic and cathartic, and has been used in dropsy, jaundice, and cutaneous eruptions. It is most conveniently employed in infusion. The fresh plant is sometimes applied, in the shape of poultice or fomentation, to hemorrhoidal tumours; and an ointment made from the flowers has been employed for the same purpose, and also locally in diseases of the skin. The flowers are used in Germany for dyeing yellow.

AQUA BINELLI. An Italian nostrum, named after a physician of Turin, which at one time enjoyed great reputation in Europe as a styptic; but has been proved to possess very little efficacy. It is a transparent liquid, with little taste and an empyreumatic odour, and, after the discovery of creasote, was conjectured to contain a small proportion of that principle. It is now out of use. A recipe for its preparation is given in the *Annuaire de Thérapeutique*, 1843, p. 227.

AQUILEGIA VULGARIS. *Columbine.* A perennial herbaceous plant, indigenous in Europe, but cultivated in our gardens as an ornamental flower. All parts of it have been medicinally employed. The roots, leaves, and flowers have a disagreeable odour, and a bitterish, acrid taste. The seeds are small, black, shining, inodorous, and of an oleaginous sweetish taste, followed by a sense of acrimony. Columbine has been considered diuretic, diaphoretic, and antiscorbutic, and has been employed in jaundice, in small-pox to promote the eruption, in scurvy, and externally as a vulnerary. It is not used at present, and is even suspected to possess dangerous properties, like most other Ranunculaceæ.

ARECA NUT. *Betel Nut.* This is the product of Areca Catechu, an East India tree belonging to the family of palms. The fruit, which is about the size and shape of a small egg, and of an orange-yellow colour, contains the nut embedded in a fibrous, fleshy envelope, and invested with a brittle shell which adheres to the exterior flesh. The kernel, which is the betel-nut of commerce, is of a roundish conical shape, rather larger than a chestnut, externally of a deep-brown, diversified with a fawn colour, so as to present a reticular appearance, internally brownish-red with whitish veins, very hard, of a feeble odour when broken, and of an astringent, somewhat acrid taste. It abounds in tannin, and contains also gallic acid, a fixed oil, gum, a little volatile oil, lignin, and various saline substances. It yields its astringency to water; and, in some parts of Hindostan, an extract is prepared from it having the appearance and properties of catechu. Immense quantities of the nut are consumed in the East, mixed with the leaves of the Piper Betel, and with lime, forming the masticatory so well known by the name of *Betel.* The red colour which this mixture imparts to the saliva and the excrements is owing to the Areca nut, which is also powerfully astringent, and, by its internal use, tends to counteract the relaxation of bowels to which the heat of the climate so strongly predisposes. The nut is used in this country almost exclusively in the preparation of tooth-powder, for which purpose it is first reduced by heat to the state of charcoal. The superiority of this form of charcoal over that from other sources is probably owing to its hardness.

ARGEMONE MEXICANA. *Prickly Poppy.* An annual plant, belonging to the Papaveraceæ, growing in our Southern and Western States, Mexico, the West Indies, Brazil, and in many parts also of Africa and Southern Asia. It has an erect, somewhat glaucous, bristly stem, with alternate sessile leaves, sinuated and prickly at the angles, and usually marked with white spots. The flowers are solitary, yellow or white, with two or three prickly deciduous sepals, four or six large petals, about twenty stamens, and four to six reflexed stigmas. The whole plant abounds in a milky, viscid juice, which becomes yellow on exposure to the air. From the statements of different authors, it may be inferred that the plant is emetic and purgative, and possesses also narcotic properties. The juice, which is acrid, has been used internally in obstinate cutaneous eruptions, and as a local application to warts and chancres, and in diseases of the eye. The flowers are stated by De Candolle to have been employed as a soporific. But the seeds are most esteemed. They are small, round, black, and roughish. In the dose of two drachms, infused in a pint of water, they are said to act as an emetic. In smaller doses they are purgative. An oil may be obtained from them by expression, which has the cathartic properties of the seeds.

ARSENIATE OF AMMONIA. *Ammoniæ Arsenias.* This salt is obtained in crystals by saturating a concentrated solution of arsenic acid with ammonia or carbonate of ammonia, and allowing it to evaporate spontaneously. It has been used with advantage by Biett in several inveterate diseases of the skin. It is administered in solution, formed by dissolving a grain of the salt in a fluidounce of distilled water. Of this the dose is from twenty to twenty-five drops, given in the course of the day, and gradually increased.

ARSENIATE OF IRON. *Ferri Arsenias.* This salt may be formed by double decomposition, by adding a solution of sulphate of iron to one of arseniate of soda. It precipitates in the form of a dirty-green powder. It has been used by Carmichael, diluted with four times its weight of phosphate of iron, as a caustic application to cancerous ulcers. It may be made into an ointment by being mixed with twelve times its weight of spermaceti cerate. Internally it has been given in cancerous affections, in the form of pill, in the dose of the sixteenth of a grain three times a day.

ASARABACCA. This is the product of the *Asarum Europæum*, an herbaceous perennial plant, growing in Europe, between 37° and 60° north latitude, in woods and shady places, and flowering in May. All parts of the plant are acrid. The leaves were specially directed by the London College, when the plant was recognised as officinal; but the whole plant, including root, stem, leaves, and flowers, is usually kept in the shops. The root is about as thick as a goose-quill, of a grayish colour, quadrangular, knotted and twisted, and sometimes furnished with radicles at each joint. It has a smell analogous to that of pepper, an acrid taste, and affords a grayish powder. The leaves, which have long footstalks, are kidney-shaped, entire, somewhat hairy, of a shining deep-green colour when fresh, nearly inodorous, with a taste slightly aromatic, bitter, acrid, and nauseous Their powder is yellowish-green. Both parts rapidly lose their activity by keeping, and ultimately become inert. Geiger, however, asserts that they keep well if perfectly dry. Their virtues are imparted to alcohol and water, but are dissipated by decoction. According to MM. Feneulle and Lassaigne, the root contains a concrete volatile oil, a very acrid fixed oil, a yellow substance analogous to *cytisin*, starch, albumen, mucilage, citric acid, and saline matters. The latest analysis is by Gräger, who found in the *root* a liquid volatile oil, two concrete volatile substances called respectively *asarum camphor* or *asarone*, and *asarite*, a peculiar bitter principle called *asarin*, tannin, extractive, resin, starch, gluten, albumen, lignin, citric acid, and various salts; in the *leaves*, asarin, tannin, extractive, chlorophylle, albumen, citric acid, and lignin. The active principles appear to be the volatile oil, which is lighter than water, glutinous, yellow, of an acrid and burning taste, and a smell like that of valerian, and the asarin, which is soluble in alcohol and very bitter, and is probably the same as the cytisin of Feneulle and Lassaigne. The root and leaves of asarabacca, either fresh or carefully dried, are powerfully emetic and cathartic, and were formerly much used in Europe with a view to these effects. The dose is from thirty grains to a drachm. But as an emetic they have been entirely superseded by ipecacuanha; and they are now used chiefly, if not exclusively, as an errhine. The powdered root, snuffed up the nostrils in the quantity of one or two grains, produces much irritation, and a copious flow of mucus, which is said to continue sometimes for several days. The leaves are milder, and generally preferred. They should be used in the quantity of three or four grains repeated every night until the desired effect is experienced. They have been strongly recommended in headache, chronic ophthalmia, and rheumatic and paralytic affections of the face, mouth and throat.

ASCLEPIAS CURASSAVICA. *Bastard Ipecacuanha. Redhead. Blood Weed.* This is a very pretty species of Asclepias, from one to three feet high, and bearing umbels of bright-red flowers. It is a native of the West Indies, abounding especially in the Island of Nevis and St. Kitts, where it is considerably used as a medicine. Both the root and the expressed juice are emetic, the former in the dose of one or two scruples, the latter in that of a fluidounce or more. They are also cathartic in somewhat smaller doses; and the expressed juice, made into a syrup with sugar, has been strongly recommended as a remedy in worms. The medicine, however, is somewhat uncertain in its operation. According to Dr. W. Hamilton, the plant may also be usefully employed in arresting hemorrhages, and in the treatment of obstinate gonorrhœa, in which it has been found very efficient by Dr. Barham. (See *Am. Journ. of Pharm.*, xix. 19.)

ASPARAGUS OFFICINALIS. *Asparagus.* This well known garden vegetable is a native of Europe. It is perennial and herbaceous. The *root*, which is inodorous, and of a weak sweetish taste, was formerly used as a diuretic, aperient, and purifier of the blood; and it is stated to be still employed to a considerable extent in France. It is given in the form of decoction, made in the proportion of one or two ounces of the root to a quart of water. Hayne asserts that, in the dried state, it is wholly inert. The *young shoots* are much used as food. Before being boiled they have a disagreeable taste; and their juice was found by Robiquet and Vauquelin to contain a peculiar crystallizable principle, called

asparagin (see *page* 77), which, however, is not known to exert any special influence on the system. The sprouts themselves are not without effect, as the urine acquires a disagreeable odour very soon after they have been eaten. They are considered by some writers as diuretic, aperient, and deobstruent, and as constituting a very wholesome and useful article of diet, early in the spring, when vegetables are scarce. Broussais thought that they were sedative to the heart, and recommended them especially in hypertrophy, and other diseases of that organ attended with excessive action, and without phlogosis of the stomach. M. Gendrin, however, after much experience with asparagus, affirms that he never knew it to exercise the slightest influence over the heart, and ascribes its palliative effects, in diseases of that organ, to a diuretic action. He found it, in all the cases in which he administered it, to increase the quantity of urine, which, in some instances, was quintupled. The most convenient forms for exhibition are those of syrup and extract, prepared from the shoots. The former may be given in the dose of one or two fluidounces, the latter, of half a drachm or a drachm. The syrup may be made by adding a sufficient quantity of sugar to the expressed juice of the shoots, previously deprived of its albumen by exposure to heat and by filtration; the extract, by evaporating the same juice to the consistence of a pilular mass. The *berries* are capable of undergoing the vinous fermentation, and affording alcohol by distillation. In their unripe state they possess the same properties as the shoots, and probably in a much higher degree. We have employed a syrup prepared from them, with apparent advantage, in a case of diseased heart.

ASPLENIUM FILIX FŒMINA. R. Brown. *Female Fern.* This is the *Polypodium Filix fœmina* of Linn., the *Aspidium Filix fœmina* of Swartz, and the *Athyrium Filix fœmina* of Roth. It has a root analogous in character to that of the male fern (*Aspidium Filix mas*), and has been supposed to possess similar vermifuge properties. At present, however, it is not used. The vulgar name of *female fern* is also given to the *Pteris aquilina*, or *common brake*, which is said by some authors to have the property of destroying the tape-worm. The leaves of two species of Asplenium, *A. Trichomanes*, or *common spleenwort*, and *A. Adiantum-nigrum*, or *black spleenwort*, are mucilaginous, and have been used as substitutes for the *maidenhairs* (*Adiantum Capillus Veneris* and *A. pedatum*) as pectorals, though destitute of the aromatic flavour which is the chief recommendation of these plants.

BALM OF GILEAD. *Balsam of Gilead. Balsamum Gileadense. Baume de la Mecque*, Fr. The genuine balm of Gilead is the resinous juice of the *Amyris Gileadensis* of Linn., the *Balsamodendron Gileadense* of Kunth, a small evergreen tree, growing on the Asiatic and African shores of the Red Sea. It was in high repute with the ancients, and still retains its value in the estimation of the eastern nations, among whom it is employed both as a medicine and cosmetic. In western Europe and in this country, it is seldom found in a state of purity, and its use has been entirely abandoned. It is described as a turbid, whitish, thick, gray, odorous liquid, which becomes solid by exposure. It possesses no medical properties which do not exist in other balsamic or terebinthinate juices. It was formerly known by the name of *opobalsamum;* while the dried twigs of the tree were called *xylobalsamum*, and the dried fruit, *carpobalsamum.*

BALSAM OF SULPHUR. This name was formerly given to a substance resulting from the reaction of sulphur upon olive oil at a high temperature. It was directed in the old Edinburgh Pharmacopœia, under the name of *Oleum Sulphuratum;* but was discharged from that work at the last revision. The directions of the College were to boil *eight parts* of olive oil and *one part* of sublimed sulphur together, with a gentle fire, in a large iron pot, stirring them constantly till they united. The iron pot should be large enough to hold three times the quantity of the materials employed, as the mixture might otherwise boil over. As the vapours which rise are apt to take fire, a lid should be at hand to cover the pot, and thus extinguish the flame if necessary. Sulphur is soluble to a considerable extent in heated oil, from which, if the solution be saturated, it is deposited in a crystalline state on cooling. But it is not a mere solution which this process is intended to effect. The oil is partly decomposed, and the resulting preparation is an extremely fetid, acrid, viscid, reddish-brown fluid. In order that it may be obtained, the oil must be heated to the boiling point. *Sulphurated oil*, or *balsam of sulphur*, was formerly thought useful in chronic catarrh, consumption, and other pectoral complaints; but inconvenience has arisen from its acrid properties, and its internal use has been abandoned. It is said to be sometimes applied as a stimulant to foul ulcers. The dose is from five to thirty drops.

BALSAMUM TRANQUILANS. *Baume Tranquille.* This is a preparation of some note, directed by the French Codex, and consisting essentially of olive oil holding in solution the active matters of certain narcotic and aromatic plants. The fresh plants are boiled with the oil until all their water is driven off; the oil is then expressed and poured upon the dried plants properly comminuted; and the mixture, having been allowed to stand for a month, is strained, and the oil decanted. The preparation is used by friction as an anodyne in local pains.

BAPTISIA TINCTORIA. *Sophora tinctoria.* Linn. *Podalyria tinctoria.* Michaux. *Wild Indigo.* This is an indigenous perennial plant, found in all parts of the United States, growing abundantly in woods and dry barren uplands. It is from one to three feet high, with a smooth, very branching stem, small, ternate, cuneate-obovate, bluish-green leaves, and yellow flowers, which appear in July and August, and, like the whole plant, become black when dried. The root, which is the part most highly recommended, is of a dark-brown colour, inodorous, and of a nauseous, somewhat acrid taste. Its virtues appear to reside chiefly in the cortical portion. In large doses, it is said to operate violently as an emetic and cathartic; in smaller, to produce only a mild laxative effect. It is said to have proved useful in scarlatina, typhus fever, and in that state of system which attends gangrene or mortification. Dr. Thacher speaks highly of its efficacy as an external application to obstinate and painful ulcers; and Dr. Comstock, of Rhode Island, found it extremely useful, both as an internal and external remedy, in threatened or existing mortification. By the latter physician it was given in decoction, made in the proportion of an ounce of the root to a pint of water, of which half a fluidounce was administered every four or eight hours, any tendency to operate on the bowels being checked with laudanum. Dr. Stevens, of Ceres, Pennsylvania, has employed a decoction of the root advantageously in epidemic dysentery. (*N. Y. Journ. of Med.*, iv. 358.) It may be used externally in the form of decoction or cataplasm. The stem and leaves possess the same virtues as the root, though in a less degree. A pale-blue colouring substance has been prepared from the plant as a substitute for indigo, but is greatly inferior.

BARBADOES NUTS. *Purging Nuts. Physic Nuts.* These are the seeds of the *Curcas purgans* of Adanson (*Jatropha Curcas* of Linnæus), growing in Brazil, the West Indies, and on the western coast of Africa. The fruit is a three-celled capsule, containing one seed in each cell, and is of about the size of a walnut. The seeds are blackish, oval, about eight lines long, flat on one side, convex on the other; and the two sides present a slight longitudinal prominence. They yielded to Soubeiran fixed oil, an acrid resin, sugar, gum, a fatty acid, gluten, a free acid, and salts. The oil may be separated by expression. When fresh it is without smell or colour, but becomes yellowish and slightly odorous by time. When cold it deposits a white substance, which is probably margarin. Alcohol does not readily dissolve it. Some call it *jatropha oil.* From three to five of the *seeds*, slightly roasted and deprived of their envelope, operate actively as a cathartic, and not unfrequently produce nausea and vomiting, with a sense of burning in the stomach. The *oil* purges in the dose of twelve or fifteen drops, and is analogous in its action to croton oil, though less powerful. The cake left after the expression of the oil is an acrid emeto-cathartic, operating in the dose of a few grains. Either of these substances may produce serious consequences in over-doses. The leaves of the plant are rubefacient, and the juice is said to have been usefully employed as a local remedy in piles.

The seeds of *Curcas multifidus* (*Jatropha multifida*, Linn.) have similar properties, and yield a similar oil. This species also grows in Brazil and the West Indies.

BASSORA GUM. The plant which yields this substance is unknown. It came into commerce originally from the neighbourhood of Bassora, on the Gulf of Persia, but is frequently found mixed with gum brought from other countries, and is probably not the product of one plant exclusively. It is in irregular pieces, of various sizes, never very large, white or yellow, intermediate in the degree of its transparency between gum Arabic and tragacanth, inodorous, tasteless, and possessed of the property of yielding a slight sound when broken under the teeth. But a small portion of it is soluble in water, whether hot or cold. The remainder swells up considerably, though less than tragacanth, and does not, like that substance, form a gelatinous mass, as it consists of independent granules which have little cohesion. The soluble portion is pure gum or *arabin*, and, according to M. Guérin, constitutes 11·2 per cent. The insoluble portion consists of a peculiar principle called *bassorin*, associated with a small proportion of saline substances, which yield, when the gum is burnt, 5·6 per cent. of ashes. The gum is useless both in medicine and pharmacy, and is described here only as containing a principle which enters into the composition of several medicinal substances.

Bassorin is insoluble in water, alcohol, and ether, but softens and swells up in hot or cold water. Diluted nitric and muriatic acids, with the aid of heat, dissolve it almost entirely. The acidulous solution, concentrated by evaporation, and treated with alcohol, lets fall a flocculent precipitate which has all the characters of pure gum, into which the bassorin appears to have been converted by the action of the acid. This does not, however, constitute more than a tenth part of the bassorin dissolved. By gradually evaporating the alcoholic acidulous solution, a thick bitterish liquid is obtained, which exhales a strong odour of ammonia when treated with potassa. Strong nitric acid converts bassorin into mucic and oxalic acids; and, treated with sulphuric acid, it yields a sweet crystalline

substance which is incapable of the vinous fermentation. (Guérin.) Vauquelin was the first to call attention to this principle, upon which he conferred its present name, from having first observed it in the Bassora gum. Bucholz afterwards discovered the same or a closely analogous principle in tragacanth; and John, a principle which was supposed to be the same, in the gum of the cherry tree; hence it has sometimes been called *tragacanthin* and *cerasin*. M. Guérin, however, has demonstrated that the insoluble principle of the cherry gum is essentially different from bassorin. Berzelius considers the latter as belonging to the class of substances which he associates under the name of mucilage, and of which the mucilages of flaxseed and quince seed are examples. (See *Linum*, p. 448.)

BDELLIUM. This name has been given to two different gum-resins, distinguished as *Indian* and *African bdellium*. Dr. Royle was informed that the former was obtained from the *Amyris Commiphora* of Roxburgh, growing in India and Madagascar. The latter is said to be the product of *Heudelotia Africana*, which grows in Senegal. Bdellium sometimes comes mixed with gum Arabic and gum Senegal. It is either in small roundish pieces, of a reddish colour, semi-transparent, and brittle, with a wax-like fracture, or in larger irregular lumps, of a dark brownish-red colour, less transparent, somewhat tenacious, and adhering to the teeth when chewed. It has an odour and taste like those of myrrh, but weaker. It is infusible and inflammable, diffusing while it burns a balsamic odour. According to Pelletier it consists of 59 per cent. of resin, 9·2 of gum, 30·6 of bassorin, and 1·2 of volatile oil, including loss. In medical properties it is analogous to myrrh, and was formerly used for the same purposes; but it is now scarcely ever given internally. In Europe, it is still occasionally employed as an ingredient of plasters. The dose is from ten to forty grains.

BEAN OF ST. IGNATIUS. *Faba Sancti Ignatii.* This is the product of the *Ignatia amara* of the younger Linnæus, which is now considered a species of Strychnos, and entitled *S. Ignatia.* (See *Nux Vomica.*) It is a tree of middling size, with numerous long, cylindrical, glabrous, vine-like branches, which bear opposite, nearly sessile, oval, pointed, entire, and very smooth leaves. The flowers are white, tubular, fragrant, and arranged in short axillary racemes. The fruit is of the size and shape of a pear, with a smooth, whitish, ligneous rind, enclosing about twenty seeds embedded in a dry pulpy matter, and lying one upon the other. These seeds are the part used. The tree is a native of the Philippine Islands, where the seeds were highly esteemed as a medicine, and, having attracted the attention of the Jesuits, were honoured with the name of the founder of their order. They are about an inch long, rather less in breadth, still less in thickness, convex on one side, obscurely angular, with two, three, or four faces on the other, and marked at one end with a small depression indicating their point of attachment. They are externally of a pale-brown colour, apparently smooth, but covered in fact with a short down or efflorescence, which may be removed by scraping them with a knife. They are somewhat translucent, and their substance is very hard and horny. They have no smell, but an excessively bitter taste. To Pelletier and Caventou they afforded the same constituents as nux vomica, and among them 1·2 per cent. of strychnia.

MM. Magendie and Delile have proved that they act on the human system in the same manner as nux vomica. In the Philippines they have been employed for the cure of obstinate intermittents, and in numerous other diseases. It is probable that in small doses they act as a tonic. In this country they are never used. We have noticed them here on account of their comparatively large proportion of strychnia, which is triple that contained in nux vomica. They are employed for the extraction of that principle.

BEBEERU BARK. The bark of a tree growing in British Guiana, which has recently been brought into notice as a powerful tonic and febrifuge. The tree is a species of *Nectandra*, and has been named by Sir Robert Schomburg, *N. Rodiei*, in honour of Dr. Rodie, by whom it was first described. The bark is in flat pieces, three or four lines thick, smooth, grayish, hard, heavy, and brittle. The fruit is as large as a small apple, obcordate or obovate, somewhat compressed, consisting of an exterior brittle shell, and an interior fleshy kernel. Both the bark and the fruit are intensely bitter. They contain two alkaline principles discovered by Dr. Rodie, and named respectively *bebeerin* and *sipeerin*. These are extracted together, in the form of sulphates, by a process similar to that for preparing sulphate of quinia. The preparation is of a dark colour, and has the appearance of an extract. Messrs. Maclagan and Tilley obtain pure *bebeerin* by the following process. The impure sulphate is dissolved in water, and precipitated by ammonia. The precipitate, mixed with an equal weight of recently precipitated oxide of lead, and dried, is treated with absolute alcohol, which, being evaporated, leaves the two alkalies in the form of a translucent resinoid mass. The bebeerin is separated by means of ether, which yields it by evaporation. It is pale-yellow, of a resinous appearance, uncrystallizable, very soluble in alcohol, less so in ether, and very slightly soluble in water. It softens

and melts with heat, and at a higher temperature takes fire. Its salts are uncrystallizable. (*Journ. de Pharm.*, 3e *sér.*, x. 89.) The sulphate, above referred to, has been employed, with great asserted success, in the treatment of intermittent and remittent fevers. Dr. Rodie recommended it so early as 1834; but it did not attract general attention until brought into notice by Dr. Douglas Maclagan, of Edinburgh, who published a number of observations tending to prove its possession of valuable antiperiodic properties. Others afterwards confirmed his statements in its favour, and it was hoped that a substitute had been found for the alkaloids of Peruvian bark; but the more recent published accounts by M. Becquerel, of France (*Journ. de Pharm.*, 3e *sér.*, xx. 439), of Dr. Wm. Pepper, of Philadelphia (*Am. Journ. of Med. Sci.*, N. S., xxv. 13), and of Dr. E. D. Dailey, of Smyrna, Delaware (*Med. Exam.*, N. S., ix. 557), show satisfactorily that, though frequently successful, it often fails, and cannot be relied on as a substitute for quinia. From a scruple to a drachm may be given between the paroxysms, in doses of two grains.

BEDEGUAR. *Fungus Rosarum.* An excrescence upon the *sweet briar* or *eglantine*, and other species of *Rosa*, produced by the puncture of insects, especially by one or more species of *Cynips*. It is of irregular shape, usually roundish, about an inch in diameter, with numerous cells internally, in each of which is the larva of an insect. It has little smell, and a slightly astringent taste. Though formerly considered diuretic, anthelmintic, and lithontriptic, and employed as a remedy for toothache, it has fallen into disuse. It was given in doses of from ten to forty grains.

BENZOATE OF AMMONIA. *Ammoniæ Benzoas.* This salt is formed by dissolving benzoic acid nearly to saturation in a warm solution of ammonia. Upon cooling the solution forms crystals, which are somewhat deliquescent, and very soluble in water. Benzoate of ammonia is deemed diuretic, and has been employed in dropsy. Dr. Seymour, of London, used it with beneficial effects in gout, and also in cases in which chalk stones were deposited near the joints.

BENZOIN ODORIFERUM. Nees. *Laurus Benzoin.* Linn. *Spice-wood. Spice-bush. Fever-bush.* An indigenous shrub, from four to ten feet high, growing in moist, shady places, in all parts of the United States. Its flowers appear early in spring, long before the leaves, and are succeeded by small clusters of oval berries, which, when ripe, in the latter part of September, are of a shining crimson colour. All parts of the shrub have a spicy, agreeable flavour, which is strongest in the bark and berries. The small branches are sometimes used as a gently stimulant aromatic, in the form of infusion or decoction. They are said to be employed in this way by the country people as a vermifuge, and an agreeable drink in low fevers; and the bark has been used in intermittents. The berries, dried and powdered, were sometimes substituted, during the revolutionary war, for allspice. According to Dr. Drake, the oil of the berries is used as a stimulant.

BENZOLE. *Benzine. Benzene. Phene. Hydruret of Phenyle.* This substance was originally obtained by distilling benzoic acid with lime. It was afterwards discovered by Faraday as a constituent of coal-gas tar. This tar, when distilled, furnishes coal-naphtha, a complex substance, containing a number of carbohydrogens, among which is benzole. Upon distilling this naphtha from a metallic still, surmounted with an open vessel filled with water, and containing a worm terminating in a refrigerated receiver, the benzole will pass over and condense in the receiver; while the other substances associated with it, having higher boiling points, will condense in the worm, and fall back into the still. The benzole is then purified by distillation at a heat between 176° and 194°, and by subjecting the product to a new distillation from one-fourth of its volume of sulphuric acid.

Benzole is a colourless oleaginous liquid, possessing an agreeable odour. Its sp. gr. is 0·85, congealing point 32°, and boiling point 176°. Its formula is $C_{12}H_6$. Its powers as a solvent are very extensive. Among the substances soluble in it are sulphur, phosphorus, and iodine. It dissolves quinia, but not cinchonia, with which it forms a bulky, gelatinous mass. Morphia and strychnia are sparingly soluble. It is also a solvent of many of the resins; as also of mastic, camphor, wax, fatty and essential oils, caoutchouc, and gutta percha. The last two substances may be obtained, without alteration of properties, in tough sheets of any desired tenuity, by spreading their benzole solutions on glass or other polished surface, and allowing the solvent to evaporate. The same solutions brushed over the skin, form artificial cuticles, which have been found useful as coverings to wounds and burns. The vapour of benzole, when inhaled, acts as an anæsthetic. In relation to this substance see the paper of C. B. Mansfield, in the *Chem. Gaz.* (No. 159, p. 224), from which the facts of this article are principally taken.

Benzole, by the action of concentrated fuming nitric acid, is converted into *nitrobenzole*, also called *nitrobenzule* and *nitrobenzide*, having the formula $C_{12}H_5,NO_4$. The product, after having been washed with water, forms an oily, yellowish, intensely sweet liquid, having an odour like that of oil of bitter almonds. Its density is 1·209, and boiling point

415°. Latterly, it has become of commercial importance under the name of *artificial oil of bitter almonds*, being employed in scenting soaps, in confectionery, and for flavouring articles of diet. Nitrobenzole may be viewed as benzole, in which one eq. of hydrogen is replaced by one of nitrous acid.

BERBERIS VULGARIS. *Barberry.* A shrub growing wild in Europe and the United States, and sometimes cultivated in gardens on account of its berries. These grow in loose bunches, are oblong, and of a red colour, have a grateful, sour, astringent taste, and contain malic and citric acids. They are refrigerant, astringent, and antiscorbutic, and are used in Europe, in the form of drink, in febrile diseases and diarrhœas. An agreeable syrup is prepared from the juice; and the berries are sometimes preserved for the table. The root and inner bark have been used for dyeing yellow, and are said to have been employed beneficially in jaundice. They owe their colouring property to a peculiar crystallizable principle, which has been named *berberin*, and which is said, in the dose of from one to ten grains, to be tonic and purgative. (*Journ. de Pharm.*, xxi. 309.) This principle has been ascertained to possess alkaline properties. (See *Chem. Gaz.*, April, 1847, p. 129, and June, 1847, p. 209.) It is a vulgar error to suppose that the vicinity of this plant is injurious to wheat. The American plant differs slightly from the European, and is described by Pursh as a distinct species, under the name of *B. Canadensis*. It grows in mountains and hilly districts from Canada to Virginia. The berries are smaller and much less juicy than those of the garden barberry.

BETONICA OFFICINALIS. *Wood Betony.* A perennial European herb, belonging to the labiate plants. It has a pleasant but feeble odour, and a warm, somewhat astringent, and bitterish taste. By the ancients it was much esteemed, and employed in numerous diseases; but it is at present little used. It is slightly warming and corroborant, but is inferior in this respect to many other plants of the same family. The root has been considered emetic and purgative.

BETULA ALBA. *Common European Birch.* Various parts of this tree have been applied to medical uses. The *inner bark*, which is bitterish and astringent, has been employed in intermittent fever. The epidermis is separable into thin layers, which may be employed as a substitute for paper, and are applied to various economical uses. The bark contains a peculiar principle, called *betulin*, which is ranked among the sub-resins. When the bark is distilled, it yields an empyreumatic oil, having the peculiar odour of Russia leather, in the preparation of which it is employed. The *leaves*, which have a peculiar, aromatic, agreeable odour, and a bitter taste, have been employed, in the form of infusion, in gout, rheumatism, dropsy, and cutaneous diseases. The same complaints, particularly dropsy, are said to have been successfully treated by enveloping the body in the fresh leaves, which thus applied excite perspiration. When the stem of the tree is wounded, a saccharine *juice* flows out, which is considered useful in complaints of the kidneys and bladder, and is susceptible, with yeast, of the vinous fermentation. A beer, wine, spirit, and vinegar are prepared from it, and used in some parts of Europe.

Of the American species of birch, *Betula lenta*, variously called *sweet birch*, *black birch*, *cherry birch*, and *mountain mahogany*, is remarkable for the aromatic flavour of its bark and leaves, which have the odour and taste of Gaultheria procumbens, and are sometimes used in infusion, as an agreeable, gently stimulant, and diaphoretic drink. An oil is obtained by distillation from the bark, which has been proved by Prof. Procter to be identical with oil of gaultheria. (*Am. Journ. of Pharm.*, xv. 243.) This species also affords a saccharine liquor, which, indeed, appears to be common to all the birches. The bark of *B. papyracea* is employed by the Northern Indians for making canoes; and thin layers of the epidermis are placed inside of boots to prevent the access of moisture.

BEZOAR. This name has been applied to concretions which form in the stomach or intestines of animals, and which were at one time thought to possess extraordinary medical virtues. Numerous varieties have been noticed; but they were all arranged in two classes, the *oriental bezoar* (*lapis bezoar orientalis*), and *western bezoar* (*lapis bezoar occidentalis*), of which the former was most esteemed. They have fallen into merited neglect.

BIRD-LIME. A viscid substance existing in various plants, particularly in the bark of *Viscum album*, and *Ilex aquifolium* or European holly, from the latter of which it is usually procured. The process for preparing it consists in boiling the middle bark for some hours in water, then separating it from the liquid, and placing it in proper vessels in a cool situation, where it is allowed to remain till it becomes viscous It is then washed to separate impurities, and constitutes the substance in question. Bird-lime thus prepared is greenish, tenacious, glutinous, bitterish, and of an odour analogous to that of flaxseed oil. Exposed to the air in thin layers it becomes dry, brown, and pulverizable, but re-acquires its viscidity upon the addition of water. It is a complex body, but is thought to owe its characteristic

properties to a proximate principle, identical with that which exudes spontaneously from certain plants, and is called *glu* by the French chemists. This principle is without odour or taste, extremely adhesive, fusible by heat, inflammable, insoluble in water, nearly insoluble in alcohol, but dissolved freely by ether and oil of turpentine. According to M. Macaire, it is insoluble in the fixed oils, either hot or cold. This property distinguishes it from the resins, to which Berzelius is disposed to attach it. M. Macaire proposes for it the name of *viscin*. (*Journ. de Pharm.*, xx. 18.) Bird-lime is so tenacious, that it may be employed to catch small birds, which, when they alight on a stick thickly covered with it are unable to escape.

BISTORT. This is the root of *Polygonum Bistorta*, a perennial herbaceous plant, growing in Europe and the North of Asia. The root is cylindrical, somewhat flattened, about as thick as the little finger, marked with annular or transverse wrinkles, furnished with numerous fibres, and folded or bent upon itself, so as to give it the tortuous appearance from which its name was derived. When dried it is solid, brittle, of a deep-brown colour externally, reddish within, destitute of smell, and possessed of a rough, astringent taste. It contains much tannin, some gallic acid and gum, and a large proportion of starch. It resembles the other vegetable astringents in medical properties, and is applicable to the same complaints; but is less efficient than catechu or kino, and in this country is seldom or never used. It may be employed in the form of powder, decoction, or extract. The dose of the powder is twenty or thirty grains, three or four times a day.

Besides the bistort, some other plants belonging to the genus Polygonum have been used as medicines. Among these are *P. aviculare*, or knot-grass, a mild astringent, formerly employed as a vulnerary and styptic; *P. Persicaria* (Persicaria mitis), of a feebly astringent saline taste, and at one time considered antiseptic: and *P. Hydropiper* or water-pepper (Persicaria urens), the leaves of which have a burning and biting taste, inflame the skin when rubbed upon it, and are esteemed diuretic. The *water-pepper* or *smart-weed* of this country—*P. punctatum* (Elliott), *P. hydropiperoides* (Michaux)—which grows abundantly in moist places, possesses properties similar to those of the European water-pepper, and is occasionally used as a detergent in chronic ulcers, and internally in gravel. Dr. Eberle very strongly recommended it in amenorrhœa, in which complaint he found no other remedy equally effectual. He gave a fluidrachm of the saturated tincture of the plant, or from four to six grains of the extract, three or four times a day. He found it to produce a warmth and peculiar tingling sensation throughout the system, with slight aching pains in the hips and loins, and a sense of weight and tension within the pelvis. (*Eberle's Mat. Med. 4th ed.*, i. 441.) Dr. Wilcox, of Elmira, New York, has found advantage from a decoction of the dried leaves, made in the proportion of an ounce to the pint, and applied locally, in mercurial salivation, and the sore-mouth of nursing-women. (*Am. Journ. of Med. Sci.*, N. S., xvi. 248.) *P. Fagopyrum* is common *buckwheat*.

BISULPHURET OF CARBON. *Carburet of Sulphur.* This compound is formed by passing the vapour of sulphur over charcoal, heated to redness in a porcelain tube. Prepared on the large scale, the charcoal may be heated in a cast iron cylinder, as recommended by M. Chandelon. (*Journ. de Pharm. 3e sér.*, xiv. 187.) It is a transparent, colourless, exceedingly volatile liquid, having a pungent, somewhat aromatic taste, and a very fetid smell. Its sp. gr. is 1·272. In composition it is a bisulphuret. It acts as a diffusible stimulant, accelerating the pulse, augmenting the animal heat, and exciting the secretions of the skin, kidneys, and genital organs. It was formerly employed in obstinate rheumatic and arthritic affections, in paralysis and cutaneous eruptions, and more recently as a resolvent in indolent tumours. It is used both internally and externally. For internal exhibition in gout and rheumatism, Dr. Otto, of Copenhagen, employed an alcoholic solution, in the proportion of two drachms to the fluidounce, of which four drops were given every two hours. At the same time the affected parts were rubbed with a liniment, made by dissolving the bisulphuret in the same proportion in olive oil. Dr. Krimer applied it to an indolent tumour, by allowing forty or fifty drops to fall upon it three times a day. This treatment, which may be supposed to act by the cold produced, assisted by the internal use of animal charcoal and cicuta, and the employment of warm alkaline baths, was attended with success. He also succeeded in reducing several strangulated hernias, by applying some drops of the bisulphuret to the hernial tumour. By Dr. Turnbull the vapour of this substance was found useful, applied to indurated lymphatic glands, and for the removal of deafness, when dependent on want of nervous energy, and a deficiency of wax. It is applied by means of a bottle with a proper sized mouth, containing a fluidrachm of the bisulphuret, imbibed by a piece of sponge. The skin over the gland is first well moistened with water. When the vapour is applied to the ear, the bottle, having a small neck to fit the meatus, is held close to the organ until considerable warmth is produced. (*Pharm. Journ. and Trans.*, ii. 352.)

BOLE ARMENIAN. The term *bolus* or *bole* was formerly applied to various forms of argillaceous earth, differing in colour, or place of origin. Such were the *Armenian*, *Lemnian*, and *French boles*, and the *red* and *white boles*. Some of these substances were so highly valued as to be formed into small masses and impressed with a seal, and hence received the name of *terræ sigillatæ*. They were all similar in effect, though the small proportion of oxide of iron contained in the coloured boles may have given them greater activity. The only one at present kept in the shops is that called *bole Armenian*, from its resemblance to the substance originally brought from Armenia. It is prepared, by trituration and elutriation, from certain native earths existing in different parts of Europe. It is in pieces of various sizes, reddish, soft and unctuous, adhesive to the tongue, and capable of forming a paste with water. It consists chiefly of alumina and silica, coloured with oxide of iron. The boles were formerly employed as absorbents and astringents; and they were undoubtedly useful in some cases of acidity of the stomach and relaxed bowels. The bole Armenian is used chiefly as a colouring ingredient in tooth powders.

BORAGO OFFICINALIS. *Borage.* This is an annual, hairy, succulent European plant, one or two feet high, with fine blue flowers, on account of which it is sometimes cultivated in our gardens. All parts of it abound in mucilage, and the stem and leaves contain nitrate of potassa with other salts. To these constituents the plant owes all its virtues. It is much used in France. An infusion of the leaves and flowers, sweetened with honey or syrup, is employed as a demulcent, refrigerant, and gently diaphoretic drink in catarrhal affections, rheumatism, diseases of the skin, &c. The expressed juice of the stem and leaves is also given in the dose of from two to four ounces. The flowers are sometimes applied externally as an emollient. A distilled water, extract, and syrup were formerly used, but have fallen into neglect. Borage is scarcely known in this country as a medicinal plant.

BRAZIL WOOD. A red dye-wood, the product of different species of Cæsalpina, growing in the West Indies and South America. Two varieties are known in commerce:— 1. The proper Brazil-wood, said to be derived from *Cæsalpina echinata*, and sometimes called *Pernambuco* or *Fernambuco wood*, from the province of Brazil, where it is collected; 2. the *brasiletto*, produced by *C. Brasiliensis* and *C. Crista*, which grow in Jamaica and other parts of the West Indies. The former is the most highly valued. The *sappan* or *sampfen wood* may be referred to the same head, being obtained from the *Cæsalpina Sappan*, and possessing properties analogous to those of the brasiletto. The *Nicaragua* or *peach wood* is also analogous to the brasiletto, and is said by Bancroft to be derived from a species of Cæsalpina. It is produced in the East Indies. Brazil wood is nearly inodorous, has a slightly sweetish taste, stains the saliva red, and imparts its colouring matter to water. It was formerly used in medicine; but has been abandoned as inert. In pharmacy it serves to colour tinctures, &c.; but its chief use is in dyeing. A red lake is prepared from it, and it is an ingredient in a red ink. Its dyeing properties are owing to a crystallizable colouring principle, named *breselin*.

BROMIDE OF IRON. *Ferri Bromidum.* This bromide is obtained by heating gently, in thirty parts of water, two parts of bromine, and one of iron filings. When the liquid becomes greenish, it is filtered and evaporated to dryness in an iron vessel; and the dry mass, again dissolved and evaporated to dryness, furnishes the bromide. Bromide of iron is a brick-red deliquescent salt, very soluble, and extremely styptic. For medicinal employment it should be in aqueous solution, protected by sugar. Mr. Dillwyn Parrish has proposed the following formula: Take of bromine *two hundred grains;* iron filings *eighty-five grains:* distilled water *four and a half fluidounces;* sugar *three ounces.* Make a solution in the manner directed for preparing solution of iodide of iron. (*Med. Exam.* vii. 162.) This solution is deemed tonic and alterative. It has been used with advantage by Dr. E. Gillespie, of Brady's Bend, Pa., in tetter, scrofulous tumours, inflammation of the glands, both acute and chronic, erysipelas, and amenorrhœa. In the case of tumours and erysipelas, Dr. Gillespie, besides giving the solution internally, applies it to the parts affected by means of a feather two or three times a day. (*Ibid.*, vii. 158.) The dose of Mr. Parrish's solution is twenty drops, three times a day, gradually increased until some effect is produced on the system. Bromide of iron is formed as the first step of the process for preparing the officinal bromide of potassium. (See *page* 1149.)

BROMIDES OF MERCURY. The *protobromide* is formed by adding bromide of potassium to nitrate of protoxide of mercury. It falls as a white curdy precipitate. The *bibromide* may be obtained by digesting the protobromide in water containing bromine. It is in the form of colourless crystals, soluble in water and alcohol. Exposed to heat it enters into fusion and sublimes. These bromides are analogous in composition and medicinal properties to the corresponding iodides of mercury. (See *pages* 1036 and 1037.) The protobromide is given in the dose of a grain daily, gradually increased. The bi-

bromide, like corrosive sublimate, is an irritant poison, and may be administered in doses of the sixteenth of a grain, gradually increased to a fourth, either in the form of pill, or in ethereal solution, made by dissolving a grain in a fluidrachm of ether.

BRYONY. *White Bryony.* This is the root of *Bryonia alba*, or white bryony, a perennial, climbing, herbaceous plant, growing in thickets and hedges in different parts of Europe. It bears rough, heart-shaped, five-lobed leaves, small yellow monœcious flowers, arranged in racemes, and roundish black berries about the size of a pea. Another species called *B. dioica*, with diœcious flowers and red berries, bears so close a resemblance in character and properties to the preceding, that it is considered by some botanists merely a variety. The roots of both plants are gathered for use. When fresh they are spindle-shaped, sometimes branched, a foot or two in length, as thick as the arm, or even thicker, externally yellowish-gray and circularly wrinkled, within white, succulent and fleshy, of a nauseous odour, which is lost in great measure by drying, and of a bitter, acrid, very disagreeable taste. The peasants are said sometimes to hollow out the top of the root, and to employ the juice which collects in the cavity as a drastic purge. (*Merat and De Lens.*) The berries are also purgative, and are used in dyeing.

As kept in the shops, the root is in circular transverse slices, externally yellowish-gray and longitudinally wrinkled, internally of a whitish colour, becoming darker by age, concentrically striated, light, brittle, and readily pulverizable, yielding a whitish powder. Besides a peculiar bitter principle called *bryonin*, the root contains starch in considerable proportion, gum, resin, sugar, a concrete oil, albumen, and various salts. It yields its active properties to water.

Bryony is an active hydragogue cathartic, in large doses sometimes proving emetic, and disposed, if too largely administered, to occasion inflammation of the alimentary mucous membrane. The recent root is highly irritant, and is said, when bruised and applied to the skin, to be capable of producing vesication. The medicine was well known to the ancients, and has been employed by modern physicians; but is now nearly superseded by jalap, which is more certain, and less liable to lose its strength by age. The dose of the powdered root is from a scruple to a drachm.

CABBAGE-TREE BARK. The bark of *Andira inermis*, De Cand., *Geoffroya inermis*, Willd., figured in Woodville's Medical Botany, p. 416, t. 151. This is a leguminous tree, with a stem rising to a considerable height, branched towards the top, and covered with a smooth gray bark. The leaves are pinnate, consisting of six or seven pairs of ovate lanceolate, pointed, veined, smooth, petiolate leaflets, with an odd one at the end. The flowers are rose-coloured, and arranged in terminal panicles, with very short pedicels. The tree is a native of Jamaica and other West India Islands. The bark, which is the part used, is in long pieces, thick, fibrous, externally of a brownish-ash colour, scaly and covered with lichens, internally yellowish, of a resinous fracture, a disagreeable smell, a sweetish, mucilaginous, bitterish taste, and affording a powder resembling that of jalap. Huttenschmidt obtained from it a crystallizable, very bitter substance, having the composition and neutralizing properties of the vegetable alkaloids, and named very inappropriately *jamaicina*. Two grains of it produced violent purging in pigeons.

On the continent of Europe the bark of *Andira retusa* (*Geoffroya Surinamensis*), which grows in Surinam, has also been employed. It is considered more powerfully vermifuge, without being equally liable to produce injurious effects. It has a grayish epidermis, beneath which it is reddish-brown, laminated, compact, very tenacious, and, when cut transversely, exhibits a shining and variegated surface. In the dried state it is inodorous, but has an austere bitter taste. The powder is of a pale-cinnamon colour.

Cabbage-tree bark is cathartic, and in large doses is apt to occasion vomiting, fever, and delirium. It is said that these effects are more liable to result if cold water is drunk during its operation, and are relieved by the use of warm water, castor oil, or a vegetable acid. In the West Indies it is esteemed a powerful vermifuge, and is much employed for expelling lumbrici; but it is dangerous if incautiously administered, and instances of death from its use have occurred. It is almost unknown in this country, and does not enter into our officinal catalogues. The usual form of administration is that of decoction, though the medicine is also given in powder, syrup, and extract. The dose of the powder is from a scruple to half a drachm, of the extract three grains, of the decoction two fluidounces.

CAHINCA. This medicine attracted at one time considerable attention. The name of *cahinca* or *cainca* was adopted from the language of the Brazilian Indians. The Portuguese of Brazil call the medicine *raiz pretta* or black root. When first noticed in Europe it was supposed to be derived from the *Chiococca racemosa* of Linnæus, which was known to botanists as an inhabitant of the West Indies. But Martius, in his "Specimen Materiæ Medicæ Brasiliensis," describes two other species of Chiococca, *C. anguifuga* and *C. densifolia*, which afford roots having the properties of that ascribed to *C. racemosa;* and, as

the medicine was brought from Brazil, there seemed to be good reason for referring it to one or both of the plants named by that botanist. A. Richard, however, received from Brazil specimens of *C. racemosa* as the cahinca plant.

A specimen brought into this market consisted of cylindrical pieces, varying in size from the thickness of a straw to that of the little finger, somewhat bent or contorted, slightly wrinkled longitudinally, with occasional small asperities, internally ligneous, externally covered with a thin brittle reddish-brown bark, having a light-brown or brownish ash-coloured epidermis. The cortical portion, which was of a resinous character, had a bitter disagreeable taste, somewhat acrid and astringent; the ligneous part was quite tasteless. The virtues of the root reside almost exclusively in its bark. They are extracted by water and alcohol. Cahinca has been analyzed by several chemists. Four distinct principles were discovered in it by Pelletier and Caventou:—1. a crystallizable bitter substance, believed to be the active principle, and called *cahincic acid;* 2. a green fatty matter of a nauseous odour; 3. a yellow colouring matter; and 4. a coloured viscid substance. Rochleder and Hlasiwetz found also caffeotannic acid. By these chemists a tincture obtained by boiling the bark in alcohol, was precipitated first with a spirituous solution of acetate of lead, and afterwards, having been previously filtered, with the tribasic acetate of lead. The first precipitate consisted chiefly of caffeotannate and a portion of cahincate of lead, the second of cahincate of lead exclusively. To obtain the caffeotannic acid separate, the first precipitate was treated with sulphuretted hydrogen, and afterwards with neutral acetate of lead, and in like manner several times, until at length a pure caffeotannate of lead remained, which, on decomposition, yielded an acid identical with the tannic acid of coffee. The cahincic acid was obtained by treating the second precipitate with sulphuretted hydrogen, and concentrating the resulting liquid. The chemists last mentioned give as its formula $C_{16}H_{13}O_7$. (*Chem. Gaz.*, ix. 121.) Cahincic acid is white, without smell, of a taste at first scarcely perceptible, but afterwards extremely bitter and slightly astringent, of difficult solubility in water, but readily soluble in alcohol, permanent in the air, and unaltered at 212°. It reddens vegetable blues, and unites with the alkalies, but does not form crystallizable salts. It is thought to exist in the root as subcahincate of lime.

Medical Properties. Cahinca is tonic, diuretic, purgative, and emetic. In moderate doses it gently excites the circulation, increases the discharge of urine, and produces evacuations from the bowels; but is rather slow in its operation. It may be made to act also as a diaphoretic, by keeping the skin warm, using warm drinks, and counteracting its purgative tendency. In some patients it occasions nausea and griping, and in very large doses always acts powerfully both as an emetic and cathartic. In Brazil it has long been used by the natives as a remedy for the bites of serpents; and its Indian name is said to have been derived from this property. According to Martius, the bark of the fresh root is rubbed with water till the latter becomes charged with all its active matters; and the liquid, while yet turbid, is taken in such quantities as to produce the most violent vomiting and purging, preceded by severe spasmodic pains. Patrick Brown speaks of the root of *C. racemosa* as very useful in obstinate rheumatisms. But the virtues of cahinca in dropsy, though well known in Brazil, were first made known to the European public in the year 1826, by M. Langsdorff, Russian Consul at Rio Janeiro. Achille Richard afterwards published a few observations in relation to it in the *Journal de Chimie Medicale;* and its properties were subsequently investigated by numerous practitioners. M. François, of Paris, contributed more than any other physician to its reputation. It was considered by him superior to all other remedies in dropsy. But general experience has not confirmed the partial estimate of Dr. François; and, having been found at least equally uncertain with other diuretics, the medicine is now little used. It was employed in substance, decoction, extract, and tincture. The powdered bark of the root was given as a diuretic and purgative, in a dose varying from a scruple to a drachm; but the aqueous or spirituous extract was preferred. The dose of either of these is from ten to twenty grains. Dr. François recommended that, in the treatment of dropsy, a sufficient quantity should be given at once to produce a decided impression, which should afterwards be maintained by smaller doses, repeated three or four times a day.

CALENDULA OFFICINALIS. *Marygold.* This well-known garden plant was formerly much employed in medicine. It has a peculiar, rather disagreeable odour, which is lost by drying, and a bitter, rough, saline taste. Among its constituents is a peculiar principle, called *calendulin*, discovered by Geiger most abundantly in the flowers, and considered by Berzelius as analogous to bassorin, though soluble in alcohol. The plant was thought antispasmodic, sudorific, deobstruent, and emmenagogue, and was given in low forms of fever, scrofula, jaundice, amenorrhœa, &c. Both the leaves and flowers were used; but the latter were preferred, and were usually administered in the recent state, in the form of tea. An extract was also prepared, and employed in cancerous and other ulcers, sick stomach, &c. At present marygold is very seldom if ever used in regular practice.

CALOTROPIS GIGANTEA. Brown. *Asclepias gigantea*, Linn. Under the name of *madar* or *mudar*, a medicine has been employed in the East Indies, with great asserted advantage. It is the bark of the root of a species of Calotropis, generally considered as *C. gigantea*, but asserted by Dr. Casanova to be a distinct species, and named by him *C. Madarii Indico-orientalis*. *C. gigantea* is a native of Hindostan, and has been introduced into the West Indies, where it is now naturalized. The bark, as employed, is destitute of epidermis, of a whitish colour, nearly or quite inodorous, and of a bitter somewhat nauseous taste. It appears to have the general properties of many other acrid medicines; in small doses, increasing the secretions, and in larger, producing nausea and vomiting. According to Dr. Casanova, who published an essay upon the subject at Calcutta, it is especially directed to the skin, the capillaries and absorbents of which it stimulates to increased action. It is chiefly recommended as a remedy in the obstinate cutaneous diseases of tropical climates, such as elephantiasis and leprosy. It has been employed also in syphilis, dropsy, rheumatism, and hectic fever. It is given in substance in the dose of from three to twelve grains, three times a day, and gradually increased till it affects the system.

CAM WOOD. A red dye-wood, procured from the *Baphia nitida* of De Candolle, a leguminous tree, growing on the Western Coast of Africa. The wood is usually kept in the shops in the ground state. It yields its colouring matter scarcely at all to cold water, slightly to boiling water, and readily to alcohol and alkaline solutions. This colouring matter is thought to be identical with santalin.

CANARY SEED. The seeds of *Phalaris Canariensis*, an annual plant belonging to the grasses, originally from the Canary Islands, but now growing wild in Europe and the United States, and cultivated in many places. The seeds are ovate, somewhat compressed, about two lines long, shining, and of a light yellowish-gray colour externally, and brownish within. Their chief constituent is starch. They were formerly esteemed medicinal, but are now used only for emollient cataplasms. They are nutritive, and their meal is said to be mixed, in some places, with wheat flour, and made into bread. They are used as food for Canary birds.

CAOUTCHOUC. *Gum elastic. Indian Rubber.* This substance is the concrete juice of the *Siphonia Cahuchu* of Schreber and Willdenow, identical with the *Siphonia elastica* of Persoon, the *Jatropha elastica* of the younger Linnæus, and the *Hevea Guianensis* of Aublet. This is a large tree growing in Brazil, Guiana, and possibly also in Central America. (*Journ. of Phil. Col. of Pharm.*, iii. 292.) On being wounded, it emits a milky juice, which concretes on exposure, and constitutes the substance in question. A similar product is afforded by several other lactescent plants; but hitherto it is only the juice of the Siphonia that has been extensively collected. Caoutchouc comes to us in large flat pieces, or moulded into various shapes. These are formed by applying successive layers of the juice upon moulds of clay, which are broken and removed when the coating has attained a sufficient thickness and consistence. In the drying of these layers they are exposed to smoke, which gives to the concrete mass a blackish colour. The juice, when it concretes by exposure to the air, assumes on the outer surface a yellowish-brown colour, while the mass remains white or yellowish-white within. The recent juice contains, according to Faraday, 1·9 per cent. of vegetable albumen, traces of wax, 7·13 per cent. of a bitter azotized substance soluble in water and alcohol, 2·9 of a substance soluble in water but insoluble in alcohol, 56·37 of water with a little free acid, and only 31·7 of the pure elastic principle to which chemists have given the name of caoutchouc. Besides these principles the concrete juice, as it reaches us, generally contains soot derived from the smoke used in drying it. *Pure caoutchouc* is nearly colourless, and in thin layers transparent. It is highly elastic, lighter than water, without taste and smell, fusible at about 248°, remaining unctuous and adhesive upon cooling, inflammable at a higher temperature, insoluble in water, alcohol, the weak acids, and alkaline solutions, soluble in ether when entirely freed from alcohol, soluble also in most of the fixed and volatile oils, though at the expense of its elasticity. It is said, however, that the oils of lavender and sassafras dissolve it without change, and that, when precipitated by alcohol from its solution in cajeput oil, it is still elastic. But its best solvents, for practical purposes, are coal-naphtha, an empyreumatic oil obtained by distilling caoutchouc itself, and pure oil of turpentine. Caoutchouc is not affected by atmospheric air, chlorine, muriatic or sulphurous acid gas, or ammonia. It consists, according to Faraday, of 87·2 parts of carbon, and 12·8 of hydrogen.

By the action of sulphur caoutchouc acquires properties which greatly increase its value in the arts. It becomes of a black colour and horny consistence, preserves its elasticity under the influence both of heat and cold, is compressible with great difficulty, and resists the ordinary solvents, such as petroleum and oil of turpentine. In this state it is said to be *vulcanized*. The discovery of the process of *vulcanization* is ascribed to Mr. Charles Goodyear, of New York. (*Chem. Gaz.*, x. 193.) It consists in submitting caoutchouc in

thin sheets to the action of a mixture composed of 40 parts of sulphuret of carbon and 1 of chloride of sulphur. For fuller details the reader is referred to the *Journ. de Pharm.* (*3e sér.*, xvii. 205). But the same object may be effected in other methods. When thin layers of caoutchouc are immersed for two or three hours in melted sulphur at the heat of 240° F., they are penetrated by the sulphur, but undergo no change of properties. If now heated in an inert medium to a temperature of from 275° to 320°, a chemical reaction takes place, and the vulcanized product is obtained. The same result takes place if the caoutchouc be first pounded with from 12 to 20 per cent. of finely powdered sulphur, and then heated to the temperature requisite for vulcanization. In either case a portion of uncombined sulphur remains mechanically mixed with the vulcanized caoutchouc, from which it may be separated by various solvents, such as solutions of caustic soda or potassa, sulphuret of carbon, oil of turpentine, anhydrous ether, &c. The *desulphurated* product thus obtained, while exempt from the disadvantages arising from the reaction of free sulphur, is more porous than before. (*Ibid.*, xxi. 366.)

Caoutchouc is used for erasing pencil marks; in the formation of flexible tubes for the laboratory, and of catheters, bougies, pessaries, and other instruments for surgical purposes; in the melted state, as a luting to the joints of chemical apparatus; in the shape of thin layers, for covering the mouths of bottles, and for other purposes in which the exclusion of air and moisture is requisite; in the manufacture of water-proof cloth; and for numerous other purposes, to which its elasticity, and the resistance which it offers to the ordinary solvents, and to other powerful chemical agents, peculiarly adapt it. It may be brought to the state of thin layers, by softening the small flasks of it in ether containing alcohol, or boiling them in water, for fifteen minutes, and then distending them by means of air forced into them; and the same end may be attained by spreading its naphtha or ethereal solution upon a smooth surface, and allowing the solvent to evaporate. Tubes of caoutchouc may be made from its solution, or from the juice imported in the liquid state. A court-plaster prepared with caoutchouc has been considerably used, and from its impermeability by moisture is sometimes valuable. (See *Amer. Journ. of Pharm.*, xv. 38.) A convenient sticking plaster may be prepared by spreading the liquid caoutchouc, by a stiff brush, upon calico, soft leather, or thin sheets of vulcanized Indian rubber as found in the shops. Small thin pieces of caoutchouc may be very advantageously employed to suppress hemorrhage from leech-bites, &c., by first softening one surface of the piece by a taper, and when cool applying it firmly over the bleeding point. The cavity of a decayed tooth may be lined with caoutchouc, so as to prevent the access of air, and thus relieve pain, by fastening a piece firmly around the end of a rod, liquefying the surface by heat, then introducing it with pressure into the cavity, and again withdrawing it. Caoutchouc has been given internally in phthisis, in the dose of one or two grains, gradually increased. (*Ann. de Thérap.*, 1847, p. 73.)

CAPPARIS SPINOSA. *Caper-bush.* A low, trailing shrub, growing in the South of Europe and North of Africa. The buds or unexpanded flowers, treated with salt and vinegar, form a highly esteemed pickle, which has an acid, burning taste, and is considered useful in scurvy. The dried bark of the root was formerly officinal. It is in pieces partially or wholly quilled, about one-third of an inch in mean diameter, transversely wrinkled, grayish externally, whitish within, inodorous, and of a bitterish, somewhat acrid, and aromatic taste. It is considered diuretic, and was formerly employed in obstructions of the liver and spleen, amenorrhœa, and chronic rheumatism.

CARANNA. *Gum Caranna.* A resinous substance, in pieces of a blackish-gray colour externally, dark-brown internally, somewhat shining and translucent, brittle and pulverizable when dry, but, in the recent state, soft and adhesive like pitch, easily fusible, of an agreeable balsamic odour when heated, and of a bitterish resinous taste. (*Geiger.*) It is said to be derived from the *Amyris Caranna* of Humboldt, a tree growing in Mexico and South America. Geiger refers it also to the *Bursera gummifera* of the West India Islands; but the resin obtained from this tree is described by the French writers under the name of *resine de Gomart*, or *resine de chibou*, or *cachibou*, and is said to bear a close resemblance to the resin *tacamahac.*

CARBURET OF IRON. *Ferri Carburetum. Plumbago. Black Lead.* This substance has been used both internally and externally in cutaneous affections. For medical use it is reduced to very fine powder, and purified by being boiled in water, and digested with dilute nitromuriatic acid. The dose is from five to fifteen grains or more, three or four times a day, given in the form of powder or pill. The ointment is made by mixing from two to six drachms with an ounce of lard.

CARDAMINE PRATENSIS. *Cuckoo-flower.* This is a perennial herbaceous plant, with a simple, smooth, erect stem, about a foot in height. The leaves are pinnate; the radical, composed of roundish irregularly toothed leaflets, those of the stem alternate, with leaflets

which become narrower, more entire, and pointed as they ascend. The flowers are purplish-white or rose-coloured, and terminate the stem in a raceme approaching the character of a corymb. The plant is a native of Europe, and is found in the northern parts of our continent, about Hudson's Bay. It is a very handsome plant, abounding in moist meadows, which it adorns with its flowers in the months of April and May. The leaves are bitterish and slightly pungent, resembling in some measure those of water-cresses, and like them supposed to be possessed of antiscorbutic properties. In Europe they are sometimes added to salads. The flowers have the same taste with the leaves, and, when fresh, a somewhat pungent odour. When dried, they become inodorous and nearly insipid. They formerly possessed the reputation of being diuretic, and, since the publication of a paper by Sir George Baker, more than half a century ago, have been occasionally used as an antispasmodic in various nervous diseases, such as chorea and spasmodic asthma, in which they were successfully employed by that physician. They produce, however, little obvious effect upon the system, and are not employed in this country.

CATALPA CORDIFOLIA. *Bignonia Catalpa.* Linn. *Catalpa tree*, or *Catawba tree.* This is a beautiful indigenous flowering tree, occasionally cultivated for ornamental purposes. It is reputed to be poisonous. The seeds have been employed by several practitioners of continental Europe in asthma. M. Automarchi recommends a decoction made by boiling twelve ounces of water with three or four ounces of the seeds down to six ounces, the whole to be given morning and night.

CEANOTHUS AMERICANUS. *New Jersey Tea. Red-root.* A small indigenous shrub, growing throughout the United States. The root is astringent, and imparts a red colour to water. It is said to be useful in syphilitic complaints, in which it is given in the form of decoction, made with two drachms of the root to a pint of water. Schoepf states that it is purgative. The leaves were used during the revolutionary war as a substitute for tea. Dr. Hubbard recommends a strong infusion of the dried leaves and seeds, as a local application in aphthous affections of the mouth and fauces, and the sorethroat of scarlatina, and as an internal remedy in dysentery. (*Boston Med. and Surg. Journ.*, Sept. 30, 1835.)

CEDRON. The seeds of a tree growing in New Granada and Central America, and described by M. Planchon under the name of *Simaba Cedron*, in the *London Journal of Botany*, v. 566, from specimens sent by Mr. Wm. Purdie, curator of the Botanical Garden at Trinidad, to Sir Wm. J. Hooker. Mr. Purdie had received the first intimation of the value of this medicine from Dr. Cespedes, a physician of Bogota. The first account of it, however, which reached Europe appears to have been that of Dr. Luigi Rotellini, a physician of Saint Domingo, who had previously resided in New Granada. It was published in an Italian journal so early as the year 1846. In France it appears to have been made known through M. Jamord, who received information of its effects from M. Herran, Chargé d'Affaires in France of the Republic of Costa Rica. The fullest account that we have seen of the plant and its products is from the pen of Sir Wm. J. Hooker. (See *Pharm. Journ. and Trans.*, Jan. 1851, x. 344.)

Simaba Cedron belongs to the natural family of Simarubaceæ. It is a small tree, with an erect stem, not exceeding six inches in diameter, branching at top in an umbellate form, with large, glabrous, pinnate leaves, and pale-brown flowers in long, branching racemes. The fruit is a large, solitary drupe, containing a single seed. The whole plant appears to be impregnated with a bitter principle, but it is the seed only that is used. A specimen of the dried fruit and the separated seed was kindly sent to one of the authors from Cartago, in Costa Rica, by Dr. Guier, formerly of Philadelphia. It is light, of a yellowish-ash colour, flattish-ovate, with one edge convex and the other nearly straight, the convex outline terminating at each end in an obtuse point, of which that at the apex is most prominent. It is about two inches long, and sixteen lines in its greatest breadth. Within, the seed is loose and movable. The seed itself is about an inch and a half long, ten lines broad, and half an inch thick. It is convex on one side, flat or slightly concave on the other, and presents an oval scar near one extremity of the flat surface. It is hard and compact, but may be readily cut with a knife.

Cedron seed is inodorous, but of a pure and intensely bitter taste, not unlike that of quassia. It yields its virtues to water and alcohol. M. Lewry obtained from it a crystalline substance, of intense bitterness, freely soluble in boiling water and neutral to test paper, which he supposes to be the active principle, and proposes to name *cedrin*. He obtained it by first exhausting the cedron with ether, then submitting it to the action of alcohol, and crystallizing from the tincture. (*Journ. de Pharm. et de Chim.*, xix. 335.)

This medicine has long had great reputation in New Granada and Central America, as a remedy for the bite of serpents, being mentioned in the *History of the Buccaneers*, published in 1699, as useful for this purpose; and such continues to be the confidence of the natives in its virtues, that they have no fears of the poisonous bite of these reptiles, if

provided with the antidote. It is also highly esteemed in the prevention of hydrophobia, and in the treatment of intermittent fever, spasm of the stomach and bowels, and dyspeptic affections. Dr. Guier informed us that he had seen it once apparently successful in curing the bite of a poisonous serpent, and had used it effectually in cholera morbus, colic, and neuralgia of the face. Dr. J. B. Thompson, of London, has found it useful in gout. (*Med. Times and Gaz.*, April, 1852, p. 364.) To us it appears to be closely analogous to quassia, with which it is botanically allied. The dose used in Central America is one or two grains. M. Herran states that he had employed the remedy in eight cases of poisoning, and that his mode of using it was to administer five or six grains with a spoonful of brandy, and to dress the bite with the tincture. He had rarely occasion to repeat the dose to effect a cure. Dr. Rotellini says that it is poisonous in over-doses, and has occasioned death in the quantity of twenty-five or thirty grains. A vinegar has been prepared in London by macerating for seven days two scruples of the cedron in an ounce of distilled vinegar. The dose is from twenty minims to a fluidrachm. (*Pharm. Journ. and Trans.*, xii. 63.)

CELASTRUS SCANDENS. *Climbing Staff-tree.* A climbing indigenous shrub, growing from Canada to Carolina, and said to possess emetic, diaphoretic, and narcotic properties. The bark is the part employed. It has been used in chronic affections of the liver and secondary syphilis. For a full description of the plant, see Darlington's *Flora Cestrica*, p. 149. Other species of Celastrus, growing in various parts of the world, have been employed in medicine, though with little reputation.

CENTAUREA BENEDICTA. *Blessed Thistle. Carduus benedictus. Cnicus benedictus.* De Cand. This is an annual herbaceous plant, the stem of which is about two feet high, branching towards the top, and furnished with long, elliptical, rough leaves, irregularly toothed, barbed with sharp points at their edges, of a bright-green colour on their upper surface, and whitish on the under. The lower leaves are deeply sinuated, and stand on footstalks; the upper are sessile, and in some measure decurrent. The flowers are yellow, and surrounded by an involucre of ten leaves, of which the five exterior are largest. The calyx is oval, woolly, and composed of several imbricated scales, terminated by rigid, pinnate, spinous points. The plant is a native of the South of Europe, and is cultivated in gardens in other parts of the world. It has become naturalized in the United States. The period of flowering is June, when its medicinal virtues are in greatest perfection. The leaves are the officinal portion. They should be gathered when the plant is in flower, quickly dried, and kept in a dry place. The herb has a feeble unpleasant odour, and an intensely bitter taste, more disagreeable in the fresh than the dried plant. Water and alcohol extract its virtues. The infusion with cold water is a grateful bitter; the decoction is nauseous, and offensive to the stomach. The bitterness remains in the extract. The active constituents are volatile oil, and a peculiar principle for which the name of *cnicin* has been proposed. This is crystallizable, inodorous, very bitter, neither acid nor alkaline, scarcely soluble in cold water, more soluble in boiling water, and soluble in all proportions in alcohol. It consists of carbon, hydrogen, and oxygen, and is analogous to salicin in composition. In the dose of 4 or 5 grains it is said often to vomit, and in that of 8 grains to be useful in intermittent fevers. (*Ann. de Thérap.*, 1843, p. 206.) The blessed thistle may be so administered as to prove tonic, diaphoretic, or emetic. The cold infusion, made with half an ounce of the leaves to a pint of water, has been employed as a mild tonic in debilitated conditions of the stomach. A stronger infusion, taken warm while the patient is confined to bed, produces copious perspiration. A still stronger infusion, or decoction, taken in large draughts, provokes vomiting, and has been used to assist the operation of emetics. The herb, however, is at present little employed, as all its beneficial effects may be obtained from chamomile. The dose of the powder as a tonic is from a scruple to a drachm, that of the infusion two fluidounces.

CHELIDONIUM MAJUS. *Celandine.* A perennial herbaceous plant, growing wild in this country, about old houses and in rocky places; but supposed to have been introduced from Europe, where it is indigenous. It is one or two feet high, bears pinnate leaves and small peduncled umbels of yellow flowers, and, when wounded, emits a yellow, opaque juice. The whole plant is used. It has a faint unpleasant odour, and a bitter, acrid, durable taste, which is stronger in the roots than in the leaves. The odour is nearly lost by drying, but the taste remains. The yellow juice is bitter and exceedingly acrid, and when applied to the skin produces inflammation and even vesication. The plant, analyzed by MM. Chevalier and Lassaigne, afforded a bitter resinous substance of a deep-yellow colour; a kind of gum-resin of an orange-yellow colour, and bitter, nauseous taste; mucilage; albumen; and various saline substances, besides free malic acid and silica. Dr. Probst, of Heidelberg, has more recently found in it a peculiar acid denominated *chelidonic acid;* two alkaline principles, one of which forms neutral salts with the acids, and is called

chelerythrin in consequence of the intense redness of its salts, the other unites with but does not neutralize the acids, and is named *chelidonin;* and lastly a neuter, crystallizable, bitter principle, which from its yellow colour he calls *chelidoxanthin.* Chelerythrin appears to be an acrid narcotic poison. (*Annal. der Pharm.*, xxix. 113.) See *Sanguinaria*, page 646, for the mode of preparing it. Celandine is an acrid purgative, possessed also of diuretic, and perhaps diaphoretic and expectorant properties. In over-doses, it produces unpleasant effects, and is by some considered poisonous. By the ancients it was much esteemed as a remedy in jaundice; and it has been found useful in the same complaint by some modern physicians. It was the chief ingredient of the old *decoctum ad ictericos* of the Edinburgh Pharmacopœia. It has been given also, in other complaints, especially those of a scrofulous character, affecting the mesenteric and lymphatic glands, the skin, and the eyes. The yellow juice is often applied to corns and warts, which it destroys by stimulating them beyond their powers. The fresh herb is also applied locally about the pelvis, with asserted benefit, in amenorrhœa. The dose of the dried root or herb is from thirty grains to a drachm, that of the fresh root one or two drachms; and the same quantity may be given in infusion. The watery extract and expressed juice have also been employed. The dose of the former is from five to ten grains, of the latter from ten to twenty drops, to be gradually increased until the effects of the remedy are experienced.

CHELTENHAM SALT, ARTIFICIAL. Several artificial mixtures have been prepared, professing to be exact imitations of the saline ingredients in the chalybeate Cheltenham water; but the only ones which appear worthy of confidence are those prepared by Robert Alsop, Chemist, of London, and W. Hodgson, jun., druggist, of this city. The composition of the natural Cheltenham chalybeate is given at page 113. The imitation of Mr. Alsop, as analyzed by Dr. Faraday, contains the same solid and gaseous constituents as the natural water, except the sulphate of lime, which is very properly omitted; and in the same proportions precisely, with the exception that there is about twice as much free carbonic acid in the artificial preparation. The iron is present in the state of protoxide, and is immediately dissolved by the free carbonic acid, upon adding a sufficient quantity of water. The carbonic acid probably exists in a free state in the dry mixture; as there is no obvious agent present to cause it to be disengaged in the mere act of solution.

Mr. Alsop's artificial mixture is in the form of a powder, nearly white, possessing a saline and slightly ferruginous taste. It forms a good combination, in which the aperient property of the salts present is combined with the tonic virtue of the iron. It is considered to be useful in glandular obstructions, especially of the liver, and in scrofulous affections, attended with feeble digestion, sluggish bowels, and pallidness of skin. It is employed, also, with advantage in sick headache, habitual costiveness, and hemorrhoids. The dose is a teaspoonful, quickly dissolved by brisk stirring in half a pint of cold water, and swallowed immediately, before the iron has time to separate in an insoluble state. This quantity may be taken in the morning, fasting, and repeated once or twice after an interval of twenty minutes, or in the course of the day. To obtain its full tonic and alterative effects, it should be persevered with for a month or six weeks.

The artificial Cheltenham salt of Mr. Hodgson is identical with that of Mr. Alsop, and may be used with entire confidence for all the purposes to which the latter is applied.

CHLORIDE OF MAGNESIUM. *Magnesii Chloridum. Muriate of Magnesia.* When a concentrated solution of this salt is evaporated to dryness, it is partially decomposed into magnesia and muriatic acid, the latter being evolved. By a careful evaporation, stopping it so soon as the vapour begins to redden litmus paper, the chloride may be obtained in the state of a fused hydrate, having the composition $MgCl,6HO$. (Casaseca, *Chem. Gaz.*, Oct. 15, 1853, p. 384.) The physiological action of this bitter and very deliquescent salt has been made the subject of a memoir by Dr. Lebert. He finds it to act mildly and favourably as a purgative, producing a flow of bile, and an increase of appetite. On account of its extreme deliquescence, he recommends it in the liquid form, prepared by dissolving the salt in its weight of water. Of this solution he gives an ounce sufficiently diluted to an adult, and half an ounce to a child from 10 to 14 years of age. (*Arch. Gén*, 4*e sér.*, iii. 448.)

CHLORIDE OF MERCURY AND QUINIA. *Hydrargyri et Quiniæ Chloridum.* This compound has been prepared by Mr. McDermott, of Dublin, by uniting chemically corrosive sublimate with quinia. The corrosive sublimate was found to be reduced to the state of calomel; and, hence, it may be inferred that half the chlorine of the former united with the quinia. This preparation has been found useful in the treatment of obstinate skin diseases, given in the dose of a grain two or three times a day.

CHLORIDE OF POTASSA, SOLUTION OF. *Liquor Potassæ Chlorinatæ. Javelle's Water. Eau de Javelle.* This is obtained precisely as the solution of chlorinated soda. (See *Liquor Sodæ Chlorinatæ.*) It is employed for taking out fruit stains, &c., from linen. In chemical constitution it is probably a hypochlorite.

CHLORIDE OF SILVER. *Argenti Chloridum.* This has been already referred to as being inevitably formed when nitrate of silver is given internally. (See *page* 898.) It is readily prepared by adding a solution of common salt to one of nitrate of silver, as long as it produces a precipitate. As first thrown down it is a white curdy substance, but it soon becomes discoloured when exposed to the light. It has been used, rubbed on the tongue, in syphilis, and internally in epilepsy, chronic dysentery and diarrhœa, and other diseases in which nitrate of silver has been given. The dose is from one to three grains or more, four or five times a day. Dr. Perry administered it at the Philadelphia hospital, Blockley, in chronic dysentery, with the immediate effect of diminishing the number of stools. The crystallized *ammonio-chloride of silver* has been given in syphilitic affections, in the dose of the fourteenth of a grain. It is formed by saturating solution of ammonia, by the aid of heat, with chloride of silver, and allowing the liquid to cool in a stopped bottle. It crystallizes in cubes, and is very liable to decomposition.

CHLORINATED ANÆSTHETIC COMPOUNDS. By the mutual action of chlorine and olefiant gas, an oily liquid is obtained, discovered by the associated Dutch chemists, and called *Dutch liquid,* or *chloride of olefiant gas.* The empirical formula of this compound is $C_4H_4Cl_2$; the rational C_4H_3Cl,HCl. When it is acted on by an alcoholic solution of potassa, muriatic acid is separated by the formation of chloride of potassium, and a compound represented by C_4H_3Cl is set free. By the action of additional chlorine, the Dutch liquid is susceptible of having each equivalent of hydrogen successively replaced by one of chlorine, forming four new compounds; namely, $C_4H_2Cl_2,HCl$—C_4HCl_3,HCl—C_4Cl_4,HCl—C_4Cl_6. The last compound here is evidently a 6–4 chloride of carbon; and the others are called by Regnault, in allusion to the replacing chlorine, without noting the disappearing hydrogen, monochlorinated, bichlorinated, and trichlorinated Dutch liquid. The Dutch liquid has been tried as an anæsthethic by Dr. Simpson and Mr. Nunnely. Dr. Simpson was not satisfied with its effects; but Mr. Nunnely, having administered it frequently in practice, found it perfectly agreeable in every respect. Its use is not attended by the troublesome excitement produced by ether, or by the tendency to collapse caused by chloroform. Two forms of Dutch liquid have been recently experimented with by Dr. Aran, of Paris; and one of them furnished satisfactory clinical results. The liquid which gave favourable results has been ascertained by Mialhe and Flourens to be the monochlorinated Dutch liquid; but its cost proved to be too high to allow of its general use as a therapeutic agent. In consequence of this objection to the liquid just named, Mialhe and Flourens were induced to search for a substitute in the corresponding compound of a parallel series of ethers, formed by the action of chlorine on muriatic ether. When muriatic ether (C_4H_5Cl) is acted on by successive portions of chlorine, the hydrogen is replaced by the latter, equivalent for equivalent, and there are formed the five following compounds: $C_4H_4Cl_2$—$C_4H_3Cl_3$—$C_4H_2Cl_4$—C_4HCl_5—C_4Cl_6. Of this series, the first member is isomeric with the Dutch liquid; the second, third, and fourth with the mono- bi- and trichlorinated Dutch liquid, and the fifth is the 6–4 chloride of carbon, the terminating compound of the other series. The first member, though identical with the Dutch liquid in elementary composition, and having a vapour of the same density, has, nevertheless, a lower boiling point, and is different in chemical properties. Thus, it is not decomposed by an alcoholic solution of potassa, as the Dutch liquid is; and is not acted on by potassium, while the Dutch liquid is immediately attacked by it. These facts show that the atomic constitution of these two substances must be different. In like manner the second, third, and fourth members of this series are different in chemical properties from their isomeric representatives in the Dutch liquid series. In denoting the different degrees of chlorination of the muriatic ether series, Regnault indicates merely (as in the Dutch liquid series) the number of eqs. of chlorine supposed to replace hydrogen. Accordingly, he calls the first member of the series monochlorinated muriatic ether, corresponding to the Dutch liquid; and the second, third, and fourth, bi- tri- and quadrichlorinated muriatic ethers, corresponding to the mono- bi- and trichlorinated Dutch liquids. This confusion of nomenclature arises from the fact that the replacement by chlorine sets out from five eqs. of hydrogen in the muriatic ether series, and from four eqs. in the Dutch liquid series.

From the explanation above given, it will be understood that the compound of the muriatic ether series corresponding to the monochlorinated Dutch liquid, is the bichlorinated muriatic ether. This compound proved too volatile to act advantageously as a local anæsthetic. The tri- and quadrichlorinated ethers are denser and less volatile, and acted more favourably. The conclusion arrived at by Mialhe and Flourens appears to be that the four chlorinated muriatic ethers all possess anæsthetic properties; and as it would be difficult to separate them, they propose the use of the mixed ethers, consisting principally of the tri- and quadrichlorinated compounds, as an anæsthetic, under the indefinite name of chlorinated muriatic ether (*chlorinated chlorohydric ether*).

Chlorinated muriatic ether is a colourless, very mobile, neuter liquid, having an aromatic ethereal odour, and hot saccharine taste. It is sparingly soluble in water, but readily soluble in alcohol, ether, and most of the fixed and volatile oils. It is not inflammable, in which respect it agrees with chloroform. Being a mixture of different liquids, its sp. gr. is not uniform. Its boiling point varies from 230° to 266°. According to the experiments of Flourens, it has a similar action to chloroform, the most important of the chlorinated anæsthetics. (See *chloroformum*). Its local action is that of a powerful sedative. (B. Cucuel, *Ann. de Thérap.*, 1853, 102.)

CHROME YELLOW. This is the neutral chromate of lead, prepared by precipitating a solution of the nitrate of lead with chromate of potassa. It is of a beautiful lemon-yellow colour. The subchromate of lead, consisting of one eq. of acid, and two eqs. of base, is of a red colour, and is sometimes used as a pigment. *Chrome green* is a mixture of chrome yellow and Prussian blue.

CHROMIC ACID. *Acidum Chromicum.* This acid is readily obtained by mixing 100 measures of a cold saturated solution of bichromate of potassa with 150 measures of sulphuric acid, and allowing the mixture to cool. The sulphuric acid unites with the potassa, and sets the chromic acid free, which crystallizes in brilliant crimson-red prisms. The mother-liquor having been poured off, the crystals should be placed upon a tile to drain, covered with a glass bell-jar. Chromic acid is deliquescent and very soluble in water. It is a powerful oxidizer, yielding its oxygen readily to organic matter, which is thereby dissolved. In composition it is the teroxide of chromium, having the formula CrO_3. This acid has been tried as a caustic by Prof. Sigmund, of Vienna, on the recommendation of Dr. Heller. Used in substance, made into a paste with water, its action is exceedingly slow and gradual, but deeply penetrating. In saturated solution its action is less penetrating and less gradual. By using a solution more or less dilute, the action may be graduated according to the degree of effect desired. Prof. Sigmund tried the concentrated solution, with advantage, for the destruction of condylomata, occurring in his syphilitic wards. This caustic is well suited to the destruction of morbid growths, and gives less pain than other caustics. Chromic acid acts as a rapid solvent of organic matter. "Smaller animals (mice, birds, &c.) were so completely dissolved by the acid within fifteen or twenty minutes, that no trace of their bones, skin, hair, claws, or teeth could be discovered." (*Dublin Quarterly Journ.*, xiii. 250, from the *Wiener Medizinische Wochenschrift.*)

CICHORIUM INTYBUS. *Chicory. Succory.* A perennial herbaceous plant, indigenous in Europe, but naturalized in this country, where it grows in fields, and in roads along the fences, in neighbourhoods which have been long settled. It is one or two feet high, with large, compound, beautifully blue flowers, which appear in July and August, and serve to distinguish the plant at first sight. The whole plant has a bitter taste, without acrimony, or any very peculiar flavour. The taste is strongest in the root, and weakest in the flowers. The leaves, when young and tender, are said to be sometimes eaten as salad in Europe. Succory is gently tonic without being irritating, and is considered by some authors as aperient and deobstruent. It is said to be useful, if freely taken, in hepatic congestion, jaundice, and other visceral obstructions in the early stages: and is affirmed to have done good even in pulmonary consumption. The usual form of administration is that of decoction, which is prepared by boiling one or two ounces of the root, or a handful of the herb, in a pint of water. The root dried and roasted is much used in certain parts of Europe as a substitute for coffee, and is said also to be mixed fraudulently with ground coffee for sale. In preparing it for coffee, Dausse recommends that the dried root should be cut into rather large and equal pieces, which are to be roasted until they lose 140 out of 500 parts. The pieces are then easily ground in a mill, and afford a yellowish-brown powder. (*Pharm. Cent. Blatt*, Oct. 1850, p. 688.) The *garden endive* is a species of Cichorium, denominated *C. Endivia.*

CICUTA VIROSA. *Water Hemlock. Cowbane.* A perennial, umbelliferous European plant, growing on the borders of pools and streams. It is very poisonous, proving fatal to most animals which feed upon it, though said to be eaten with impunity by goats and sheep. Several instances are on record of children who have died from eating the root by mistake for parsnep. It operates as an acrid narcotic, producing inflammation of the stomach, together with symptoms which indicate cerebral disturbance, such as vertigo, intoxication, and convulsions. Infusion of galls is recommended as an antidote, but should not be relied on to the exclusion of emetics. When the plant vomits, as it frequently does, fatal effects are less apt to ensue. It is said to be less poisonous dried than fresh; and it has been inferred that the active principle is volatile. But the volatile oil, obtained by distillation, was found by Simon, of Berlin, not to be poisonous. On the other hand, the alcoholic extract of the dried root operated as a violent poison upon animals. (*Annal. der Pharm.*, xxxi. 258.) It is at present never used internally, having been superseded by

Conium maculatum. Externally it is sometimes employed as an anodyne poultice in local pains, particularly those of a rheumatic or gouty nature.

The *Cicuta maculata* or *American water hemlock* is closely analogous, in botanical character and effects, to the European species. In several instances, children have been fatally poisoned by eating its root. It is never used in medicine. For a full account of this plant, see *Bigelow's Medical Botany* (i. 125). In cases of poisoning by either of these plants, vomiting should be induced as speedily as possible, and maintained till the stomach is thoroughly evacuated.

CITRATE OF IRON AND MAGNESIA. *Ferri et Magnesiæ Citras.* This double salt has been introduced to the notice of the profession by M. Van der Corput. It is made by dissolving two ounces of freshly precipitated hydrated oxide of iron in a moderately heated solution of three ounces of citric acid, and saturating the liquor with carbonate of magnesia. The solution, after filtration, is evaporated by means of a water-bath to a syrupy consistence, and spread on glass to dry in scales. The carbonate required is nearly an ounce. Three and a quarter ounces of sulphate of iron will furnish by decomposition the necessary hydrated oxide for three ounces of the acid. (See formula for *Ferri Oxidum Hydratum.*) This salt is in transparent greenish-yellow scales, having a slightly ferruginous somewhat acid taste. It is very soluble in water, but insoluble in alcohol and ether. It may be given in doses of five or ten grains, in the form of solution, syrup, or pill. (See the remarks of Prof. Procter on this preparation, contained in the *Am. Journ. of Pharm.* for Oct. 1850, p. 315.)

CITRATE OF IRON AND QUINIA. *Ferri et Quiniæ Citras.* This is made, according to Prof. Procter, by heating together, in a capsule, *an ounce* of recently precipitated quinia, *two drachms* of citric acid, *five ounces* of citrate of iron, and *twelve fluidounces* of water, constantly stirring, and avoiding ebullition. When the solution is effected, evaporate carefully to a syrupy consistence, and spread on glass to dry in thin layers. This double salt is in the form of shining scales, of a garnet-red colour, more or less deep. It is given as a tonic in doses of five grains or more, three times a day, either in solution, or in the form of pill. This double salt is sometimes adulterated with cinchonia, which replaces part of the quinia. A sample, analyzed by Mr. C. G. Williams, was found to contain only 5·3 per cent. of quinia, instead of 12·5 per cent. (*Chem. Gaz.*, xi. 269.)

CITRATE OF SODA. *Sodæ Citras.* This salt may be formed by saturating a solution of citric acid with bicarbonate of soda, evaporating the liquid, and setting it aside to crystallize. It is a white salt crystallized in six-sided pyramids, and having a saline taste without any bitterness. Citrate of soda has been proposed by M. Guichon, of Lyons, as a pleasant purgative, having properties similar to those of citrate of magnesia, and, though possessing a taste more decidedly saline than the latter, having the advantages of cheapness, and of a constant solubility, which permits it to be associated with other medicinal preparations. The dose is from ten to fourteen drachms, given in simple aqueous solution, or acidulated with citric acid and sweetened.

CIVET. *Zibethum.* This is an odorous substance, obtained from two animals of the genus Viverra, viz., the *V. Civetta* or civet cat of Africa, and the *V. Zibetha* which inhabits the East Indies. It is secreted into a cavity which opens between the anus and external genitals, and is collected from animals confined for the purpose. It is semi-liquid, unctuous, yellowish, becoming brown and thicker by exposure to the air, of a very strong, peculiar odour, similar to that of musk, though less agreeable and less diffusible, and of a bitterish, subacrid, disagreeable, fatty taste. When heated it becomes quite fluid, and at a higher temperature takes fire, and burns with a clear flame, leaving little residue. It is insoluble in water, and only slightly soluble in ether and cold alcohol; but heated alcohol dissolves it almost entirely, depositing it again upon cooling. It contains, among other ingredients, a volatile oil, fat, and free ammonia. In medicine it was formerly employed as a stimulant and antispasmodic, like castor and musk; but it is now used exclusively as a perfume.

CLEMATIS ERECTA. *Upright Virgin's Bower.* A perennial European plant. The leaves and flowers have an acrid burning taste. When bruised in a mortar they irritate the eyes and throat, giving rise to a flow of tears and to coughing; and applied to the skin they produce inflammation and vesication. Hence the name of *flammula Jovis*, by which the plant was known in older pharmacy. The acrimony is greatly diminished by drying. Störck found this species of Clematis useful in secondary syphilis, cancerous and other foul ulcers, and severe headaches. He gave it internally, and at the same time applied the powdered leaves to the surface of the sore. It acted as a diuretic and diaphoretic. Two or three drachms of the leaves were infused in a pint of water, of which he administered four ounces three times a day. He also employed an extract, in the dose of a grain or two in the course of a day. At present the plant is not used.

Other species of Clematis have the same acrid properties. Among these are *C. Flammula* or *sweet scented virgin's bower*, which, though a native of Europe, is cultivated in our gardens, *C. Vitalba* or *traveller's joy*, also a native of Europe, and several indigenous species, of which *C. Virginica* or *common virgin's bower*, *C. Viorna* or *leather flower*, and *C. crispa* have been particularly cited by authors as proper substitutes for the C. erecta used by Störck. All these are climbing plants. C. Vitalba has been used in Europe with success in the cure of itch. For this purpose the roots and stems, bruised, and boiled for a short time to diminish their acrimony, were infused in boiling oil, which, thus impregnated, was applied to the skin several times a day. Twelve or fifteen applications were usually sufficient.

COBALT BLUE. This beautiful pigment is a compound of oxide of cobalt and alumina, obtained by precipitating the mixed solutions of a salt of alumina and of cobalt by means of an alkali, and washing, drying, and strongly calcining the precipitate. (*Berzelius.*) The cobalt blue of Thenard is made by heating together the hydrated subphosphate of cobalt and hydrate of alumina. It is used in painting. An oxide of cobalt prepared by precipitating the chloride with potassa has been employed in rheumatism. It is emetic in the dose of 10 or 20 grains. The salts of the metal are irritant poisons.

COBWEB. *Spider's Web. Tela Araneæ.* The genus *Aranea* of Linn. has been divided by subsequent naturalists into several genera, of which the *Tegeneria* of Walkenaer is the one that includes the medicinal species of spider. The *T. domestica* of Europe, and *T. medicinalis* of this country (Henz, *Journ. Acad. of Nat. Sci.*, ii. 53), are the particular species which have attracted most attention. They inhabit cellars, barns, and other dark places, and are of a brown or blackish colour. It is affirmed that the web of the field spider is inefficacious, while that collected in the cellars of houses, &c., has extraordinary medical virtues. Several authors speak in very decided terms of its powers as a febrifuge and antispasmodic. According to Dr. Robert Jackson, it is superior even to bark and arsenic in the cure of intermittents, and is, moreover, highly useful in various spasmodic and nervous diseases, controlling and tranquillizing irregular nervous action, exhilarating the spirits, and disposing to sleep, without producing any of the narcotic effects of opium on the brain. Among the complaints in which it has been found useful, besides intermittent fever, are periodical headache, hectic fever, asthma, hysteria, and nervous irritations attended with morbid vigilance and irregular muscular action. It will be observed that these are, for the most part, affections over which the imagination has much control. The dose of spider's web is five or six grains, to be given in the form of pill, and repeated every three or four hours. Dr. Jackson states that its influence is not in proportion to the quantity administered, and that he obtained the same effects from ten as from twenty grains. This might well be, if the supposition be allowed that its chief operation is through the imagination. Spider's web has also been used, with asserted advantage, as a styptic in wounds, and a healing application in superficial ulcers. Spiders themselves were formerly employed in the treatment of intermittent fever, and this application of the web is not of recent origin.

COCHLEARIA OFFICINALIS. *Common Scurvy-grass.* This is an annual or biennial plant, sending up early in the spring a tuft of radical leaves, which are heart-shaped, roundish, of a deep shining-green colour, and supported on long footstalks. The leaves of the stem are alternate, oblong, somewhat sinuate, the lower petiolate, the upper sessile. The stem is erect, branched, angular, six or eight inches high, and bears, at the extremity of the branches, numerous white cruciform peduncled flowers, in thick clusters. The fruit is a roundish two-celled pod, containing numerous seeds. The whole plant is smooth and succulent. It is a native of the northern countries of Europe, where, as well as in the United States, it is occasionally cultivated in gardens. The whole herb is officinal. It has, when fresh, a pungent unpleasant odour if bruised, and a warm, acrid, bitter taste. These properties are lost by drying. They are imparted to water and alcohol by maceration, are retained by the expressed juice, and probably depend on a peculiar volatile oil which is separable in very small quantity by distillation with water.

Common scurvy-grass is gently stimulant, aperient, and diuretic. It is highly celebrated as a remedy in sea-scurvy, and has been recommended in chronic obstructions of the viscera, and certain forms of chronic rheumatism. The fresh plant may be eaten as a salad, or used in the form of infusion in water or wine, or of the expressed juice. Alcohol and water are impregnated with its virtues by distillation; and the distilled spirit has been found useful in paralysis, in the dose of thirty drops several times a day. The expressed juice may be used as a local application in scorbutic affections of the gums.

COCOA. *Cacao. Chocolate Nuts.* These are the seeds of *Theobroma Cacao*, a handsome tree, from twelve to twenty feet in height, growing in Mexico, the West Indies, and South America, in some parts of which it is largely cultivated, particularly in Guayaquil

and Venezuela. The fruit is an oblong-ovate capsule or berry, six or eight inches in length, with a thick, coriaceous, somewhat ligneous rind, enclosing a whitish pulp, in which numerous seeds are embedded. These are ovate, somewhat compressed, about as large as an almond, and consist of an exterior thin shell, and a brown oily kernel. Separated from the matter in which they are enveloped, they constitute the *cocoa* of commerce. They have a slightly aromatic, bitterish, oily taste, and, when bruised or heated, an agreeable odour. They contain a large quantity of fixed oil, together with albumen and bitter extractive. The oil is obtained by hot expression, or by decoction. It is a soft solid, whitish or yellowish, with a peculiar agreeable odour, and a bland pleasant taste, and is known by the name of *cocoa butter*. According to Brandes, it has peculiar properties, and yields a peculiar acid when saponified. He calls the oil *cocin*, and the acid *cocinic acid*. (*Journ. de Pharm.*, xxiv. 652.) It has since been found to contain several solid and volatile fatty acids; as caproic, caprylic, capric, and pichuric acids. (*Ibid.*, 3*e sér.*, xv. 69.) The oil is said to be frequently adulterated with animal fats. The chief use to which it is applied is as an ingredient in cosmetic unguents. A peculiar crystallizable azotized principle, called *theobromin*, has been found in the seeds by M. Woskresensky. It is said to contain a larger proportion of nitrogen than cafeïn. (*Journ. de Pharm.*, 3*e sér.*, i. 136.) The shells of the nuts are sometimes employed in the state of infusion, as a substitute for tea or coffee. They impart to boiling water a taste analogous to that of chocolate, but weaker. The kernel is consumed in great quantities, in the shape of chocolate, or in some analogous form.

Chocolate is differently prepared in different countries. In Great Britain and the United States, it usually consists, when pure, exclusively of the cocoa or chocolate nuts, which are first roasted, then deprived of their shell, and lastly reduced, by grinding between heated stones, to the state of a paste, which is moulded into oblong cakes. Not unfrequently rice flour or other farinaceous substance, with butter or lard, is added; but these must be considered as adulterations. On the continent of Europe, sugar is generally incorporated with the paste, and spices, especially cinnamon, are often added. Vanilla is a favourite addition in South America, France, and Spain. Cocoa is often sold in the state of powder, which is sometimes mingled with other ingredients, such as ground rice, barley flour, sugar, &c. Chocolate is prepared for use by reducing it to powder, and boiling it in milk, water, or a mixture of these fluids. In this state it is much employed as a drink at the morning and evening meals, and serves as an excellent substitute for coffee in dyspeptic cases. It is also a good article of diet for convalescents, and may sometimes be given advantageously as a mild nutritive drink in acute disease.

COFFEE. The coffee plant—*Caffea Arabica*—belongs to the class and order Pentandria Monogynia of the sexual system, and to the natural order Cinchonaceæ of Lindley. It is a small tree, rising from fifteen to thirty feet in height. The branches are opposite, the lower spreading, the upper somewhat declining, and gradually diminishing in length as they ascend, so as to form a pyramidal summit, which is covered with green foliage throughout the year. The leaves are opposite, upon short footstalks, oblong-ovate, acuminate, entire, wavy, four or five inches long, smooth and shining, of a dark-green colour on their upper surface, paler beneath, and accompanied with a pair of small pointed stipules. The flowers are white, with an odour not unlike that of the jasmine, and stand in groups in the axils of the upper leaves. The calyx is very small, the corolla salverform, with a nearly cylindrical tube, and a flat border divided into five lanceolate, pointed segments. The stamens project above the tube. The fruit, which is inferior, is a roundish berry, umbilicate at top, at first green, then red, and ultimately dark-purple. It is about as large as a cherry, and contains two seeds surrounded by a paper-like membrane, and enclosed in a yellowish pulpy matter. These seeds, divested of their coverings, constitute coffee.

This tree is a native of Southern Arabia and Abyssinia, and probably pervades Africa about the same parallel of latitude, as it is found growing wild at Liberia, on the western coast of the continent. It is cultivated in various parts of the world where the temperature is sufficiently elevated and uniform. Considerable attention has long been paid to its culture in its native country, particularly in Yemen, in the vicinity of Mocha, from which the demands of commerce were at first almost exclusively supplied. About the year 1690, it was introduced by the Dutch into Java, and in 1718, into their colony of Surinam. Soon after this latter period, the French succeeded in introducing it into their West India Islands, Cayenne, and the Isles of France and Bourbon; and it has subsequently made its way into the other West India Islands, various parts of tropical America, Hindostan, and Ceylon.

The tree is raised from the seeds, which are sown in a soil properly prepared, and, germinating in less than a month, produce plants which, at the end of the year, are large enough to be transplanted. These are then set out in rows at suitable distances, and in three or four years begin to bear fruit. It is customary to top the trees at this age, in order to prevent their attaining an inconvenient height, and to increase the number of

fruit-bearing branches. It is said that they continue productive for thirty or forty years. Though almost always covered with flowers and fruit, they yield most abundantly at two seasons, and thus afford two harvests during the year. Various methods are employed for freeing the seeds from their coverings; but that considered the best, is by means of machinery to remove the fleshy portion of the fruit, leaving the seeds surrounded only by their papyraceous envelope, from which they are afterwards separated by drying, and by the action of peeling and winnowing mills.

The character of coffee varies considerably with the climate and mode of culture. Consequently, several varieties exist in commerce, named usually from the sources from which they are derived. The *Mocha coffee*, which is in small roundish grains, takes precedence of all others. The *Java coffee* is highly esteemed in this country; but our chief supplies are derived from the West Indies and South America. Some good coffee has been brought from Liberia. Coffee improves by age, losing a portion of its strength, and thus acquiring a more agreeable flavour. It is said to be much better when allowed to become perfectly ripe upon the tree, than as ordinarily collected. The grains should be hard, and so heavy as readily to sink in water. When soft, light, black or dark-coloured, or musty, they are inferior.

Coffee has a faint, peculiar odour, and a slightly sweetish, somewhat austere taste. An analysis by M. Payen gives for its constituents, in 100 parts, 34 of cellulose, 12 of hygroscopic water, 10 to 13 of fatty matter, 15·5 of glucose, with dextrine and a vegetable acid, 10 of legumin, 3·5 to 5 of *chlorogenate of potassa and caffein*, 3 of a nitrogenous body, 0·8 of free caffein, 0·001 of concrete volatile oil, 0·002 of fluid volatile oil, and 6·697 of mineral substances. (*Journ. de Pharm.*, 3*e sér.*, x. 266.) Pfaff recognised, in the precipitate produced by acetate of lead with the decoction of coffee, two peculiar principles, one resembling tannin, called *caffeo-tannic acid*, and the other an acid, called by him *caffeic acid*. *Caffein* was first discovered by Runge, and afterwards by Robiquet. According to Payen it exists in the coffee partly free, partly in the form of a double salt, consisting of a peculiar acid, denominated *chlorogenic acid*, combined with potassa and caffein. It may be obtained in the following manner. Exhaust bruised coffee by two successive portions of boiling water, unite the infusions, add acetate of lead, in order to precipitate the principles which accompany the caffein, filter, decompose the excess of acetate of lead in the filtered liquor by sulphuretted hydrogen, concentrate by evaporation, and neutralize with ammonia. The caffein is deposited in crystals upon cooling, and may be purified by redissolving in water, treating with animal charcoal, and evaporating. For another method, said to be more economical, proposed by H. J. Versmann, of Lubeck, the reader is referred to the *Chemical Gazette* (Feb. 16, 1852, p. 67). Caffein crystallizes, by the cooling of its concentrated solution, in opaque, silky, flexible needles; by slow and spontaneous evaporation, in long transparent prisms. It has a feebly bitter and disagreeable taste, is soluble in water, alcohol, and ether, melts when exposed to heat, and at a higher temperature sublimes, without residue, in needles analogous to those formed by benzoic acid. It is precipitated from its aqueous solution by no reagent except tannic acid, and is remarkable for containing a larger proportion of nitrogen than almost any other proximate vegetable principle, in this respect equalling some of the most highly animalized products. The present views of its composition are represented by the formula $N_2C_8H_5O_2$; and it is believed to be identical with theïn, or the peculiar principle of tea. Notwithstanding its large proportion of nitrogen, caffein does not putrefy, even when its solution is kept for some time in a warm place.

Coffee undergoes considerable change during the roasting process. It swells up very much, acquiring almost double its original volume, while it loses from 15 to 20 per cent. of its weight. (*Pharm. Cent. Blatt*, Oct. 1850, p. 687.) It acquires, at the same time, a peculiar odour entirely different from that of the unaltered grains, and a decidedly bitter taste. A volatile oil is developed during the process, and, according to Chenevix, a portion of tannin. The *caffein* does not appear to undergo material change, as, according to Garot, it may be extracted unaltered from the roasted coffee. The excellence of the flavour of roasted coffee depends much upon the manner in which the process is conducted, and the extent to which it is carried. It should be performed in a covered vessel, over a moderate fire, and the grains should be kept in constant motion. When they have acquired a chestnut-brown colour, the process should cease. If too long-continued, it renders the coffee bitter and acrid, or, by reducing it to charcoal, deprives it entirely of flavour. The coffee should not be burnt long before it is used, and should not be kept in the ground state.

Medical and Economical Uses.—More attention has been paid to the effects of coffee on the system in the roasted than in the crude state. Unroasted coffee has been employed by Dr. Grindel, of Russia, in intermittent fever, and the practice has been followed by other physicians; but the success, though considerable, has not been such as to lead to the conclusion that this medicine would answer as a substitute for Peruvian bark. It was given

in powder, in the dose of a scruple every hour, in decoction prepared by boiling an ounce with eighteen ounces of water down to six, or in the state of extract in the dose of from four to eight grains.

The action of coffee is directed chiefly to the nervous system. When swallowed it produces a warming cordial impression on the stomach, quickly followed by a diffused agreeable nervous excitement, which extends itself to the cerebral functions, giving rise to increased vigour of imagination and intellect, without any subsequent confusion or stupor such as characterizes the action of narcotic medicines. Indeed, one of its most extraordinary effects is a disposition to wakefulness, which continues for several hours after it has been taken. It is even capable of resisting, to a certain extent, the intoxicating and soporific influence of alcohol and opium, and may sometimes be advantageously employed for this purpose. It also moderately excites the circulatory system, and stimulates the digestive function. A cup of coffee, taken after a hearty meal, will often relieve the sense of oppression so apt to be experienced, and enable the stomach to perform its office with comparative facility. The exhilarating effects of coffee, united with its delicious flavour when suitably qualified by cream and sugar, have given rise to its habitual employment as an article of diet. Its use for this purpose has prevailed from time immemorial in Persia and Arabia. In 1517 it was introduced by the Turks into Constantinople, whence it was carried to France and England about the middle of the succeeding century, and has since gradually made its way into almost universal use. It cannot be supposed that a substance capable of acting so energetically upon the system, should be entirely destitute of deleterious properties. Accordingly, if taken in very large quantities, it leaves, after its first effects are passed, a degree of nervous derangement or depression equivalent to the previous excitement; and its habitual immoderate employment is well known very greatly to injure the tone of the stomach, and frequently to give rise to troublesome dyspeptic and nervous affections. This result is peculiarly apt to take place in individuals of susceptible nervous systems, and in those of sedentary habits. We have repeatedly known patients, who have long suffered with headache and vertigo, to get rid of them by abstaining from coffee.

In the treatment of disease, coffee has been less employed than might have been expected from its effects upon the system. There can be no doubt that it may be advantageously used in various nervous disorders. In a tendency to stupor or lethargy dependent on deficient energy of the brain, without congestion or inflammation, it would be found useful by stimulating the cerebral functions. In light nervous headaches, and even in sick headache not caused by the presence of offending matter in the stomach, it often proves temporarily useful. It has acquired much reputation as a palliative in the paroxysms of spasmodic asthma, and has been recommended in hooping-cough, and in hysterical affections. The Egyptians are said to have formerly employed it as a remedy in amenorrhœa. Hayne informs us that in a case of violent spasmodic disease, attended with short breath, palpitation of the heart, and a pulse so much increased in frequency that it could scarcely be counted, immediate relief was obtained from a cup of coffee, after the most powerful antispasmodics had been used in vain for several hours. By the late Dr. Dewees it was highly recommended in cholera infantum. It is said also to have been used successfully in obstinate chronic diarrhœa; and the late Dr. Chapman, of Philadelphia, found it highly useful in calculous nephritis. We have heard of its effectual use in croup. In acute inflammatory affections it is contra-indicated. It should be given in cases of poisoning from opium, after the evacuation of the stomach, or when from any cause such evacuation is not effected.

Coffee is usually prepared in this country by boiling the roasted grains, previously ground into a coarse powder, in water for a short time, and then clarifying by the white of an egg. Some prefer the infusion, made by a process similar to that of displacement. It has more of the aroma of the coffee than the decoction, with less of its bitterness. The proper proportion for forming the infusion for medical use is an ounce to a pint of boiling water, of which a cupful may be given warm for a dose, and repeated, if necessary. *Citrate of caffein*, made by dissolving caffein in a solution of citric acid with a gentle heat, and evaporating carefully, has been recommended as a preventive and remedy in sick headache, in the dose of a grain every hour, before or during the paroxysm.

The *leaves* of the coffee plant possess properties analogous to those of the fruit, and are extensively used, in the form of infusion, as a beverage, in the vicinity of Padang in the island of Sumatra. An account of their employment was published in the *Singapore Free Press* by Mr. N. M. Ward, of Padang. Previously to this, Dr. John Gardener, of London, had proposed to introduce them into use in Europe, and is stated to have taken out a patent for the mode of preparing them. A specimen examined by Dr. Stenhouse has been found to contain caffein in larger proportion than the coffee-bean, and also caffeic acid. Mr. Ward states that, in Sumatra, the leaves are prepared for use by moderately roasting them, and then powdering them coarsely by rubbing in the hands. The powder

is made into an infusion like common tea. The taste is said to be like that of tea and coffee combined. (*Pharm. Journ. and Trans.*, xii. 443, and xiii. 207 and 382.)

COLLINSONIA CANADENSIS. *Horse-weed. Horse-balm. Richweed. Heal-all. Stone-root. Knot-root.* An indigenous plant, with a perennial, knotty root, and an herbaceous simple stem about two feet high, furnished with two or three pairs of broad, cordate-ovate, smooth leaves, and terminating in a panicle of yellow flowers in branched racemes. The flowers are diandrous and monogynous, with a labiate calyx and corolla, the latter of which has the lower lip fringed. The plant grows in woods from Canada to Carolina, and flowers from July to September. The whole plant has a strong disagreeable odour, and a warm pungent taste. It is considered tonic, astringent, diaphoretic, and diuretic; and the root, in substance, is said to irritate the stomach, and produce vomiting, even in small doses. The plant is used in numerous complaints in domestic practice. It is preferred in the fresh state, as the active principle is volatile. A decoction of the fresh root is said to have been used with advantage in catarrh of the bladder, leucorrhœa, gravel, dropsy, and other complaints; and the leaves are applied by the country people, in the form of cataplasm or fomentation, to wounds, bruises, and sores, and in cases of internal abdominal pains.

COLUTEA ARBORESCENS. *Bladder Senna.* A shrub, growing spontaneously in the southern and eastern parts of Europe, and cultivated in gardens as an ornamental plant. Its leaves are pinnate, consisting of from three to five pairs of leaflets, with an odd one at the end. The leaflets are obovate, slightly emarginate, smooth, and of a deep-green colour on the upper surface, grayish-green and somewhat pubescent beneath. The flowers are yellow, and the fruit vesicular, whence the plant derived its vulgar name. The leaflets are purgative, and, in some parts of Europe, are used as a substitute for senna, which is said to be sometimes adulterated with them. Bladder senna is comparatively very feeble. It is administered in infusion or decoction, of which the dose is about half a pint, containing the virtues of from one to three ounces of the leaves.

COMPTONIA ASPLENIFOLIA. *Sweet Fern.* A shrubby indigenous plant, named from the resemblance of its leaves to the *spleenwort fern*, but belonging to the Linnæan class and order *Monœcia Triandria.* It grows in thin sandy or stony woods, from New England to Virginia. All parts of it possess a resinous spicy odour, which is increased when the plant is rubbed. It is said to be tonic and astringent, and to be occasionally used in domestic practice as a remedy in diarrhœa, and various other complaints. It is employed in the form of decoction.

CONVALLARIA MAJALIS. *Lily of the Valley.* This charming little garden flower is a native of Europe, and is found growing wild in the United States, upon the highest mountains of Virginia and Carolina. The *flowers* have a strong delightful odour, which is in great measure lost by drying. Their taste is nauseous, bitter, and acrid. Taken internally they are said to be emetic and cathartic, and their extract purges actively in the dose of half a drachm. They were formerly used in epilepsy and against worms. At present they are employed only as a sternutatory, for which purpose they are dried and reduced to a coarse powder. The *root*, which is also bitter, has similar purgative properties, and, reduced to powder, is said to be sternutatory.

CONVALLARIA POLYGONATUM. Linn. *Polygonatum uniflorum.* Desfontaines. *Solomon's Seal.* A perennial, herbaceous, European plant, the root of which is horizontal, jointed, white, and marked, at short intervals, with small circular impressions, which bear a remote resemblance to those made by a seal, and have served to give a name to the plant. The root is inodorous, and of a sweetish mucilaginous taste, followed by a slight degree of bitterness and acrimony. It is said to be emetic. In former times it was used externally in bruises, especially those about the eyes, in tumours, wounds, and cutaneous eruptions, and was highly esteemed as a cosmetic. At present it is not employed, though recommended by Hermann as a good remedy in gout and rheumatism. The berries and flowers are said to be acrid and poisonous. *C. multiflora* (*Polygonatum multiflorum*, Desf.), which grows both in this country and Europe, is analogous to the preceding in properties. Dr. John H. Rauch found two fluidounces of a decoction, made by boiling two ounces of the root in a pint of milk, to produce nausea, a cathartic effect, and either diaphoresis or diuresis. He used it advantageously as an internal remedy in piles, and externally, in the form of decoction, in the affection of the skin resulting from the poisonous exhalations of certain plants. (*Inaugural Essay*, March, 1849.)

COPAL. A resinous substance, brought from the East Indies, South America, and the western coast of Africa, but most abundantly from the first mentioned source. It is the concrete juice of different trees, and is furnished by exudation. The East Indian copal has been ascribed by some writers to the *Vateria Indica* of Linn., the *Elæocarpus copal-*

iferus of Retzius; and the Brazilian, by Martius and Hayne, probably with justice, to different species of *Hymenæa*. There is some reason to believe that the East India copal is also the product of a Hymenæa; at least a specimen of this resin was collected by M. Perottet from the *Hymenæa verrucosa*, which he found growing in the Isle of Bourbon. This tree is a native of Madagascar, and probably of the neighbouring parts of Africa; and M. Perottet was informed that the copal of India is taken thither by the Arabs of Muscat, who obtain it from the East coast of Africa. (*Journ. de Pharm.*, 3*e sér.*, i. 406.) It is stated by Mr. James Vaughan, who was stationed as army surgeon at Aden, in Arabia, that copal is taken to that port from the African coast opposite the island of Zanzibar, where it is said to be dug up from the earth. (*Pharm. Journ. and Trans.*, xii. 385.) Copal varies somewhat in appearance and properties, as procured from different sources. It is in roundish, irregular, or flattish pieces, colourless, yellowish, or brownish-yellow, more or less transparent, very hard, with a shining conchoidal fracture, inodorous and tasteless, of a sp. gr. varying from 1·045 to 1·139, insoluble in alcohol, soluble in ether, and slightly so in oil of turpentine. Some varieties unite with alcohol, if suspended in its vapour while boiling. By heat it melts and is partially decomposed, becoming thereby soluble in alcohol and oil of turpentine. It is not a proximate principle, but consists of various resins united in different proportions. The East India or African copal is described by Mr. Schindler as of a globular form, softer and more transparent than the other varieties, with a surface always clear, and having an agreeable smell when heated. It is readily and freely dissolved by the oils of turpentine and rosemary when pure, but not by these fluids when rendered resinous by age. It is more readily fusible than the others, and makes the best varnish. The West India copal is in flat pieces, seldom weighing more than three ounces, rarely containing insects, very hard, of a rough appearance, of a yellowish colour, and without smell or taste. It is much less readily dissolved by the oil of turpentine than the E. India variety, swells but does not dissolve in oil of rosemary, and is slightly soluble in absolute alcohol. A third kind, probably also American, is in convex or concave pieces, about a pound in weight, often containing insects and other impurities. In solubility it resembles the last mentioned variety, in fusibility is intermediate between it and the E. Indian, and is altogether inferior. (*Pharm. Journ. and Trans.*, Aug. 1850.) *Crude* and *scraped* copal are also known in the market—the former of a dull opaque appearance externally, the latter much clearer and more transparent, in consequence of being deprived of its outer coat. The process of *scraping* is said to consist in the removal of the exterior portion by means of an alkaline solution, which readily dissolves copal. This resin is used chiefly in the preparation of varnishes.

CORAL. A substance found at the bottom of the Mediterranean and other seas, formerly considered as a plant, but now universally admitted to belong to the animal kingdom. The *red coral* (*Corallium rubrum* of Lamarck, *Isis nobilis* of Linn.) is in the form of a small shrub, a foot or two in height, with a stem sometimes an inch or two in thickness, fixed to the rock by an expansion of the base, divided above into branches, and covered with a pulpy membrane, which is properly the living part, and which is removed when the coral is collected. The central portion is extremely hard, of various shades of red, susceptible of a brilliant polish, longitudinally striated, and formed of concentric layers, which are rendered obvious by calcination. Its chief constituent is carbonate of lime, which is coloured by oxide of iron, and united, as in similar calcareous products, with more or less animal matter. It was formerly highly esteemed as a remedy, but is in no respect superior to prepared oyster shell, or other form of carbonate of lime, derived from the animal kingdom. It was employed in fine powder, or in different preparations, such as troches, syrups, conserves, &c. At present it is valued chiefly as an ornament.

CORTEX CARYOPHYLLATA. *Cassia Caryophyllata. Clove Bark* These names have been given to a bark, brought from the West Indies, and derived from a tree belonging to the family of Myrtaceæ, supposed to be the *Myrtus acris* of Schwartz. It is usually in cylinders from one to two feet long by an inch in diameter, composed of numerous separate pieces rolled around one another, having a dark-brown colour, a pungent taste, and an odour similar to that of cloves. It is sometimes in fragments, of a similar colour, taste, and smell, but softer and lighter, and supposed to be derived from older branches. A similar bark is said to be derived from the *Myrtus caryophyllata* of Linn., which grows in Ceylon. The clove bark has aromatic properties not unlike those of the spice from which it derived its name; but it is much inferior, and is now never used in this country. Some authors have confounded with it a wholly different bark, produced in the Moluccas, and known by the Indian name of culilawan. (See *Culilawan.*)

CORYLUS ROSTRATA. *Beaked Hazel.* This is a small indigenous shrub, growing especially in mountainous districts. The nut is invested with a scaly involucre, projecting beyond it like a beak, and thickly covered with short spicula like those of Mucuna pruriens.

These spicula have been employed by Dr. Heubener, of Bethlehem, Pennsylvania, as an anthelmintic, and found to be efficacious. They operate in the same way as cowhage, and may be administered in the same manner and dose. (See a communication by the late Mr. Duhamel, in the *Am. Journ. of Pharm.*, xiv. 280.)

COTYLEDON UMBILICUS. *Navel-wort. Penny-wort.* This is a perennial, herbaceous, succulent plant, belonging to the class and order Decandria Pentagynia, and the natural family of Crapulaceæ. It is about six inches high, with fleshy, peltate, crenate leaves, and a flower-stem bearing, in the form of a spike, pale-yellow, bell-shaped, pendulous flowers, which appear in June and July. The plant is a native of England, where it grows upon old walls and rocks, and dry sandy banks. It was first brought before the profession as a remedy in epilepsy, by Mr. Thos. Salter, of Poole, who had found its expressed juice very efficient in that disease, and published the results of his observations in the *London Medical Gazette* for March, 1849 (*page* 367). In the following May, Dr. Joseph Bullar, of Southampton, communicated the results of his observations on the same subject to the *Prov. Med. and Surg. Journ.*, which were confirmatory of those of Mr. Salter. Since that period, other testimony has been advanced in favour of the remedy; among which is that of Dr. Graves, of Dublin, who considers it a valuable aid in the treatment of epilepsy, and states that it has long been known in Ireland as a popular remedy, not only in that disease, but in asthma. (*Dublin Quart. Journ. of Med. Sci.*, xiv. 264.) It is, however, proper to say, that Dr. Ranking, of Norwich, England, in a letter published in the *Lond. Med. Times and Gaz.* for April, 1854 (*page* 328), declares that, so far as his experience goes, he considers the medicine utterly worthless, having employed it perseveringly in more than thirty cases of epilepsy, without the smallest benefit in a single instance.

The medicine is said to have no other observable effect than that of a gentle tonic to the nervous system. The part used is the expressed juice, which should be obtained when the leaves are most succulent, before the appearance of the flowers. An extract, and a fluid extract have also been employed. The juice has been given in doses varying from a fluidrachm to a fluidounce twice or three times a day, and should be long persevered with. The dose of the fluid extract is stated at a fluidrachm, that of the dry extract at five grains, to be increased if necessary.

CRABS' CLAWS. *Chelæ Cancrorum.* These, in a prepared state, were formerly included in the Edinburgh Pharmacopœia, but were very properly omitted upon the last revision of that work. Supposing them identical with the crust of the lobster, they consist, in the 100 parts, of 60 parts of carbonate of lime, 14 of phosphate of lime, and 26 of animal matter. They are prepared by levigation and elutriation, so as to bring them to a fine powder. They were formerly used as an absorbent and antacid; but the animal matter in their composition confers on them no peculiar virtues. They are given in the same dose with prepared chalk.

CRABSTONES. *Lapilli Cancrorum. Crabs' Eyes.* These are concretions, found in the stomach, one on each side, of the European crawfish, at the time the animal is about to change its shell. They are most abundantly procured in the province of Astracan, in Asiatic Russia. The crawfish are bruised with wooden mallets, and laid up in heaps to putrefy. The animal remains are then washed away, and the stones picked out. They are inodorous, insipid bodies, somewhat hemispherical in shape, of a white or reddish colour, hard and stony consistence, and laminated texture. They are very variable in size, weighing from one to twelve grains each. They effervesce with acids, and, without dissolving, become converted, owing to the animal matter which they contain, into a soft transparent mass, retaining the original shape of the stone. By this character they are distinguished from counterfeit stones, which are sometimes fabricated of chalk, mixed with mucilaginous substances. They consist of carbonate and phosphate of lime, cemented together by animal matter. Crabstones have been used as an absorbent and antacid, given in the same dose with prepared chalk. They were prepared for exhibition by being levigated in the usual manner; but they are now no longer officinal, having been expunged from the Edinburgh Pharmacopœia.

CROCUS OF ANTIMONY. *Saffron of Antimony.* This compound is generated during the deflagration of equal weights of tersulphuret of antimony and nitrate of potassa. The nitric acid of the nitre is decomposed, nitrogen and nitric oxide being given off, and, by furnishing oxygen to part of the tersulphuret, converts its constituents into sulphuric acid and teroxide of antimony. The sulphuric acid combines with the potassa of the nitre, to form sulphate of potassa; while the teroxide unites or mixes with the undecomposed tersulphuret to constitute the crocus. The product of the deflagration is reduced to powder, washed to separate sulphate of potassa, and then fused. When crocus of antimony is intended to be employed for making tartar emetic, it should not be fused; because it requires for preparing this antimonial to be reduced to a very fine powder, and

the fused substance is pulverized with difficulty. Instead of fusing the deflagrated mass, it should be reduced to very fine powder, and washed with boiling water. In this state it more readily dissolves in the solution of cream of tartar.

Fused crocus is in masses of a liver-brown colour. As obtained without fusion, it is a saffron-brown insoluble powder, containing about two-fifths of its weight of teroxide, the remainder being tersulphuret. In the London Pharmacopœia of 1836, the unfused crocus was used for preparing tartar emetic; but in the edition of 1851 the crocus has been abandoned, and the subsulphate of antimony substituted for it.

CUCUMBER OINTMENT. An emollient ointment, prepared from the common cucumber (fruit of *Cucumis sativus*), has been considerably employed in irritated states of the skin. The following is the mode of preparing it recommended by Prof. Procter. Take of green cucumbers 7 pounds avoirdupois, pure lard 24 ounces, veal suet 15 ounces. Grate the washed cucumbers to a pulp, express, and strain the juice. Cut the suet into small pieces, heat it over a salt water bath till the fat is melted out from the membrane; then add the lard, and, when melted, strain through muslin into an earthen vessel capable of holding a gallon, and stir until thickening commences, when one-third of the juice is to be added, and the whole beaten with a spatula till the odour has been almost wholly extracted. The portion which separates is to be decanted, and the remaining two-thirds of the juice are to be consecutively incorporated and decanted in the same manner. The jar is then closely covered and placed in a water-bath, until the fatty matter entirely separates from the juice. The green coagulum floating on the surface is now removed, and the jar put in a cool place that the ointment may solidify. The crude ointment is then separated from the watery liquid on which it floats, melted and strained, and placed in glass jars, which must be kept closely sealed. A layer of rose water upon its surface will favour its preservation. A portion may be triturated with a little rose water until white and creamy, and put into a separate jar for present use. (*Am. Journ. of Pharm.*, xxv. 409.)

CUCURBITA CITRULLUS. *Watermelon.* The seeds of the watermelon are employed, to a considerable extent, as a domestic remedy in strangury and other affections of the urinary passages. They have the same properties with the seeds of the other Cucurbitaceæ, of which four different kinds were formerly officinal under the name of the *greater cold seeds*—viz., those of the *Cucurbita Pepo* or pumpkin, the *Cucurbita Lagenaria* or gourd, the *Cucumis Melo* or muskmelon, and the *Cucumis sativus* or cucumber. These, when bruised and rubbed up with water, form an emulsion which was formerly thought to possess considerable virtues, and was much used in catarrhal affections, disorders of the bowels and urinary passages, fever, &c.; but they have been superseded by other more agreeable demulcents. Watermelon seeds are also esteemed by some diuretic. They are given in infusion, made with one or two ounces of the bruised seeds to a pint of water, and taken *ad libitum*.

The seeds of the *Cucurbita Pepo*, or *pumpkin*, have recently obtained in this country considerable reputation in the treatment of *tape-worm*. This employment of them, however, is not new. In the *Dictionary of Materia Medica* by Mérat and De Lens (ii. 493), it is stated that Dr. Hoarau had reported that, in the Isle of France, the seeds of a small variety of pumpkin were used against the tape-worm, and with never-failing success. In the year 1820, M. Mongeny, a physician of Cuba, published the results of his experience with the flesh of the pumpkin in the same disease. He had discovered the remedy by accident, and found it uniformly successful. He gave to the patient, in the morning, fasting, about three ounces of the fresh pumpkin in the form of a paste, and followed it at the end of an hour by about two ounces of honey, which latter was twice repeated at intervals of an hour. MM. Brunet and Lamothe, of Bordeaux, verified the statements of M. Mongeny, as to the efficacy of the remedy in tænia, employing, however, a paste made from the seeds, in the quantity of about an ounce and a half, with as much sugar. (*Ann. de Thérap.* 1853, p. 301.)

In the *Boston Med. and Surg. Journ.* (October 8, 1851, *page* 201), is a communication from Mr. Richard Soule, recommending the seeds in very strong terms as a remedy in tænia; and his letter is preceded by some editorial observations, in which reference is made to the previous successful employment of the remedy by Dr. J. S. Jones, of Boston. Since that time various other notices of the efficacy of the seeds have appeared in the journals, and a very striking case was related to ourselves, on the best authority, in which they had proved immediately and completely successful after the vain employment of all other known remedies, through a course of several years. Mr. Soule gives the preference to the seeds from the West Indies. The dose of the seeds is about two ounces; which are to be taken in the morning fasting, and followed in an hour or two by a fluidounce of castor oil. The mode of administration is various. Sometimes the seeds, deprived of their outer covering, are beaten into a paste with sugar, and thus taken. In other in-

stances they are formed into an emulsion, by rubbing them up thoroughly with water, and a little sugar. At the suggestion of the late Dr. H. S. Patterson, of Philadelphia, the expressed oil of the seeds was used in a case by Mr. John C. Lyons, and with success. After fasting for 24 hours, the patient took, in the morning, f℥ss of the oil, which was followed in two hours by f℥ss more, and in two hours after the last dose by f℥i of castor oil, which brought away the worm. (*Med. Examiner*, N. S , ix. 629.)

CULILAWAN. *Cortex Culilaban.* An aromatic bark, produced by *Cinnamomum Culilawan* (*Laurus Culilawan*, Linn.), a tree of considerable size, growing in the Molucca islands, Cochin-china, and other parts of the East. It is usually in flat or slightly rolled pieces, several inches long, an inch or more in breadth, and one or two lines thick. Sometimes the bark is thinner and more quilled, bearing considerable resemblance to cinnamon. The epidermis is for the most part removed, but when present is of a light brownish-gray colour, soft to the touch, and somewhat spongy. The colour of the bark itself is a dull dark cinnamon-brown, the odour highly fragrant, the taste agreeably aromatic, and not unlike that of cloves. The active constituent is a volatile oil, which may be separated by distillation. Culilawan has the medical properties common to the aromatics, but is scarcely used at present.

CUNILA MARIANA. *American Dittany.* A small indigenous perennial herb, growing on dry, shady hills, from New England to Georgia, and flowering in June and July. The whole herb has a warm pungent taste, and a fragrant odour, dependent on an essential oil. Its medical properties are those of a gently stimulant aromatic, analogous to the mints, pennyroyal, &c. In warm infusion, it is popularly employed to excite perspiration in colds and slight fevers, to promote suppressed menstruation, to relieve flatulent colic, and for various other purposes to which the aromatic herbs are thought applicable.

CUTTLE-FISH BONE. *Os Sepiæ.* This is a calcareous body, situated underneath the skin, in the back of the *Sepia officinalis*, or *cuttle-fish*, which inhabits the seas of Europe, especially the Mediterranean, in the waters of which the bone is not unfrequently found floating. It is oblong-oval, from five to ten inches long, and from one and a half to three inches broad, somewhat convex on both sides, with thin edges, of a rather firm consistence upon the upper surface, very friable beneath, and composed of numerous layers, loosely connected, so as to give to the mass a porous consistence. It is lighter than water, of a white colour, a feeble odour of sea plants, and a saline taste. It contains, according to John, from 80 to 85 per cent. of carbonate of lime, besides animal matter, a little common salt, and traces of magnesia. Reduced by levigation and elutriation to a fine powder, it may be given as an antacid like chalk or oyster-shell. It is sometimes used as an ingredient of tooth-powders. Small pieces of it are often put into bird-cages, that the birds may rub their bills against them ; and the powder is employed for polishing. Another product of the cuttle-fish is a blackish-brown liquor, secreted by a small gland into an oval pouch, communicating externally near the rectum by a long excretory duct, through which the animal is said to have the power of ejecting it at will. This, when taken from the fish, is dried, and used in the preparation of the water colour called *sepia.*

CYANURET OF ZINC. *Zinci Cyanuretum.* This cyanuret is precipitated as a white insoluble powder, by adding cautiously, until it ceases to produce a precipitate, a recently filtered solution of cyanuret of potassium, obtained from the impure black cyanuret, to a solution of sulphate of zinc. It is used in Germany as a substitute for hydrocyanic acid, and is said to possess anthelmintic properties. It has been employed in epilepsy, chorea, and neuralgia, in several painful affections of the stomach, and in the colics attendant on difficult menstruation. The dose is a quarter of a grain, gradually increased to a grain and a half, given in mixture. It is included in the officinal list of the French Codex.

CYNANCHUM VINCETOXICUM. R. Brown. *Asclepias Vincetoxicum.* Linn. *White Swallow-wort. Vincetoxicum.* A perennial herbaceous European plant, the root of which was formerly esteemed a counterpoison, and hence gave origin to the officinal name. It has a bitterish acrid taste, and, when fresh, a disagreeable odour which is diminished by drying. Taken internally, especially in the recent state, it excites vomiting, and is capable in large quantities, of producing dangerous if not fatal inflammation of the stomach. Its former reputation as an alexipharmic was without foundation. It is said to be useful in cutaneous diseases, scrofula, &c., but is little employed. The leaves of the plant also are emetic. Feneulle found in the root a peculiar principle analogous to emetin.

CYNARA SCOLYMUS. *Garden Artichoke.* This is a perennial plant, indigenous in the South of Europe, and cultivated in our gardens as a culinary vegetable. The flowers, constituting what are commonly called the *heads*, are the part used. The receptacle and the lower portion of the fleshy leaflets of the calyx are eaten, and the other parts rejected. When young, the heads are cut up raw and eaten as salad; when older, they are boiled, and

dressed variously. The flowers are said to curdle milk, and the plant to yield a good yellow dye. The leaves and their expressed juice are very bitter, and have been thought to be actively diuretic. They have long had some reputation in the treatment of dropsies. Dr. Badely, of Chelmsford, England, recommends a tincture and extract prepared from the leaves, in rheumatic, gouty, and neuralgic affections. He gives a drachm of the tincture, with five grains of the extract, three times a day, with or without other remedies as circumstances seem to require. The leaves should be fresh, and the preparations made from them quickly used. (*Lond. Lancet*, 1843, p. 556.)

CYNOGLOSSUM OFFICINALE. *Hound's Tongue.* A biennial plant, common both in Europe and this country, and named from the shape of its leaves. The leaves and root have been employed, but the latter has been generally preferred. The fresh plant has a disagreeable narcotic odour resembling that of mice, which is dissipated by drying. The taste is nauseous, bitterish, and mucilaginous. Different opinions as to its powers have been entertained, some considering it nearly inert, others as a dangerous poison. Hound's tongue has been used as a demulcent and sedative in coughs, catarrh, spitting of blood, dysentery, and diarrhœa: and has been applied externally in burns, ulcers, scrofulous tumours, and goitre. The *pilulæ de cynoglosso*, which are officinal in some parts of Europe, though they contain the root of hound's tongue, owe their properties chiefly to opium.

CYPRIPEDIUM PARVIFLORUM. *Ladies' Slipper. Moccasin Plant.* Several species of Cypripedium inhabit the woods in different parts of the United States, some of them with very beautiful flowers. The root is the part used. Dr. R. P. Stevens, of Ceres, Pennsylvania, says of them, that he has found the *C. spectabile* and *C. acaule*, especially when growing in dark swamps, to be possessed of narcotic properties, and to be less safe than the *C. parviflorum*, which is a gentle stimulant with a tendency to the nervous system, and is considered by him quite equal to valerian. He has employed it advantageously in hysteria, and in the pains of the joints following scarlet fever. (*N. Y. Journ. of Med.*, iv. 359.) Dr. E. Ives considers the *C. pubescens*, *spectabile*, and *humile* as identical in their effects, but the *pubescens* as the most powerful. He has employed them all in a variety of nervous diseases, and known them to cure epilepsy. The complaints specially mentioned by him are hypochondriasis, neuralgia, and morbid sensitiveness of the nervous system generally, and especially of the eye. He gave fifteen grains three times a day. (*Trans. of Am. Med. Assoc.*, iii. 312.)

DIANTHUS CARYOPHYLLUS. *Clove Pink.* The *clove pink* or *carnation* is too well known to require minute description. It is a perennial, herbaceous plant, belonging to the family of Caryophyllaceæ, and characterized as a species by its branching stem, its solitary flowers, the short ovate scales of its calyx, its very broad beardless petals, and its linear, subulate, channeled, glaucous leaves. Indigenous in Italy, it is everywhere cultivated in gardens for the beauty of its flowers, of which numerous varieties have been produced by horticulturists. Those are selected for medicinal use which have the deepest red colour, and the most aromatic odour. The petals should not be collected till the flower is fully blown, and should be employed in the recent state. They have a fragrant odour, said to resemble that of the clove. Their taste is sweetish, slightly bitter, and somewhat astringent. Both water and alcohol extract their sensible properties, and they yield a fragrant essential oil by distillation. In Europe they are employed to impart colour and flavour to a *syrup*, which serves as a vehicle for other less pleasant medicines. According to the direction of the former Edinburgh Pharmacopœia, this was prepared by macerating one part of the flowers, without their claws, with four parts of boiling water for twelve hours, then filtering, and adding seven parts of sugar.

DIAPHORETIC ANTIMONY. *Antimonium Diaphoreticum. Potassæ Biantimonias.* This compound is directed in the French Codex, to be formed by deflagrating in a red-hot crucible, and keeping red-hot for half an hour, a mixture of pure antimony with twice its weight of nitrate of potassa, both being in fine powder. The product is washed with water and dried, and forms the *washed diaphoretic antimony*. As thus prepared, M. Oscar Figuier has shown that it contains, besides antimonic acid, both teroxide of antimony and antimonious acid; the nitre not being in sufficient quantity completely to peroxidize the antimony. When, however, the antimony is deflagrated with three times its weight of nitre, and the matter is kept at a red heat for an hour and a half, the whole of the antimony is converted into antimonic acid; and, when the product is thoroughly exhausted by boiling water, the solution obtained contains a large quantity of neutral antimoniate of potassa, and the insoluble residue is impure biantimoniate. M. Figuier rejects this residue, which forms the diaphoretic antimony of the ordinary process, and obtains the preparation from the solution of the neutral antimoniate, by passing through it a stream of carbonic acid gas, which removes one eq. of potassa from two of the antimoniate, and throws down the biantimoniate in the form of a white powder. By this process, he obtained a quantity of

the preparation equal to three-fourths of the weight of the materials employed. Diaphoretic antimony is a perfectly white powder. When properly prepared, as by the process of M. Figuier, it consists of two eqs. of antimonic acid, one of potassa, and six of water. The dose is two or three drachms. On account of its weak and variable nature, it has been very properly laid aside in practice.

DICTAMUS ALBUS. *White Fraxinella. Bastard Dittany.* This is a perennial European plant, the root of which is bitter and aromatic, and has been used as an anthelmintic, emmenagogue, and stomachic tonic, though at present little employed in Europe, and not at all in this country. Störck gave it in intermittents, worms, amenorrhœa, hysteria, epilepsy, and other nervous diseases. The bark of the root is the most active part. The dose is from a scruple to a drachm.

DIPPEL'S ANIMAL OIL. *Oleum Cornu Cervi.* This oil is obtained during the distillation of bones, in the processes for obtaining ammoniacal products on a large scale. The portion which first comes over is pale-yellow; but, in the progress of the distillation, it becomes gradually deeper coloured and thicker, and at last black and viscid. It is purified and rendered colourless by redistillation, a pyrogenous resin being left behind. Thus rectified it is a colourless liquid, very limpid and volatile, with a penetrating extremely fetid odour, and burning taste. By repeating the distillation till a dark residuum is no longer left in the retort, it may be obtained free from fetor, and of an agreeable, aromatic odour; and in this mode it is said to have been prepared by Dippel. Four or five distillations are necessary. (*Am. Journ. of Pharm.*, ix. 244.) The oil is soon altered by the action of air and light, becoming thick, yellow, brown, and finally black. It has an alkaline reaction, and probably contains the various principles which have been discovered by Reichenbach in the products of the distillation of organic substances.

This oil was originally obtained from hartshorn, and was a product of the decomposition of the gelatinous tissue, the horn containing no fat. When obtained from bones, it is a product of the same tissue; as these are boiled with a large quantity of water, and dried, before they are submitted to destructive distillation. The oily product of this distillation, after rectification, forms the *bone-oil* of commerce. Bone-oil has a dark-brown almost black colour, with a greenish shade. It is perfectly opaque in the mass, but brown when viewed by transmitted light in a thin layer. Its sp. gr. is about 0·970. Its smell is peculiarly disagreeable and somewhat ammoniacal. A piece of fir-wood, moistened with muriatic acid, and held over the mouth of a vessel containing it, acquires, a dark reddish-purple colour, characteristic of pyrrol. It contains several organic bases, such as *petinin, picolin, &c.*, which have been examined by Dr. Thomas Anderson, of Scotland. (See his paper on the Products of the Distillation of Animal Substances, in the *Philos. Mag.*, 3d series, xxx. 174.)

Animal oil was formerly much used in medicine; but its repulsive odour and taste, as it is ordinarily prepared, have caused it to be almost entirely laid aside. It is given in the dose of a few drops, mixed with water, and acts as a stimulant and antispasmodic. Its presence in the spirit and salt of hartshorn gives to these preparations medicinal properties different from those of the pure spirit and carbonate of ammonia.

DIRCA PALUSTRIS. *Leather Wood.* An indigenous shrub, usually very small, but sometimes attaining the height of five or six feet, growing in boggy woods, and other low wet places, in almost all parts of the United States. The berries, which are small, oval, and of an orange colour, are said to be narcotic and poisonous. The bark has attracted most attention. It is extremely tough, and of very difficult pulverization. In the fresh state it has a peculiar rather nauseous odour, and an unpleasant acrid taste, and when chewed excites a flow of saliva. It yields its acrimony completely to alcohol, but imperfectly to water even by decoction. In the dose of six or eight grains, the fresh bark produces violent vomiting, preceded by a sense of heat in the stomach, and often followed by purging. Applied to the skin it excites redness, and ultimately vesicates; but its epispastic operation is very slow. It appears to be analogous in its properties to mezereon, to which it is botanically allied.

DRAGON'S BLOOD. *Sanguis Draconis.* This is a resinous substance obtained from the fruit of several species of *Calamus*, especially *C. Rotang* and *C. Draco*, small palms, growing in the Molucca Islands and other parts of the East Indies. On the surface of the fruit, when ripe, is an exudation, which is separated by rubbing, or shaking in a bag, or by exposure to the vapour of boiling water, or finally by decoction. The finest resin is procured by the two former methods. It comes in two forms; sometimes in small *oval masses*, of a size varying from that of a hazelnut to that of a walnut, covered with the leaves of the plant, and connected together in a row like beads in a necklace; sometimes in *cylindrical sticks* eighteen inches long and from a quarter to half an inch in diameter, thickly covered with palm leaves, and bound round with slender strips of cane. In both these forms, it is

of a dark reddish-brown colour, opaque, and readily pulverizable, affording a fine scarlet powder. It sometimes comes also in the form of a reddish powder, and in small irregular fragments or tears. An inferior kind, said to be obtained by boiling the fruit in water, is in *flat circular cakes*, two or three inches in diameter and half an inch thick. This also yields a fine red powder. A fourth variety, much inferior even to the last mentioned, is in *large disks*, from six to twelve inches in diameter, by an inch in thickness, mixed with various impurities, as pieces of the shell, stem, &c., and supposed to be derived from the fruit by decoction with expression. A substance known by the name of Dragon's blood is derived by exudation from the trunk of the *Dracæna Draco*, a large tree inhabiting the Canary Islands and the East Indies, and another from the *Pterocarpus Draco*, a tree of the West Indies and South America, by incision into the bark. These last, however, are little known in commerce. According to Lieut. Wellstead, much dragon's blood is obtained, in the island of Socotra, by spontaneous exudation from a large tree, growing at a considerable elevation on the mountains.

Dragon's blood is inodorous and tasteless, insoluble in water, but soluble in alcohol, ether, and the volatile and fixed oils, with which it forms red solutions. According to Herberger, it consists of 90·7 parts of a red resin which he calls *draconin*, 2·0 of fixed oil, 3·0 of benzoic acid, 1·6 of oxalate of lime, and 3·7 of phosphate of lime. It was formerly used in medicine as an astringent, but is nearly or quite inert, and is now never given internally. It is sometimes used to impart colour to plasters, but is valued chiefly as an ingredient of paints and varnishes.

DUTCH PINK. A yellow or brownish-yellow paint, consisting of clay, or a mixture of clay and chalk, or carbonate of lime in the form of whiting, coloured by a decoction of woad, French berries, or birch leaves, with alum.

EMERY. A very hard mineral, the powder of which is capable of wearing down all other substances except the diamond. As found in commerce, it is said to be derived chiefly from the island of Naxos in the Grecian Archipelago, but, according to Landerer, it has been found also in Asia Minor, and the Morea. It is pulverized by grinding it in a steel mill; and the powder is kept in the shops of different degrees of fineness. It is used for polishing metals and hard stones.

EPIGÆA REPENS. *Trailing Arbutus. Ground Laurel. May-flower.* This is a small trailing plant, with woody stems from six to eighteen inches long, entire, cordate-ovate leaves, and small very fragrant flowers, which appear early in the spring. It is found in the woods, and affects the sides of hills with a northern exposure. Dr. Darlington states that the plant has been supposed to be injurious to cattle, when eaten by them. (*Flora Cestrica*, p. 259.) Dr. Eli Ives, of New Haven, Connecticut, has furnished us with the following account of its virtues and uses, founded on his own observation. "The Epigæa repens has been freely used for some years in diseases of the urinary organs, and of the pelvic viscera generally, particularly of irritated action, in those cases in which the uva ursi and buchu are indicated. The leaves and stems are prepared in the same manner, and administered in the same dose as the uva ursi. The Epigæa has given relief in some cases where the uva ursi and buchu have failed. May 4th, 1849."

EUONYMUS ATROPURPUREUS. *Burning Bush. Spindletree. Wahoo.* Some years since a bark was introduced into notice in this city, as a remedy in dropsy, under the name of wahoo, by Mr. Geo. W. Carpenter, who had obtained a knowledge of its virtues in the Western States. On a journey to the North West in the year 1845, one of the authors had the opportunity of examining the plant from which the bark was derived, and found it to be *Euonymus atropurpureus;* but it is probable that *E. Americanus* has identical properties. They are shrubs or small trees belonging to the Linnæan class and order Pentandria Monogynia, and to the natural family of Celastraceæ of Lindley; and in the autumn present a striking appearance from the rich red colour of their capsules, which has obtained for them the name of burning bush. They grow throughout the United States. Euonymus Europæus has probably similar properties. According to Grundner, who experimented with the fruit of the European species, this was found to have no other effect than that of a diuretic. (*Pharm. Cent. Blatt*, A. D. 1847, p. 873.) Dr. Griffith says that the seeds of this and other species are purgative and emetic. (*Med. Bot.*, p. 220.) An oil expressed from these seeds is used in Europe for the destruction of vermin in the hair, and sometimes also as an application to old sores. (*Pharm. Cent. Blatt*, Sept. 1851, p. 641.) Mr. C. A. Santos, in a dissertation upon the American species, published in the *American Journal of Pharmacy* (xx. 80), speaks of the bark as tonic, hydragogue, cathartic, diuretic, and antiperiodic. Dr. Twyman, of Westport, Missouri, informed the author that he had found it as a cathartic rather to resemble rhubarb, than to possess hydragogue properties, and thought he had obtained useful effects from it as an alterative to the hepatic function. Similar information was obtained from other sources. On the whole, the character of its

action must be considered as somewhat uncertain; and it might well form an object of further examination. As a diuretic in dropsy it may be given in the form of decoction or infusion, made in the proportion of an ounce to a pint of water, in the dose of a wine-glassful several times a day. The name of *wahoo* (pronounced *wawhoo*), by which the plant is known in the North West, was given to it by the Indians. The same name has also been applied to the *Ulmus alata* of the Southern States, and has thus led to mistakes.

EUPHRASIA OFFICINALIS. *Eyebright.* A small annual plant, common to Europe and the United States, without odour, and of a bitterish, astringent taste. It was formerly used in various complaints, and among the rest in disorders of the eyes, in which it was thought to be very efficacious, and in the treatment of which it is still popular in some countries. The probability is that it is nearly inert.

FERROCYANURET OF ZINC. *Zinci Ferrocyanuretum.* This compound is formed by double decomposition between hot solutions of ferrocyanuret of potassium (ferroprussiate of potassa) and sulphate of zinc. It is thrown down as a white powder. It has similar medical properties to those of the cyanuret, and is used in the same diseases. The dose is from one to four grains, given in pill.

FRAXINUS EXCELSIOR. *Common European Ash.* It has been stated, in the first part of this work, that, in the South of Europe, this tree yields manna by incisions in its trunk. In this place, however, it is noticed only in reference to its bark and leaves. The bark is bitter and astringent, and, before the introduction of cinchona into use, was employed in the treatment of intermittent fever; but has since fallen into neglect. Keller believed that he had found in the bark a peculiar crystallizable organic alkali, which Buchner denominated *fraxinin;* but Rochleder and Schwarz have since shown that the crystals formed along with the bitter substance obtained by the process of Keller, were nothing but mannite. (*Pharm. Cent. Blatt*, May, 1853, p. 312.) The *leaves* have been at different times recommended as an antidote to the poison of serpents, and as a remedy in scrofula. Within a few years they have been introduced into use in Germany in the treatment of gout and rheumatism, in which they have acquired considerable reputation. Drs. Pouget and Peyraud, of France, have spoken in the highest terms of their efficacy in these diseases; and, upon the authority of the former, it is stated that they have been used for forty years by the peasants of Auvergne as a specific in gout. M. Garot has shown that they contain 16 per cent. of *malate of lime*, to which it is thought their anti-arthritic virtues may be ascribed. (*Journ. de Pharm.*, 3e *sér.*, xxiv. 311.) By some authors the leaves are said to be purgative, which is, however, contradicted by Drs. Pouget and Peyraud. An ounce may be infused in a pint of boiling water, and taken three times during the day. (See *Am. Journ. of Med. Sci.*, N. S., xxv. 492.)

FRENCH CHALK. A variety of indurated talc. It is compact, unctuous to the touch, of a greenish colour, glossy, somewhat translucent, soft and easily scratched, and leaves a silvery line when drawn over paper. It is used chiefly for marking cloth, &c., and for extracting grease spots.

FRUIT ESSENCES, ARTIFICIAL. Several of the compound ethers have been found to possess the odour and flavour of certain fruits, a property which has led to their employment as flavouring materials for confectionery and desserts, under the name of fruit essences. The simple ethers, present in these compounds, so far as they have become of commercial importance, are common ether, or oxide of ethyle, which should be called ethylic ether, and oxide of amyle or amylic ether. Each of these ethers possesses basic properties, and has its alcohol; common or ethylic ether corresponding to common or ethylic alcohol, and amylic ether to amylic alcohol or fusel oil. These alcohols are hydrated oxides of ethyle and amyle respectively. (See *Alcohol Amylicum*, p. 851, and *Alcohol*, p. 852.)

Butyrate of Ethylic Ether. Butyric Ether. ($C_4H_5O,C_8H_7O_3$.) This ether is readily prepared by mixing 100 parts of butyric acid with 100 of alcohol, and 50 of concentrated sulphuric acid, and agitating the mixture for a short time. The ether forms a layer on the surface, and may be purified by washing it with water, and subjecting it to the action of chloride of calcium. Butyric ether is sparingly soluble in water, but very soluble in alcohol, and boils at 230°. It is said to be much used to communicate a pine-apple flavour to rum. Dissolved in 8 or 10 parts of alcohol it forms the *pine-apple essence.* From 20 to 25 drops of this essence, added to a pound of sugar containing a little citric acid, imparts to the mixture a strong taste of pine-apple. *Butyric acid* is formed during what is called the butyric fermentation, which usually consumes two or three months before it is completed, and which is preceded by the lactic fermentation. To prepare it a solution of grape sugar is mixed with half its weight of chalk, and with about one-tenth of its weight of cheese to act as a ferment, and the whole is kept at the temperature of 90°. The sugar is first transformed into a viscous substance, and afterwards into lactic acid, which is gradually

converted into butyric acid, with the disengagement of hydrogen and carbonic acid. At the end of the fermentation, the liquid contains principally a mixture of butyrate and lactate of lime, from which the butyric acid may be obtained by precipitating the lime as a carbonate by carbonate of soda, and decomposing the resulting butyrate of soda with sulphuric acid. Butyric acid is a colourless liquid, having a very disagreeable odour and a rancid taste. It dissolves in all proportions in water and alcohol, boils at 327° F., and has the density of 0·963. It is a hydrated acid, having the formula $C_8H_7O_3$,HO.

Pelargonate of Ethylic Ether. Pelargonic Ether. Œnanthic Ether. (C_4H_5O,$C_{18}H_{17}O_3$). A preliminary step in forming this ether is to prepare the *pelargonic acid.* This is most conveniently obtained, according to Dr. R. Wagner, by the action of nitric acid on oil of rue. Treat the oil with double its weight of very dilute nitric acid, and heat the mixture until it begins to boil. Two layers are formed in the liquid; the upper one being brownish, and the lower consisting of the products of the oxidation of the oil, with the excess of nitric acid. The lower layer, having been separated, is freed from the greater part of the nitric acid by evaporation in a chloride of zinc bath, and then filtered. The filtrate is a solution of pelargonic acid, and may be converted into pelargonic ether by a prolonged digestion, at a gentle heat, with alcohol. The ether, as thus prepared, has the agreeable odour of quince, and, when dissolved in alcohol in due proportion, forms the *quince essence.* (See *Am. Journ. of Pharm.*, July, 1853, p. 320.) *Pure* pelargonic ether (œnanthic ether) is a colourless liquid, having an agreeable vinous odour, and a taste, at first slight, but afterwards acrid. Its sp. gr. is 0·87, and boiling point, when constant, 433° F. Pelargonic acid, so called from its having been first obtained from *Pelargonium roseum*, or rose geranium, is a hydrated acid, and has the formula $C_{18}H_{17}O_3$,HO. Delffs's analysis of œnanthic acid gives it the same composition, and, accordingly, he considers the two acids as undoubtedly identical. (*Chem. Gaz.*, April 15, 1852, p. 144.) The formula given for œnanthic acid at *page* 753 must, therefore, be abandoned.

Acetate of Amylic Ether. ($C_{10}H_{11}O$,$C_4H_3O_3$). This is prepared by distilling a mixture of one part of amylic alcohol (fusel oil), two of acetate of potassa, and one of concentrated sulphuric acid. The distilled liquid is purified from free acid, by washing with a weak alkaline solution, and from water, by distillation from chloride of calcium. It is a colourless, limpid liquid, lighter than water, boiling at 272° F., insoluble in water, but soluble in alcohol. It possesses the odour, in a remarkable degree, of the Jargonelle pear, and is manufactured on a large scale for flavouring syrups and confectionery. An alcoholic solution of this ether forms the *Jargonelle pear essence.* Fifteen parts of acetate of amylic ether, with half a part of acetic ether, dissolved in 100 parts of alcohol, form what may be called the *bergamot pear essence*, which, when employed to flavour sugar acidulated with a little citric acid, imparts the odour of the bergamot pear, and a fruity, refreshing taste. Acetate of amylic ether, mixed with butyric ether, forms another fruity compound, which recalls the odour of the banana, and forms, in alcoholic solution, the *banana essence.*

Valerianate of Amylic Ether. ($C_{10}H_{11}O$, $C_{10}H_9O_3$). This is made by carefully mixing four parts of pure amylic alcohol (fusel oil) with four of sulphuric acid, and adding the mixture, when cold, to five parts of valerianic acid. The whole is warmed for a few minutes in a water-bath, and then mixed with a little water, which causes the ether to separate. Lastly, it is purified by washing it with water and a weak solution of carbonate of soda. An alcoholic solution of this ether, in the proportion of one part to six or eight of alcohol, forms a flavouring liquid under the name of *apple essence.* For the mode of obtaining valerianic acid, see *Valerianate of Soda*, p. 1188.

It is thus perceived that the bases of the fruit essences are certain ethereal compounds of organic acids with the oxides of ethyle and amyle. Besides the essences here described, there are found in commerce the strawberry, raspberry, apricot, green gage, mulberry, and black currant essences, all of which may be viewed as various mixtures of the ethers of the ethyle and amyle series, modified by the addition of pure nitrous ether, vanilla, volatile oils, &c., to bring about a resemblance to the fruit, the odour and taste of which it is the object to imitate. In making these essences, it is important that the materials should be pure, especially the fusel oil and alcohol. The alcohol, used as a solvent, should be rectified and deodorized.

These fruit essences are extensively employed for flavouring ices, jellies, lozenges, and drops, and for making fruit syrups and effervescent beverages. They are manufactured on a large scale by Messrs. Mander, Weaver, & Co., of Wolverhampton, England, and sold by their agents, Messrs. Phelps, Fowler, & Co., of New York. The more useful ones are also prepared by Messrs. Powers & Weightman, manufacturing chemists, of Philadelphia.

FUCUS VESICULOSUS. *Sea-wrack. Bladder-wrack.* This was omitted as an officinal in the edition of the Dublin Pharmacopœia of 1850. It belongs to *Cryptogamia Algæ* in the sexual system, and to the natural order Algaceæ. The following is the generic character.

"MALE. *Vesicles* smooth, hollow, with villose hairs within, interwoven. FEMALE. *Vesicles* smooth, filled with jelly, sprinkled with immersed grains, prominent at tip. *Seeds* solitary." This sea-weed is perennial, with the frond or leaf flat, smooth and glossy, from one to four feet high, from half an inch to an inch and a half broad, furnished with a midrib throughout its length, dichotomous, entire upon the margin, and of a dark olive-green colour. Small spherical vesicles, filled with air, are immersed in the frond near the midrib. The fruit consists of roundish, compressed receptacles, at the ends of the branches, filled with a clear tasteless mucus. The plant grows upon the shores of Europe and of this continent, attaching itself to the rocks by its expanded woody root. On the coast of Scotland and of France, it is much used in the preparation of kelp. It is also employed as a manure, and is mixed with the fodder of cattle. It has a peculiar odour, and a nauseous saline taste. Several chemists have undertaken its analysis, but the results are not satisfactory. It contains much soda in saline combination, and iodine, according to Gaultier de Claubry, in the state of iodide of potassium. These ingredients remain in its ashes, and in the charcoal resulting from its exposure to heat in close vessels. This charcoal, which is sometimes called *Æthiops vegetabilis* or *vegetable ethiops*, has long had the reputation of a deobstruent, and been given in goitre and scrofulous swellings. Its virtues were formerly ascribed chiefly to carbonate of soda, in which it abounds; but, since the discovery of the medical properties of iodine, this has been considered as its most active ingredient. The mucus contained in the vesicles was applied externally, with advantage, by Dr. Russel, as a resolvent in scrofulous tumours.

Other species of Fucus are in all probability possessed of similar properties. Many of them contain a gelatinous matter, and a sweet principle analogous to mannite; and some are used as food in times of scarcity. Large quantities of a sea weed, named in the East *agar-agar*, are gathered on the rocky coasts of the East India Islands, and sent to China, where it is valued for making jellies, and a size for stiffening silks. The *Ceylon moss* is a delicate fucus (*Gigartina lichenoides*), growing on the coast of Ceylon, where it is gathered by the natives. It abounds in starch and vegetable jelly, which render it applicable to the same purposes as the carrageen or Irish moss. (*Pharm. Journ. and Trans.*, xiii. 355.) *F. Helminthocorton* (*Gigartina Helminthocorton* of Greville) has some reputation in Europe as an anthelmintic, and is said also to be febrifuge. It is one of the ingredients in that mixture of marine plants which is sold in Europe under the name of *Corsican moss* or *helminthocorton*. This is used in decoction, from four to six drachms being boiled in a pint of water, and a wineglassful given three times a day.

FULIGOKALI. This preparation, proposed by M. Deschamps, is formed by boiling for an hour, 20 parts of caustic potassa, and 100 of shining soot, in powder, in 2 parts or a sufficient quantity of water. The solution, when cold, is diluted, filtered, and evaporated to dryness. Fuligokali is in the form of a black powder, or of scales, very soluble in water, and having an empyreumatic odour and mild alkaline taste. It is used in the same affections as *anthrakokali*. The dose is two or three grains, repeated several times a day. An ointment, containing from sixteen to thirty-two grains to the ounce of lard, was found by Dr. Gibert, of Paris, to be detersive, resolvent, and gently stimulant. (See a paper by the late A. Duhamel, in the *Am. Journ. of Pharm.*, xiv. 284.)

FUMARIA OFFICINALIS. *Fumitory.* A small annual European plant, naturalized in this country, growing in cultivated grounds, and flowering from May to August. It was formerly considerably employed as a medicine, and is still used in Europe. The leaves are the officinal part. They are inodorous, have a bitter saline taste, and are very succulent, yielding by expression a juice which has the sensible and medicinal properties of the plant. An extract prepared by evaporating the expressed juice, or a decoction of the leaves, throws out upon its surface a copious saline efflorescence. The plant, indeed, abounds in saline substances, and to these, in connexion with its bitter extractive, its medical virtues are to be ascribed. It is gently tonic, in large doses is said to be laxative and diuretic, and is thought, moreover, to have an alterative action. Both in ancient and modern times it has been esteemed a valuable remedy in visceral obstructions, particularly those of the liver, in scorbutic affections, and in various troublesome eruptive diseases. Cullen speaks favourably of its influence in these last complaints. He gave the expressed juice in the dose of two ounces twice a day. Others have prescribed it in much larger quantities. The leaves either fresh or dried may be used in decoction, without precise limitation as regards the dose. The inspissated juice and an extract of the dried leaves have also been employed.

FUSTIC. A yellow dye-wood, obtained from *Morus tinctoria* (*Broussonetia tinctoria*, Kunth), a tree growing in the West Indies and South America. It is not used in medicine or pharmacy. According to Bancroft, two different woods bear in England the name of fustic, one the product of the tree just mentioned, distinguished as *old fustic*, probably

from the greater magnitude of the billets in which it is imported; the other derived from the *Rhus Cotinus* or *Venice sumach*, and called *young fustic*. The wood of M. tinctoria owes its colouring properties to two principles which have been isolated by R. Wagner, one which he has denominated *morin*, and the other bearing some resemblance to tannic acid, which he calls *moritannic acid*. (See *Chem. Gaz.*, ix. 1, 21, and 241.)

GALANGAL. *Galanga.* Two varieties are described by authors, the *galanga major* and *galanga minor*, or *large* and *small galangal*. They are considered by some as the roots of different plants; but there is reason to believe that they are both derived from *Maranta Galanga* of Linn. (*Alpina Galanga* of Willd.), and that they differ in consequence of the different stages of growth at which they are collected. They are brought from the East Indies. The *larger variety* is cylindrical, three or four inches long, as thick as the thumb or thicker, often forked, reddish-brown externally, slightly striated longitudinally, marked with whitish circular rings, orange-brown internally, rather hard and fibrous, difficultly pulverizable, of an agreeable aromatic odour, and a pungent, hot, spicy, permanent taste. The *small galangal* resembles the preceding in shape, but is smaller, not exceeding the little finger in thickness, of a darker colour, and of a stronger taste and smell. According to Morin, galangal contains a volatile oil, an acrid resin, extractive, gum, bassorin, and lignin. A. Vogel, jun., found also starch and fixed oil. (*Pharm. Cent. Blatt*, 1844, p. 158.) R. Brandes is said to have found a peculiar crystallizable substance called *kempferid*. (*Annal. der Pharm.*, xxxii. 311.) The active principles are the volatile oil and acrid resin. Its medical effects are those of a stimulant aromatic. It was known to the ancient Greeks and Arabians, and formerly entered into numerous compound preparations. At present it is seldom employed. Its dose is from fifteen to thirty grains in substance, and twice as much in infusion.

GALEGA OFFICINALIS. *Goat's Rue.* A perennial herb, growing in the South of Europe, and sometimes cultivated in gardens. It is without smell unless bruised, when it emits a disagreeable odour. Its taste is unpleasantly bitter and somewhat rough, and when chewed, it stains the saliva yellowish-brown. In former times it was much employed as a remedy in malignant fevers, the plague, the bites of serpents, worms, &c.; but it has fallen into merited neglect. The roots of *Galega Virginiana*, a native of the United States, are said to be diaphoretic and powerfully anthelmintic. They are given in decoction.

GALIUM APARINE. *Cleavers. Goose-grass.* This is an annual, succulent plant, common to Europe and the United States, growing in cultivated grounds, and along fences and hedges. It is inodorous, and has a bitterish, herbaceous, somewhat acrid taste. Analyzed by Schwartz, it was found to contain, besides chlorophylle, starch, and other principles common to all plants, three distinct acids, viz.: a variety of tannic acid, which he names *galitannic acid*, citric acid, and a peculiar acid previously discovered by Schwartz and Rochleder, and named *rubichloric acid*. (*Pharm. Journ. and Trans.*, xii. 190.) The expressed juice is said to be aperient, diuretic, and anti-scorbutic; and has been used in dropsy, congestion of the spleen, scrofula, and scorbutic eruptions. In the last complaint it has been thought peculiarly useful. Three ounces of the juice may be taken twice a day. Dr. Winn, of Truro, Cornwall, has recently called the attention of the profession to this medicine. Several persons in his neighbourhood had been cured of lepra by a decoction of the plant; and he had himself employed it with great advantage not only in this but other cutaneous diseases. At first he gave it in the form of decoction made by boiling a handful of the recent herb in a quart of water for twenty minutes, of which a tumblerful was given three times a day; but he now prefers the inspissated juice, in the form of a fluid extract, of which ℥j represents Oss of the decoction. (*London Med. Times and Gaz.*, Feb. 1854, page 144.) The fresh herb, in the form of ointment or decoction, has been applied externally to scrofulous swellings with supposed advantage.

GALIUM VERUM. *Yellow Ladies' Bed-straw. Cheese rennet.* This species of Galium is perennial, and a native of Europe. The flowers, which are yellow, have a peculiar, agreeable odour, and have been given in nervous affections, with a view to their supposed antispasmodic powers. The herb is inodorous, but has an astringent, acidulous, bitterish taste. The property of coagulating milk was formerly ascribed to it, but is certainly not constant, as the experiment has been frequently tried without success. The bruised plant is sometimes used to colour cheese yellow, being introduced into the milk before coagulation. It is also used for dyeing yellow. The roots of this and of most other species dye red; and the plant, eaten by animals, colours the bones like madder. This plant was analyzed by Schwartz, and found to contain the same principles as *G. Aparine*, mentioned above. It was formerly highly esteemed as a remedy in epilepsy and hysteria, and was applied externally in cutaneous eruptions. It may be employed in the form either of the recently expressed juice, or of a decoction prepared from the fresh plant. Its medical properties, however, are feeble.

Of the American species, the *G. tinctorium* is closely allied in properties to G. verum. It is said to be useful in cutaneous diseases; and the root is employed by the Indians for staining their feathers and other ornaments red.

GELSEMINUM SEMPERVIRENS. Juss. *Gelseminum Nitidum.* Michaux. *Bignonia Sempervirens.* Willd. *Yellow Jasmine. Carolina Jasmine.* This is one of the most beautiful climbing plants of our Southern States, ascending lofty trees, and forming festoons from one tree to another, and in its flowering season, in the early spring, scenting the atmosphere with its delicious odour. It belongs to the Linnæan class and order Pentandria Digynia, and the natural family of Apocynaceæ. The stem is twining, smooth, and shining; the leaves perennial, opposite, shortly petiolate, lanceolate, entire, dark-green above, and paler beneath; the flowers in axillary clusters, large, of a deep-yellow colour and fragrant, with a very small, five-leaved calyx, and a funnel-shaped corolla, having a spreading, five-lobed, nearly equal border. The fruit is a flat, compressed capsule, divisible into two parts, two-celled, and furnished with flat seeds, which adhere to the margins of the valves. The root is the part employed. It is said to have a slight narcotic odour and an agreeably bitter taste, and yields its virtues to water, and readily to diluted alcohol. From the accounts given of its effects, it appears to be a cerebro-nervous sedative, without nauseating or purgative properties, but sometimes causing diaphoresis, especially in febrile diseases. In moderate doses it produces agreeable sensations of languor, with muscular relaxation, so that the patient finds some difficulty in moving the eyelids, and keeping the jaws closed. More largely taken it occasions dizziness, dimness of vision, dilated pupil, general muscular debility, and universal prostration; but after a short time these symptoms pass off leaving no unpleasant effects. It is no doubt capable of causing death in over-doses, and must therefore be used cautiously.

The discovery of its medical virtues was accidental. A planter of Mississippi, labouring under an obstinate bilious fever, directed his servant to get a particular root from the garden, and prepare a tea from it. The tea was prepared accordingly, and drank by the invalid, who was soon afterwards affected with great prostration, and especially muscular debility, so that he could not raise a limb, but without stupor. These effects gradually passed off, and with them the fever. The servant had made a mistake in the root, and dug that of the Gelseminum, instead of the one intended. The planter, having made this discovery, employed the root afterwards with success upon his own plantation and in the neighbourhood. The remedy passed into the hands of irregular practitioners, and was employed by the "eclectic physicians" before its virtues came to the knowledge of the profession. Attention was called to it by a paper of Professor Procter in the *Am. Journ. of Pharm.* for October, 1852 (*page* 307), who derived most of his information from the "*Eclectic Dispensatory*," and a paper by F. D. Hill, in the "*Eclectic Medical Journal*" of Cincinnati. Communications have since been published in reference to it in the *Southern Journ. of Med. and Phys. Sciences*, for January, 1853 (*page* 40) by Dr W. S. Jenkins, of Castilian Spring, Tenn.; in the *Stethoscope* of Nov. 1853 (*page* 636) by Dr. H. M. Nash, of Norfolk, Va.; and in the *Iowa Med. Journ.* by Dr. Bachelor (see *Charleston Med. Journ. and Rev.*, March, 1854, *page* 243). From these sources most of the statements in this article were drawn. The diseases in which the medicine has been prescribed are intermittent, remittent, and typhoid fevers, inflammation of the lungs and pleura, rheumatism, neuralgia, chorea, and epilepsy. The preparation usually employed is a tincture made by macerating for two weeks the fresh bark of the root, well bruised, in diluted alcohol, or some form of ardent spirit, and then expressing, and filtering. It has a dark-red colour, and the bitterness of the root, and is probably saturated. The dose is from ten to fifty drops, every hour or two; but is of course somewhat indefinite, as there is no precise formula for the tincture. Dr. Jenkins gives from half a teaspoonful to three times the quantity.

GENISTA TINCTORIA. *Dyers' Broom. Dyers' Weed. Green Weed.* A low shrub, growing wild in Europe, and sometimes cultivated in this country in gardens. The flowering tops of the plant are employed to dye yellow, whence its name was derived. Both these and the seeds have been used in medicine. They are said to be purgative and even emetic, especially the seeds, which were formerly given as a cathartic in the dose of a drachm and a half. By some authors they are said to be diuretic, and to be useful in dropsy. The plant has been long used as a preventive of hydrophobia by the peasants of Podolia, the Ukraine, and other provinces of Russia. They employ it in the form of strong decoction, both internally and locally, in connexion with *Rhus coriaria*, and persevere with it for six weeks. The trials made with it in other parts of Europe have failed.

GERANIUM ROBERTIANUM. *Herb Robert.* This species of Geranium grows wild both in Europe and the United States, but is rare in this country; and Pursh states that the American plant is destitute of the heavy smell by which the European is so well known, though the two agree in all other respects. The herb has a disagreeable, bitterish,

astringent taste, and imparts its virtues to boiling water. It has been used internally in intermittent fever, consumption, hemorrhages, nephritic complaints, jaundice, &c., has been employed as a gargle in affections of the throat, and has been applied externally as a resolvent to swollen breasts and other tumours.

GLASS OF ANTIMONY. *Vitrum Antimonii.* This is prepared from the tersulphuret of antimony by a partial roasting and subsequent fusion. The tersulphuret is reduced to coarse powder, and strewed upon a shallow, unglazed earthen vessel, and heated gently and slowly, being continually stirred to prevent it from running into lumps. White vapours of sulphurous acid arise; and when these cease, the heat is increased a little to reproduce them. The roasting is continued in this manner until, at a red heat, no more vapours are given off. The matter is then melted in a crucible with an intense heat, and kept in a state of fusion until it assumes the appearance of melted glass, when it is poured out on a heated brass plate. In this process, part of the sulphur of the tersulphuret is driven off by the roasting; while the portion of antimony which loses its sulphur becomes teroxidized. The roasted matter, accordingly, consists of teroxide of antimony and undecomposed tersulphuret; and these, by uniting during the fusion, form the glass. Glass of antimony is in thin irregular pieces, exhibiting a vitreous fracture, and having a metallic steel-gray lustre. When well prepared it is transparent, and, upon being held between the eye and the light, appears of a rich orange-red, or garnet colour; but if of inferior quality it is black and opaque. It is hard and brittle, and rings when struck with a hard substance. It is insoluble in water, but soluble in acids and in cream of tartar, with the exception of a few red flocculi. Its essential constituents are the teroxide and tersulphuret, united in variable proportions. When of good quality it consists of about eight parts of teroxide to one of tersulphuret. It usually contains about five per cent. of silica, and three of sesquioxide of iron, which are derived from the crucible, and to the former of which the vitrification of the product is owing. When good it is dissolved, with the exception of a few red flocculi, in strong muriatic acid. An excess of silica is known by the acid leaving a gelatinous residuum, and the iron may be detected by ferrocyanuret of potassium, and its amount judged of by the bulk of the precipitate and the depth of its blue colour. Sometimes *glass of lead* is sold for glass of antimony, a fraud easily detected by the difference between the two substances in specific gravity; the glass of lead having a density of nearly seven, while that of glass of antimony is not quite five.

Medical Properties, &c. Glass of antimony is an active antimonial; but, owing to its variable composition and uncertain operation, is at present very seldom used. When the levigated powder is mixed with one-eighth of its weight of melted yellow wax, and the mixture roasted over a slow fire, with constant stirring until it ceases to exhale vapours, a coal-like pulverizable mass is formed, which is the *cerated glass of antimony*, a preparation formerly included in the Edinburgh Pharmacopœia.

GLECHOMA HEDERACEA. *Nepeta Glechoma. Ground-ivy.* A small perennial herb, indigenous in Europe and the United States, and growing in shady grassy places, as in orchards and along fences and hedges. It belongs to the family of labiate plants, and shares their general properties. The herb was formerly officinal, and still enjoys some credit as a domestic remedy. It has a peculiar disagreeable odour, and a bitterish, rough, somewhat aromatic taste, and imparts its properties to boiling water. From the statements of authors, it appears to be gently stimulant and tonic, with, perhaps, a peculiar direction to the lungs and kidneys. It has also been considered aperient. The complaints in which it has been most used are chronic affections of the pulmonary and urinary organs; and at one time it had considerable reputation as a remedy in consumption. It has also been employed as a vulnerary and errhine. The usual form in which it was administered was that of infusion, of which a quantity was given for a dose containing the virtues of half a drachm or a drachm of the herb.

GLUE. An impure form of gelatin, obtained from various animal substances by boiling them in water, straining the solution, and evaporating it till upon cooling it assumes the consistence of jelly. The soft mass which results is then divided into thin slices, which are dried in the open air. Glue, when of good quality, is hard and brittle, of a brown colour, and equally transparent throughout. It softens and swells very much in cold water, without dissolving; but is readily dissolved by hot water. It is employed chiefly for cementing pieces of wood together, being too impure for the purposes of a test, or for internal use.

Capsules of Gelatin. Glue has within a few years been applied to an important practical purpose in pharmacy. Certain medicines are so offensive to the taste, and consequently so apt to sicken the stomach, that it is highly desirable to administer them in such a way as to prevent their contact with the tongue and palate. This object is fully accomplished, so far as regards many disagreeable liquid medicines, by the use of the

capsules of gelatin, invented by M. Dublanc, of Paris. These are prepared from the purest glue in the following manner. Small pouches made of fine skin, of an oval form, are attached by a waxed thread to the smaller extremity of a hollow elongated metallic cone, which is bent towards its point, and has its base closed by a cover, which is screwed so as to make the instrument air-tight. Into this conical tube sufficient mercury is poured to fill the pouch, which, thus distended, is dipped into a concentrated sweetened solution of glue, and afterwards exposed to heat in a vertical position, so as to dry the layer of gelatin which it has received. In the same manner a second coating may be given, and the process again repeated till a sufficient thickness has been obtained. The cone being then reversed, the mercury flows out of the pouch, which collapses, and allows the capsule of gelatin to be removed. Into this the medicine may now be introduced, care being taken to avoid any contact with the outer surface of the capsule. The opening is next to be closed by means of a thin lamina of gelatin previously softened by steam; and a solution of the same substance should be applied to the edges by means of a camel's hair pencil. Another mode of preparing the capsules is as follows. Take a cylinder of iron or hard wood, four lines in diameter and a few inches long, and smoothly rounded at one end. Dip half an inch of this end first into a saturated warm alcoholic solution of soap, and afterwards, when the soap has concreted upon the surface, into a concentrated hot solution of gelatin, and repeat the latter immersion once or oftener, if it be desired to have a firm capsule. When the glue has concreted, remove the capsule. A top for it may be made in the same way, and, after the body has been filled with the liquid to be given, is to be applied and secured by rubbing a camel's hair pencil moistened with hot water over the line of junction. (*Med. Exam.*, N. S., i. 441.) M. Mothès considers the following plan of preparing the capsules the most convenient. He has a number of assorted "copper olives" prepared, covers their surface with a layer of something to prevent oxidation, immerses them in a sweetened and aromatized concentrated solution of gelatin, then places them vertically on boards to cool, and before complete desiccation removes the capsules, places them on sieves, and dries them by a stove-heat. (*Journ. de Pharm. et de Chim.*, xvii. 204.) For an account of another process, invented and described by Mr. Alfred Guillou, of Philadelphia, the reader is referred to the *Am. Journ. of Pharm.* (ix. 20). The capsules may be made of such a capacity as to contain from ten to fifteen grains of copaiba.

GNAPHALIUM MARGARITACEUM. *Cudweed. Life-everlasting.* An indigenous herbaceous perennial, growing in fields and woods, and flowering in August. The herb of this and of *G. polycephalum*, or *sweet-scented life-everlasting*, is sometimes used in the form of tea by the country people, in diseases of the chest and of the bowels, and in hemorrhagic affections, and externally, in the way of fomentation, in bruises, languid tumours, and other local complaints; but it probably possesses little medical virtue. Shoepf says that it is anodyne. In Europe, different species of Gnaphalium are also occasionally employed for similar purposes.

GOLD. *Aurum.* The preparations of this metal were introduced to the notice of physicians by Dr. Chrestien, of Montpellier, in 1810. They are employed both internally, and by frictions on the tongue and gums. The principal affections in which they have been recommended are secondary syphilis, syphilitic ulcerations, scrofula, and inveterate eruptions, particularly those of a leprous character. The chief preparations which have been employed, up to the present time, are metallic gold in a finely divided state, the oxide (teroxide or auric acid), the chloride (terchloride), the iodide, the double chloride of gold and sodium, the chloroaurate of ammonia (a compound of terchloride of gold and muriate of ammonia), and the cyanuret (tercyanuret) of gold. *Gold in powder* may be obtained by rubbing up gold-leaf with 10 or 12 times its weight of sulphate of potassa until brilliant particles are no longer visible, and then washing away the sulphate with boiling water. The *oxide* may be procured by treating the nitromuriatic solution of gold with an excess of magnesia, and washing the precipitate, first with water, and afterwards with dilute nitric acid. This process being tedious, M. L. Figuier prefers to obtain the oxide by precipitating a cold solution of chloride of gold, rendered strongly alkaline by caustic potassa, with a solution of chloride of barium. The precipitate, consisting of aurate of baryta, is then treated with dilute nitric acid, which dissolves the baryta and leaves the oxide of gold pure. Ten parts of gold, thus treated, produced 11¾ parts of oxide; while the same quantity of metal by the magnesia process, only yielded 9 parts. (*Journ. de Pharm.*, Dec. 1847.) The *chloride* is obtained by dissolving pure gold in three times its weight of nitromuriatic acid, with the aid of a moderate heat. The solution is evaporated by a gentle heat nearly to dryness, being at the same time stirred with a glass rod. It is in the form of a crystalline mass of a deep-red colour. Its solution has a fine yellow tint. Being deliquescent, it requires to be kept in ground-stoppered bottles. The *iodide* may be made by precipitating a solution of terchloride of gold by one of iodide of

potassium, and washing the precipitate with alcohol to remove the excess of iodine. It is of a greenish-yellow colour, and, when heated in a porcelain crucible, is resolved into iodine vapours and a residue of pure gold. *Chloride of gold and sodium* is prepared by dissolving four parts of gold into nitromuriatic acid, evaporating the solution to dryness, and dissolving the dry mass in eight times its weight of distilled water. To this solution one part of pure decrepitated common salt is added, previously dissolved in four parts of water. The mixed solution is then evaporated to dryness, being in the mean time constantly stirred with a glass rod. This salt is of a golden-yellow colour, and, when crystallized, is in the form of long prismatic crystals, unalterable in the air. The *chloroaurate of ammonia* is formed by dissolving one part of the terchloride of gold and two parts of muriate of ammonia in distilled water, assisted by a few drops of nitromuriatic acid, and evaporating the solution to dryness by a gentle heat. The *cyanuret* is best obtained, according to M Oscar Figuier, as follows. Prepare the chloride of gold as neutral as possible by repeated solutions and crystallizations; and to the solution of this salt add, very cautiously, avoiding any excess, a solution of *pure* cyanuret of potassium, so long as any precipitate falls. (See *Potassii Cyanuretum.*) The precipitate, consisting of cyanuret of gold, is to be washed with pure water and dried in the dark. Gold in powder, and the oxide, chloride, iodide, sodio-chloride, and cyanuret are officinal in the French Codex.

The preparations of gold are decidedly poisonous, though in different degrees. The chloride is most virulent, and, according to Dr. Chrestien, is even more active than corrosive sublimate. In an over dose, it produces pain, inflammation, and even ulceration of the stomach and bowels, and otherwise acts as a corrosive poison. The general effects of these preparations, in moderate doses, is to produce increased fulness and frequency of the pulse, and to augment the urine and insensible perspiration, without interfering with the appetite or the regular action of the bowels; but if the dose be pushed too far, general irritation is apt to be produced, inflammation seizes upon some organ, according to the predisposition of the individual, and fever is developed.

Gold in powder, the oxide, chloride, and *iodide* are not as much used as the double chloride of gold and sodium. The oxide may be given in the form of pill, in the dose of a tenth of a grain, in scrofula and lymphatic swellings, beginning with one pill daily, and afterwards gradually increasing to seven or eight in 24 hours. The chloride has been used with advantage as a caustic, in lupus, and syphilitic tubercles and ulcers, by M. Chavannes. The iodide may be given in the same cases with the other preparations. The dose is from the fifteenth to the tenth of a grain.

Chloride of gold and sodium is the preparation of gold most commonly employed. It may be given in lozenges, each containing the twelfth of a grain, by mixing intimately five grains of the salt with an ounce of powdered sugar, and making the whole with mucilage of tragacanth into a proper mass, to be divided into sixty lozenges. Pills, containing the same dose, may be formed by dissolving ten grains of the dried salt in a drachm of distilled water, and forming the solution into a pilular mass with a mixture of four drachms of potato starch and one drachm of gum Arabic, to be divided into one hundred and twenty pills. (*Journ. de Pharm.*, xx. 648.) For frictions on the gums and tongue, Chrestien recommends the following formula:—Crystallized chloride of gold and sodium, one grain; powdered orris root, deprived of its soluble parts by alcohol and water, and dried, two grains. Mix. At first the fifteenth part of this powder is used daily by frictions; afterwards the fourteenth, the thirteenth, &c., until, increasing gradually, the tenth or eighth part is employed. The use of four grains of the salt in this way is said commonly to cure bad cases of recent syphilis; such, for example, as are characterized by the co-existence of chancres, warts, and buboes. In preparing this powder, lycopodium may be substituted for the orris.

Chloroaurate of ammonia has been recommended by Bouchardat in amenorrhœa and dysmenorrhœa in debilitated subjects, in the dose of about the tenth of a grain. A grain may be dissolved in five teaspoonfuls of alcohol and five of water, and a teaspoonful given morning and evening, mixed with sweetened water.

Cyanuret of gold is employed, like the chloride of gold and sodium, mixed with inert powders, by friction, and in the form of pill. The fifteenth of a grain may be rubbed into the gums daily for fifteen days, next the fourteenth of a grain for fourteen days, and so on, increasing until the dose amounts to the ninth or eighth of a grain. The dose for internal exhibition is the eighteenth of a grain, gradually increased to the eighth. Cyanuret of gold has been found useful in the treatment of syphilis and scrofula by M. Pourché, and is said to be less exciting than the double chloride, when used in those diseases. (*Journ. de Pharm.*, xx. 599 and 649.)

The different medicinal compounds of gold should not be prepared in pill, powder, or otherwise, until they are wanted for use; as they are liable to undergo decomposition when kept. They should be carefully secluded from the light.

GRATIOLA OFFICINALIS. *Hedge Hyssop.* This is a perennial herb, indigenous in the South of Europe, where it flourishes in meadows and other moist grounds. The whole herb is used. It is nearly inodorous, but has a bitter nauseous taste. Both water and alcohol extract its active properties. It is a drastic cathartic and emetic, possessing also diuretic properties, and is employed on the continent of Europe in dropsy, jaundice, worms, chronic hepatic affections, scrofula, and various other complaints. With us it is almost unknown as a remedy. The dose of the powdered herb is from fifteen to thirty grains; of the infusion made in the proportion of half an ounce to the pint of boiling water, half a fluidounce.

GUACO. This name is given in Central and South America, and the West Indies, to various plants having supposed alexipharmic properties, and belonging to the genera *Mikania* and *Aristolochia;* but it is to the different species of the former genus that the appellative properly belongs, and especially to the *Mikania Guaco*, described by Humboldt and Bonpland. (*Pl. Æq.*, ii. 84.) The genus Mikania belongs to the Linnæan class and order *Syngenesia Æqualis*, and to the natural order *Asteraceæ*. The plants are closely allied to the Eupatoria. For their generic character, see *Lindley's Flora Medica* (*page* 451), and *Griffith's Medical Botany* (*page* 392). *Mikania Guaco* is described as having twining stems, with round, sulcate, and hairy branches; ovate, subacuminate, remotely dentate leaves, somewhat narrowed at the base, rough above, and hairy beneath; and flowers in opposite, axillary corymbs. The plant is a native of intertropical America, and has been introduced into the W. India Islands from the continent. The leaves are the part used. In the recent state they have a bitter taste, and a strong disagreeable odour; but their sensible properties and medical virtues are impaired by drying.

This and other plants have long been employed by the natives as a preventive and cure of the bites of poisonous serpents. This application of them was first made known by Mutis; and his account was confirmed by Humboldt and Bonpland. The medicine has also been employed as a febrifuge and anthelmintic, and a few years since attracted considerable attention for its supposed prophylactic and remedial powers in epidemic cholera and chronic dysentery. It has, moreover, been recommended in chronic rheumatism, both internally and locally, and as a direct application in bites of insects, bruises, and sprains, and atonic deafness. The probability, however, is that, like eupatorium, it has simply the virtues of a mild tonic, and gentle stimulant to the secretions. It is best employed in the recent state. The natives, when employing it as a counter-poison, apply the bruised leaves and expressed juice to the bite, and at the same time drink of the infusion. The preparations recommended for internal use are chiefly an infusion and tincture, the former made in the proportion of an ounce of the leaves to a pint of boiling water, the latter of about a pound to the gallon of proof spirit. The dose may be about the same as analogous preparations of eupatorium. (See *Lond. Med. Times and Gaz.*, Dec. 1852, p. 651, and *Journ. de Pharm.*, *3e sér.*, xx. 357.)

GUANO. *Bird-manure.* This is a valuable manure, consisting of the decomposed excrement of countless aquatic birds, which has accumulated for ages on certain barren and uninhabited islets of the western coast of South America, and in other localities throughout the world. The best comes from Peru, and will be here described. It is a coarse dry powder of a brown colour. Exposed to the air it absorbs moisture, and becomes somewhat sticky. Its smell is offensive, and somewhat ammoniacal. With the powder are intermingled friable lumps, which exhibit in their inside whitish specks, and which, when exposed to the air, fall to powder, exhaling an ammoniacal smell. It is soluble in great part in water, and the solution formed contains chiefly oxalate of ammonia. When exposed to heat it blackens, burns with a slight flame, exhales the smell of ammonia, and leaves a whitish ash, varying in amount from 27 to 35 per cent. The guanos of commerce vary very much in composition, from the best Peruvian to the inferior sorts, which have scarcely any value as fertilizers. A good specimen of guano, analyzed by Fownes, consisted of about two-thirds oxalate of ammonia, and one-third earthy and alkaline phosphates, &c. The source of the oxalate of ammonia is undoubtedly the uric acid, originally in the excrement, and which is often found undecomposed in the guano. The value of guano as a fertilizer, depends chiefly upon the proportion of the nitrogenous ingredients; the phosphates being of secondary importance. Unger obtained from Peruvian guano, a peculiar substance, analogous to zanthic oxide, and called *guanine.* It forms crystallizable salts with acids, and has the formula $N_5C_{10}H_5O_2$.

In Colombia, S. A., guano has been used with benefit, internally and externally, as a remedy in the different forms of lepra. The late Prof. Horner, of Philadelphia, used it as a cataplasm, mixed with an equal quantity of potter's clay, in chronic inflammation of the knee-joint. In this proportion it blistered the surface; and cataplasms were afterwards used, containing one-third and one-fourth of guano. (*Med. Exam.*, Feb. 1852, p. 69.) Prof.

Horner attributed the revulsive effect of the guano to urate of ammonia; but the best authorities state that oxalate of ammonia is the characteristic salt of this substance.

GUN COTTON. *Pyroxylin.* This substance, discovered by Schönbein, of Bâle, in Switzerland, is conveniently prepared by the following process, given by Mr. Thomas Taylor, of London. Mix, in a glass vessel, 1½ fluidounces of nitric acid (sp. gr. 1·45) with an equal bulk of sulphuric acid, and, when the mixture has cooled, pour it upon 100 grains of fine cotton, contained in a Wedgwood mortar, and, with a glass rod, imbue the cotton as quickly as possible with the acids. As soon as the cotton is completely saturated, pour off the superabundant liquid, and, with the aid of the pestle, quickly press out as much of it from the cotton as possible. Then throw the cotton into a basin of water, wash it until it has not the slightest acid taste, and dry it with a gentle heat. Gun cotton may be made with strong nitric acid alone; but, as this acid is not always of full strength, it is better to mix with it sulphuric acid, which acts by strengthening the nitric acid, from its affinity for water. It is also prepared by immersing the cotton in a mixture of nitre and sulphuric acid.

Properties, &c. Gun cotton has the appearance of ordinary cotton, but is harsh to the touch. It is perfectly insoluble in water, and nearly so in strong alcohol; but dissolves in large quantity in acetic ether. As ordinarily prepared for commercial purposes, it is insoluble in ether, but, when carefully and *freshly* prepared, it dissolves in that menstruum, forming a powerfully adhesive liquid. (See *Collodium.*) According to Dr. J. H. Gladstone, of England, it is subject to spontaneous decomposition, if kept for some time. The same fact has been observed by Mr. James Beatson, of New York, and Prof. Procter, of Philadelphia. The specimen, observed by Prof. Procter to undergo decomposition, had not been well washed. The change is shown by the bottle, in which the gun cotton is kept becoming full of nitrous acid vapour; and the substance is so far altered that it is no longer explosive, or soluble in ether. According to M. Béchamp, of Strasburg, the product is soluble in ether, if the cotton be immersed in a mixture of nitre and sulphuric acid, while still hot from their reaction; but not soluble, if the cotton be added to the mixture when cold. By treating gun cotton with protochloride of iron, M. Béchamp caused the disengagement of nitrous oxide gas, and gave the filaments a coating of oxide of iron, which was readily dissolved off by muriatic acid. After this treatment the gun cotton was restored to its original state of cotton. (*Chem. Gaz.*, Jan. 1, 1854, p. 11.) When kindled gun cotton flashes off like gunpowder, burning without residue. Its inflaming point is at the temp. of 370°. Dr. Marx makes its inflaming point lower. It has been tried as a substitute for gunpowder in firearms; but, from its strong bursting power, it has not been found to answer for this purpose. It appears, however, to be well adapted to rock blasting. Its composition has not been satisfactorily determined. While Mr. T. Ransome, of Manchester, makes its composition correspond with that of lignin (cotton), in which two eqs. of hydrogen are replaced by two of nitric acid ($C_{12}H_{10}O_{10}-H_2+2NO_5=$ gun cotton $N_2C_{12}H_8O_{20}$); Mr. Walter Crum, of Glasgow, views it as the same substance, in which three eqs. of water are replaced by three of nitric acid ($C_{12}H_{10}O_{10}-3HO+3NO_5$ $=N_3C_{12}H_7O_{22}$). M. Pelouze gives a different formula.

GUTTA PERCHA. This valuable product of the East Indies was first brought into notice by Dr. Wm. Montgomerie, a British army surgeon, who became acquainted with its singular properties in the year 1842 at Singapore, and in the following year sent specimens of it to Europe. It is the product of a large tree growing in the southern extremity of the Malayan Peninsula, the island of Singapore, Borneo, and probably many other islands in the neighbourhood. This tree belongs to the Linnæan class and order Decandria Monogynia, natural family Sapotaceæ, and genus Isonandra of Dr. Wight, and has received the name of *Isonandra gutta.* It is of considerable magnitude, with a trunk commonly three feet, and sometimes as much as six feet in diameter, having numerous ascending branches, which are crowded with leaves at their extremities. The flowers are small and white; the leaves petiolate, oblong, four or five inches long by two in breadth, bright green above and brownish beneath. Dr. Montgomerie states that the natives procure the gutta percha by the very wasteful mode of cutting down the tree, stripping off the bark, and then collecting the milky juice, which is put into convenient recipients, and coagulates on exposure to the air. Twenty or thirty pounds are thus collected from each tree; but the probability is that the product would be much greater if obtained by tapping the tree, and thus preserving it for future use. Large quantities of gutta percha are now imported into Europe and this country. As found in commerce it is generally impure, containing fragments of vegetable matter and earth. From these it may be freed by kneading in hot water, or by melting it with oil of turpentine, straining, and evaporating.

Gutta percha is of a dull white or whitish colour, of a feeble odour, tasteless, at ordinary temperatures hard, almost horny, somewhat flexible in thin pieces, having an unctuous

feel under the fingers, and very tenacious. Its sp. gr. is 0·9791. (*Soubeiran.*) At about 120° F., it becomes softer and more flexible, but is still elastic, resisting, and tenacious. At 150° or 160°, it is soft, very plastic, and capable of being welded and moulded into any form. It is thus softened whether by means of hot water or by dry heat. On cooling it reassumes its former state, and retains any form which may have been given to it. In the softened state it is readily cut with a knife, though with some difficulty when cold. Exposed to a heat of 330° it loses a portion of water, and on hardening becomes translucent and gray; but it recovers its original characters if immersed in water. Subjected to igneous distillation it yields volatile products, resembling closely the volatile oil obtained from caoutchouc by the same process. Heated in an open vessel, it melts, foams up, and takes fire, burning with a brilliant flame and smoke. A portion thus melted retains the state of a viscid fluid on cooling. Gutta percha is a non-conductor of electricity. It is insoluble in water, alcohol, alkaline solutions, and the weak acids. Ether and the volatile oils soften it in the cold, and imperfectly dissolve it with the aid of heat. Oil of turpentine dissolves it perfectly, forming a clear colourless solution, which yields it unchanged by evaporation. It is also dissolved by bisulphuret of carbon, chloroform, and benzole. According to Soubeiran, it contains, besides pure gutta percha, small portions of a vegetable acid, casein, and two resins, one soluble in ether and oil of turpentine, the other in alcohol. (*Journ. de Pharm.*, 3*e sér.*, xi. 22.) Freed from these impurities, it has an ultimate composition closely analogous if not identical with that of caoutchouc. For a particular account of the distinctive properties of pure gutta percha, and the two resins mixed with it, the reader is referred to an article by M. Payen, in the *Journ. de Pharm.* (3*e sér.*, xxii. 183), also in the *Chem. Gaz.* (x. 353.) M. Arppe considers gutta percha as a mixture of six different resins, which may have been formed from a carbo-hydrogen $C_{10}H_8$. (See *Chem. Gaz.*, ix. 471.)

This singular substance has been applied to many useful and ornamental purposes. Its plasticity when moderately heated, and great firmness and tenacity at ordinary temperatures, and its insolubility in water and alcohol, are the properties to which it chiefly owes its value. By immersing it in hot water, it is made susceptible of being formed into any desirable shape; so that utensils of various kinds, metallic and other ornamental impressions, casts, sheets, bands, cords, sticks, tubs, &c., applicable to numerous purposes in the arts, may be made from it with great facility. To give it greater pliability, it is sometimes mixed with the tar resulting from the igneous decomposition of caoutchouc, or with its own tar and lampblack. It may be vulcanized in the same manner as caoutchouc, and undergoes a similar change of properties. (See *Caoutchouc.*)

In the dissolved state it may be employed as a varnish, impervious to moisture. It has been introduced into surgery, in order to preserve limbs and joints in fixed positions; and has been used beneficially in clubfoot, fractures, and diseases of the joints. It is employed for these purposes in the shape of bands, two or three inches broad and about a line thick, which, being softened in water, are applied in this state, and, when they harden, form a firm case for the limb. Holes should be made through the bands, for the escape of the vapour from the surface. It is also used for the formation of catheters and other tubes, splints, stethoscopes, bougies, specula, pessaries, and various other instruments, useful in surgery. Vogel recommends the solution in bisulphuret of carbon as an application to the skin in incised wounds. The liquid speedily evaporates, producing a refrigerant effect; while the gutta percha hardens, and holds the edges of the wound firmly together. According to Mr. Acton, the best substance for protecting the surface from the contact of poisons, contagions, &c., is prepared by dissolving with a gentle heat a drachm of gutta percha in an ounce of benzole, and ten grains of caoutchouc in the same quantity of the same menstruum, and mixing the solutions. It may be applied by a brush, and a delicate film is left by the evaporation of the liquid. A saturated solution in chloroform is highly recommended in various chronic affections of the skin by Dr. Graves, of Dublin. It is applied by means of a camel's hair pencil, and forms, on the evaporation of the solvent, a thin elastic covering, which completely excludes the air, and acts like an artificial cuticle to the part. The crusts or scales should be previously removed by poultices or alkaline solutions. The affections in which it has been found most efficacious, are the dry scaly and tubercular diseases of the skin, especially psoriasis. It has been used also to render the variolous eruption abortive. (*Dub. Quart. Journ. of Med. Sci.*, xiv., 1.)

HAMAMELIS VIRGINICA. *Witch-hazel.* An indigenous shrub, from five to fifteen feet high, growing in almost all sections of the United States, usually on hills or in stony places, and frequently on the banks of streams. It is remarkable for the late appearance of its yellow flowers, which expand in September or October, and continue till the weather becomes very cold in winter. The fruit, which is a nut-like capsule not unlike the hazlenut, ripens in the following autumn, and is often mingled on the same plant with the new

blossoms. The bark has a bitter, astringent, somewhat sweetish and pungent taste. It probably first attracted notice as a remedy of the Indians, who are said to have used it as a sedative and discutient in painful tumours, and other cases of external inflammation. It is used in the shape of poultice, or as a wash in the form of decoction, in hemorrhoidal affections and ophthalmia. The leaves are said to possess similar properties, and, in the state of infusion, to be given internally in bowel complaints and hemorrhages. Dr. James Fountain, of Peekskill, N. Y., speaks in strong terms of the efficacy of the bark in hemorrhage of the lungs and hæmatemesis, and also highly recommends, as one of the best applications in external piles, an ointment prepared from lard and a decoction of equal parts of this bark, white-oak bark, and that of the apple-tree. He believes the witch-hazel to possess anodyne properties. (*N. Y. Journ. of Med.*, x. 208.) Dr. N. S. Davis agrees with Dr. Fountain in his estimate of this remedy, which he has employed usefully in incipient phthisis. He gives it in decoction, made with an ounce of the bark to a pint of water, of which the dose is a wineglassful every three, six, or eight hours. (*Transact. of Am. Med. Assoc.*, i. 350.) The seeds are black and shining externally, white, oily, and farinaceous within, and edible like the hazel-nut.

HEDERA HELIX. *Ivy.* This well-known evergreen creeper is a native of Europe. The fresh *leaves* have a balsamic odour, especially when rubbed, and a bitterish, harsh, unpleasant taste. They are used for dressing issues, and, in the form of decoction, have been recommended in sanious ulcers and cutaneous eruptions, particularly tetter and the itch. Dried and powdered, they have been employed in the atrophy of children, and in complaints of the lungs, in the dose of a scruple or more. The *berries*, which have an acidulous, resinous, somewhat pungent taste, are said to be purgative and even emetic. MM. Vandamme and Chevallier discovered in ivy seeds a peculiar alkaline principle, which they called *hederin* (*hederia*). It is very bitter, and appears to be closely allied to quinia in febrifuge properties. It is obtained by treating the seeds with hydrate of lime, dissolving the precipitated alkali in boiling alcohol, and evaporating the alcoholic solution. (*Am. Journ. of Pharm.*, xiii. 172.) Prof. Posselt has discovered two acids in the seeds, one of which has their taste in a high degree, and was named by him *hederic acid*, the other he did not obtain quite pure. (See *Chem. Gaz.*, March 1, 1849, p. 93.) From the trunks of old ivy plants, growing in the South of Europe and the North of Africa, a resinous substance exudes through incisions in the bark, which has been employed in medicine under the name of *ivy gum*. It is in pieces of various sizes, of dark yellowish-brown colour sometimes inclining to orange, more or less transparent, sometimes of a deep ruby-red colour internally, of a vitreous fracture, pulverizable, yielding a lively orange-yellow powder, of a peculiar not disagreeable odour when heated or inflamed, and of a bitterish resinous taste. Its chief constituent is resin, though some pieces contain a considerable proportion of bassorin, and others large quantities of ligneous matter. It was formerly used as a stimulant and emmenagogue, but is now scarcely employed. Placed in the cavities of carious teeth, it is said to relieve toothache. The *wood* of the ivy, which is light and porous, is sometimes used for making *issue-peas*.

HELENIUM AUTUMNALE. *False Sunflower. Sneezewort.* An indigenous perennial herb, from three to seven feet high, with large golden-yellow compound flowers, which appear in August. It grows in all parts of the United States, flourishing best in meadows, moist fields, and other low grounds. All parts of it are bitter and somewhat acrid, and, when snuffed up the nostrils in the state of powder, produce violent sneezing. The leaves and flowers have been recommended as an excellent errhine. Clayton says that the plant is thought to be useful in intermittent fever.

HELLEBORUS FŒTIDUS. *Bear's-foot.* This is a perennial European plant, growing in shady places, and flowering in March and April. It derived its botanical designation from its offensive odour. The leaves, which are the part used, have a bitterish, pungent, and acrid taste, and when chewed excoriate the mouth. The foot-stalks are still more acrid. This species of hellebore is said by Allioni to be the most acrid and energetic of the plants belonging to the genus. It is powerfully emetic and cathartic, and in very large doses produces dangerous effects. It has long been used in Great Britain as a domestic remedy for worms, and was brought to the notice of the profession by Dr. Bisset, who found it an efficacious anthelmintic, and prescribed it also in asthma, hysteria, and hypochondriasis. M. Decerfs has known it to cause the expulsion of tænia. It is given in powder or decoction. The dose for a child from two to six years old is from five grains to a scruple of the dried leaves, or a fluidounce of the decoction made by boiling a drachm of the dried leaves in half a pint of water. This quantity should be repeated morning and night for two or three days in succession. A syrup made from the juice of the green leaves is used in England.

HELONIAS DIOICA. *False Unicorn Plant. Star-wort.* This is a small perennial herbaceous plant, growing in most parts of the United States, in shady and hilly situations.

The root, which is the part used, is bulbous. Pursh says that it is used as a remedy in colic. Dr. Braman has found it peculiarly efficacious in atony of the generative organs, and has obtained great advantages from it in leucorrhœa. He states the dose of the powdered root at a drachm and a half, three times a day. It may also be given in the forms of syrup and tincture. (*Bost. Med. and Surg. Journ.*, xl. 416.)

HERMODACTYLS. *Hermodactyli.* Under this name are sold in the shops of Europe the roots or bulbs of an uncertain plant, growing in the countries about the eastern extremity of the Mediterranean. By some botanists the plant is considered a species of *Colchicum*, and the *C. variegatum*, a native of the South of Europe and the Levant, is particularly indicated by Fée, Geiger, and others; while by authors not less eminent, the roots are confidently referred to *Iris tuberosa*. They certainly bear a considerable resemblance to the bulb of Colchicum autumnale, being heart-shaped, channelled on one side, convex on the other, and from half an inch to an inch in length, by nearly as much in breadth. As found in the shops, they are destitute of the outer coat, of a dirty yellowish or brownish colour externally, white and amylaceous within, inodorous, and nearly tasteless, though sometimes slightly acrid. They are often worm-eaten. Their chief constituent is starch, and they contain no veratria or colchicia. From this latter circumstance, and from their insipidity, it has been inferred that they are probably not derived from a species of Colchicum; but Geiger observes that they may have lost their acrimony by age. They are in fact almost without action upon the system, and are now seldom used; never, we believe, in this country. It is doubted whether they are the *hermodactyli* of the ancients, which were certainly a powerful medicine, operating very much in the same manner as our colchicum, and like it proving useful in gout and rheumatism. Pereira describes a bitter variety of hermodactyls, which was brought from India by Dr. Royle. The bulbs are smaller and darker than the others, and have externally a striped or reticulated appearance. From their bitter taste they are probably more active.

HIBISCUS ABELMOSCHUS. *Abelmoschus moschatus.* Wight and Arnott. An evergreen shrub, growing in Egypt, and in the East and West Indies, and affording the seeds known under the names of *semen Abelmoschi, alceæ Ægyptiacæ* and *grana moschata*. These are of about the same size as flaxseed, kidney-shaped, striated, of a grayish-brown colour, of an odour like that of musk, and of a warm somewhat spicy taste. They were formerly considered stimulant and antispasmodic; but are now used only in perfumery. The Arabs flavour their coffee with them. They are said to be employed in the adulteration of musk. Another species, *Hibiscus esculentus*, or *Abelmoschus esculentus* of Wight and Arnott, is cultivated, under the name of *okra*, *bendee*, or *gombo*, in various parts of the world, for the sake of its fruit, which abounds in mucilage, and is used for thickening soup. The leaves are sometimes employed for preparing emollient poultices.

HURA BRASILIENSIS. *Assacou.* Hura Brasiliensis of Martius is a Brazilian tree belonging to the family of Euphorbiaceæ, and known to the natives of the country it inhabits by the name of *assacou*. Another species of the same genus, *H. crepitans*, growing in the W. Indies, and characterized by the tendency of its fruit to break when ripe with violence into several pieces, and thus scatter the seeds, has long been known as an acrid emeto-cathartic, capable in large doses of acting as a violent poison. The fresh juice, the seeds, and a decoction of the bark, all have these properties, which, in fact, belong in a greater or less degree to most of the Euphorbiaceæ; and, as in other members of the same family, an oil expressed from the seeds is actively purgative. It is highly probable that the Hura Brasiliensis is similar in all these respects to its congener. Martius states that the juice is anthelmintic, and employed to intoxicate fish. But attention has recently been especially attracted to the plant, in consequence of reports favourable to its efficacy in that terrible scourge of Brazil, the elephantiasis or leprosy of the country. These reports were received by the Academy of Medicine, of Paris, from the French Consul in one of the towns of Para, of which province the natives are said to regard the remedy as a specific in the complaint referred to. Experiments have been made by the Brazilian physicians, and it is said with favourable results, though complete cures have not been obtained. The fact is, that various acrid emeto-cathartic medicines, capable also of producing diaphoresis, have been more or less useful in elephantiasis, as the Calotropis gigantea, and one or more species of Ionidium; and it is probable that the assacou acts in a similar manner, and with similar results. The milky juice of the plant, and an infusion or decoction of the bark are used. The juice is extremely acrid, producing on the skin, when applied to it, an erysipelatous redness and a pustular eruption; and the natives are said to employ it in the preparation of a poison. A grain of the juice made into a pill, or a scruple of the bark infused in a pint of water, is given every day, and gradually increased as the stomach and bowels will bear it. Every week an emetic preparation is administered, made by boiling half an ounce of the bark in a pint of water to half a pint, to which twelve

drops of the juice are added. Every second or third day the patient takes a bath, consisting of a saturated infusion of the bark. (*Journ. de Pharm. et de Chim.*, xiv. 424.)

HYDRANGEA ARBORESCENS. *Common Hydrangea. Seven Barks.* This species of Hydrangea is indigenous, growing in shady places, in the woods and on the banks of streams throughout the middle and southern States. It is a shrub from four to eight feet high, with ovate or cordate leaves, from three to six inches long, generally acuminate, serrately toothed, and slightly pubescent or nearly glabrous. The flowers are in fastigiate cymes, and appear in July. For a particular botanical description of the plant, the reader is referred to Torrey and Gray's *Flora of North America* (i. 591). The root, which is the part used, consists of a caudex, from which proceed numerous radicles, from the thickness of a quill to that of the finger or more. For use it should be cut into transverse pieces when fresh, and then dried. The taste is aromatic, pungent, and not unpleasant. The root was analyzed by Mr. Laidley, of Richmond, Va., who found in it gum, albumen, starch, resin, and various salts, among which was a protosalt of iron. (*Am. Journ. of Pharm.*, xxiv. 20.) Attention was first called to it as a remedy in the *N. J. Med. Report. and Trans.* for Oct., 1850 (p. 44), by Dr. S. W. Butler, whose father, Dr. E. Butler, long residing as a missionary among the Cherokee Indians, employed it with great apparent advantage in their calculous complaints. Dr. Butler used it in the form of decoction, or of a syrup made from the decoction with sugar or honey. A strong syrup may be given in the dose of a teaspoonful three times a day. In over-doses it occasions vertigo, oppression of the chest, &c.

HYDRASTIS CANADENSIS. *Yellow root. Orange root.* This is an indigenous plant, growing in different parts of the United States, but most abundantly beyond the Alleghanies. It flourishes best in rich shady woods. It has a perennial root, and an herbaceous stem, from six inches to a foot high, with two unequal leaves, and a single terminal whitish or rose-coloured flower. The root consists of a tortuous caudex and numerous long fibres, and is of a bright-yellow colour. It is juicy in the recent state, and loses much of its weight when dried. It has a strong, somewhat narcotic odour, and an exceedingly bitter taste. Examined by Mr. Alfred A. B. Durand, of Philadelphia, it was found to contain albumen, starch, fatty matter, resin, yellow colouring matter, sugar, lignin, and various salts. He also discovered a peculiar nitrogenous, crystallizable substance, for which he proposes the provisional name of *hydrastin*, until it shall be determined whether it is, as he suspects, an organic alkali. (*Am. Journ. of Pharm.*, xxiii. 113.) The root probably possesses the ordinary virtues of the vegetable bitters, and is said to be popularly employed as a tonic in some parts of the country. In the form of infusion, it has been used in the Western States as a topical application in ophthalmia; and the Indians are said to employ it in the same manner in old ulcers of the legs. The notion of its efficacy in cancer, originating in a report which reached the late Professor Barton, that it was used in the cure of this complaint by the Cherokees, is probably altogether groundless. Dr. U. E. Ewing, of Lexington, Ky., and Dr. D. M. McCann, of Martinsburgh, Ohio, have recommended an infusion or decoction of the root as an injection in gonorrhœa. Dr. McCann made the decoction in the proportion of a drachm of the dried root to a pint of water, and injected a syringe-full three times a day. Dr. Ewing used the infusion with the addition of *sulphate of copper*. (*Med. Examiner*, N. S., vii. 733.) Dr. P. C. Gooch has subsequently used it in five cases, and obtained no good effect whatever. (*Am. Journ. of Med. Sci.*, N. S., xxiii. 286.) The Indians employ the juice of the root to stain their clothing, &c., yellow.

HYDRIODIC ACID. *Acidum Hydriodicum.* Dr. Andrew Buchanan, of Glasgow, recommends the following formula for obtaining this acid for medicinal purposes. Take of iodide of potassium 330 grains, tartaric acid 264 grains. Dissolve the salts, separately, each in a fluidounce and a half of distilled water, and mix the solutions. Filter the liquor, in order to separate the bitartrate of potassa which precipitates, and add to it sufficient distilled water to make the whole measure fifty fluidrachms. When of this strength, each fluidrachm of the acid contains five grains of iodine. The solution of hydriodic acid, when thus prepared, is sufficiently pure for medicinal use, although containing a little cream of tartar in solution. At first it is limpid, or has only a slight yellow tinge; but on keeping it assumes, first a wine-yellow, and afterwards a beautiful red colour, in consequence of the disengagement of iodine.

Dr. Buchanan considers uncombined iodine to be an irritant, and its alterative powers, when these are manifested, to depend upon its conversion into hydriodic acid, of a strength sufficiently moderate to be readily absorbed, and to pass into the current of the circulation. He conceives that when iodine is given, and proves to be absorbed, it is by being first converted into hydriodic acid by hydrogen derived from the gastric juice, or from the tissues of the stomach, which latter undergo corrosion. A desire to avoid this incidental irritant effect led Dr. Buchanan at first to combine the iodine with starch, which he supposes to

furnish the necessary hydrogen while undergoing digestion, and finally to use the hydriodic acid ready formed.

In giving the liquid hydriodic acid according to his formula, Dr. Buchanan begins by exhibiting a few drops, and afterwards increases the dose, first to a fluidrachm and finally to half a fluidounce three times a day, equal to a drachm of iodine daily. This was his ordinary maximum dose, but sometimes he gave a fluidounce three times a day. In all cases the acid was administered sufficiently diluted with water to reduce it to an agreeable sourness, in which state it possesses no irritant action whatever. When, however, the acid has undergone a change of colour, as previously mentioned, Dr. Buchanan uses a solution of starch as a vehicle, in order to divest the free iodine, the presence of which is indicated by this change, of all irritant qualities. Hydriodic acid, when thus used, exhibits the same therapeutic effects as free iodine, with the advantages of having no irritant property, and of affording the means of introducing much larger quantities of iodine into the system through the medium of absorption, than when given in the ordinary form. (*Am. Journ. of Med. Sci.*, xx. 210 and 214, from the *Med. Gazette.*) Dr. Samuel Lewis and Mr. T. J. Husband, of this city, have combined hydriodic acid with several of the organic alkalies, with a view to form new medicinal preparations. (*Am. Journ. of Pharm.*, xvi. 21.)

HYDRIODIC ETHER. *Æther Hydriodicus. Iodide of Ethyle.* This ether may be obtained by gradually and cautiously mixing five parts of alcohol, ten of iodine, and one of phosphorus, and distilling. The phosphorus is converted into phosphorous acid by the oxygen of the alcohol, and the liberated ethyle unites with the iodine. Hydriodic ether is a colourless non-inflammable liquid, insoluble in water, with a penetrating ethereal odour and pungent taste. Its density is 1·92, and boiling point 158° F. When exposed to the air it becomes red from the liberation of iodine, a change which is prevented by adding to the bottle containing the ether, a globule of mercury. Being an iodide of ethyle, its formula is C_4H_5I. M. Huette has proposed this ether as a medicinal agent, to be used by inhalation, placed under a layer of water. Fifteen or twenty inspirations suffice to impregnate the system with iodine. Its physiological effects appear to be those of an antispasmodic and general stimulant. It increases the appetite, renders the pulse fuller, and gives vivacity to the feelings and activity to the intellect. M. Huette considers it a suitable preparation for bringing the system rapidly under the influence of iodine, and by any desired dose. (See *Am. Journ. of Pharm.*, xxiii. 156.)

HYDROCOTYLE ASIATICA. *Thick-leaved Pennywort. Bevilacqua.* Boileau. This is a small umbelliferous plant, with a trailing stem, and, in consequence of the shape of its leaves, bearing some resemblance to the violet. It grows in moist grounds in India, Southern Africa, and the Islands of the Indian Ocean. It has long been ranked among the medicinal plants of India, where it has been used as an alterative to purify the blood in children. It has been supposed to possess diuretic properties; and, according to Ainslie, is employed in infusion with fenugreek in fever and bowel complaints. But it has recently attracted considerable attention, from the claims strongly urged in its favour as a remedy in that most obstinate affection often called leprosy, but more correctly elephantiasis of the Greeks. It was first employed in this complaint by Dr. Boileau, of the Island of Mauritius, who was himself a victim of the disease, and had resorted to this remedy under the false impression that it might be identical or analogous with the *cuichunchulli.* He was so much pleased with its effects that he was induced to try it upon others; and a great number of lepers were put under its influence. All the cases were arrested, many were benefited, and in some the disease almost disappeared. The statements of Dr. Boileau have been supported by those of M. Lépine, of Pondicherry, and the medicine would certainly seem to merit a thorough investigation. Dr. Boileau, probably at first in ignorance of its proper botanical title, gave it the name of *bevilacqua.* He used it in powder, infusion, and syrup. An ounce of the dried plant may be given daily in the form of infusion, made with a pint of water. This should be continued for several weeks, and combined with baths, and attention to the state of the bowels. After this preparation, the syrup is to be given in spoonful doses three times a day, to be gradually increased after three weeks, if no improvement has taken place, to eight spoonfuls daily. The powder may be added to the syrup, if deemed necessary, in the dose, at first of fifteen grains, increased cautiously to a drachm. (*Journ. de Pharm.*, 3*e sér.*, xxiv. 424, and xxv. 153.)

HYDROCYANIC ETHER. *Æther Hydrocyanicus. Hydrocyanate of Etherine. Cyanuret of Ethyle.* This ether was discovered by Pelouze. It is formed by distilling a mixture of sulphovinate of baryta and cyanuret of potassium. It is a colourless liquid of a penetrating garlic odour, soluble in alcohol and ether, sparingly soluble in water, boiling at 180°, and weighing specifically 0·78. It is very poisonous, but less so than hydrocyanic acid, with which it agrees in therapeutic action and dose.

HYPERICUM PERFORATUM. *St. John's Wort.* A perennial herb, abundant both in Europe and this country, often covering whole fields, and proving extremely troublesome to farmers. It is usually from one to two feet high, with leaves which, from the presence of numerous transparent vesicles, appear as if perforated, and have hence given origin to the botanical designation of the plant. The flowers, which are numerous and of a deep-yellow colour, appear during the summer from June to August. The flowering summits are the parts used, though the unripe capsules are possessed of the virtues of the plant in an equal degree, and the seeds are said to be even stronger. St. John's wort has a peculiar balsamic odour, which is rendered more sensible by rubbing or bruising the plant. Its taste is bitter, resinous, and somewhat astringent. It imparts a yellow colour to cold water, and reddens alcohol and the fixed oils. Its chief constituents are volatile oil, a resinous substance, tannin, and colouring matter. As a medicine it was in high repute among the ancients, and the earlier modern physicians. Among the complaints for which it was used were hysteria, mania, intermittent fever, dysentery, gravel, hemorrhages, pectoral complaints, worms, and jaundice; but it was, perhaps, most highly esteemed as a remedy in wounds and bruises, for which it was employed both internally and externally. It is difficult to ascertain its exact value as a remedy; but from its sensible properties, and from the character of the complaints in which it has been thought useful, it may be considered, independently of its astringency, as somewhat analogous in medical power to the turpentines. It formerly enjoyed great reputation for the cure of demoniacs; and the superstition still lingers among the vulgar in some countries. At present the plant is scarcely used except as a domestic remedy. The summits were given in the dose of two drachms or more. A preparation was at one time officinal, under the name of *oleum hyperici*, made by treating them with a fixed oil. It has a red colour, and is still used in many families as a sovereign remedy for bruises.

HYPOSULPHITE OF SODA. *Sodæ Hyposulphis.* This salt is readily prepared, according to Walchner, by mixing a pound of dry carbonate of soda, in fine powder, with five ounces of sulphur, heating the mixture gradually in a porcelain vessel until the sulphur melts, and stirring the agglutinated mass, still kept hot, in order that every portion of it may come in contact with the air. The sulphuret of sodium, first formed, is thus converted into sulphite of soda. This is dissolved in water, and the filtered solution, being boiled with sulphur, becomes one of hyposulphite of soda, from which, on concentration, the salt is deposited in large, colourless, transparent crystals, which are freely soluble in water, but insoluble in alcohol. Hyposulphite of soda is largely used by daguerreotypists for the purpose of dissolving the sensitive coating of iodide of silver from the plate, after the action of the light, and thus fixing the image already formed.

Latterly, this salt has been used in skin diseases, and especially in that form of stomach disease attended with yeasty vomiting. It is particularly efficacious in the treatment of violent irritations of the skin; but is also useful in visceral obstructions. It may be prepared as a *syrup* by dissolving an ounce and a half of the salt in seven fluidounces of water, and adding sixteen ounces of sugar. Of this two teaspoonfuls may be taken three times a day. (Mouchon, *Ann. de Thérap.*, 1852, 111.) Dr. R. Neale, of London, has used this salt with great advantage in an obstinate case of yeasty vomiting, in which the vomited matter showed, under the microscope, numerous sarcinæ ventriculi. He gave it in the dose of from ten to fifteen grains three times a day, in half a fluidounce of infusion of quassia. (*Braithwaite's Retrospect*, xxviii. 131.)

HYPOSULPHITE OF SODA AND SILVER. *Sodæ et Argenti Hyposulphis.* This double salt may be prepared by dissolving freshly precipitated oxide of silver in a solution of hyposulphite of soda, and evaporating the solution. It is in the form of minute crystals, very soluble in water, but insoluble in alcohol, and possessing a very sweet taste. Its solution, protected from the light, undergoes no change, and, when quite pure, does not discolour the skin or linen. M. Delioux, of Rochefort, has tried this salt externally only, and thinks it acts like nitrate of silver, but more mildly. He used it with advantage in urethral discharges especially, dissolved in the proportion of one or two parts in two hundred of water. (*B. and F. Medico-Chirurg. Review*, Am. ed., April, 1853, p. 447, from the *Bull. de Thérap.*)

HYSSOPUS OFFICINALIS. *Hyssop.* This is a labiate plant, belonging to the class and order Didynamia Gymnospermia of the sexual system. It is perennial, with numerous erect, quadrangular, somewhat branching stems, which are woody in their inferior portion, about two feet high, and furnished with opposite, sessile, lanceolate-linear, pointed, punctate leaves. The flowers are violet-coloured or blue, sometimes white, turned chiefly to one side, and arranged in half verticillated, terminal, leafy spikes. The upper lip of the corolla is roundish and notched at the apex, the lower is divided into three segments, of which the undermost is obovate.

Common hyssop is a native of the continent of Europe, where, as well as in this country, it is also cultivated in gardens. The flowering summits and leaves are the parts used. They have an agreeable aromatic odour, and a warm, pungent, bitterish taste. These properties they owe to an essential oil, which may be obtained separate by distillation with water, and rises also with alcohol. Hyssop is a warm gently stimulant aromatic, applicable to the same cases with the other labiate plants. Its infusion has been much employed in chronic catarrhs, especially in old people, and those of a debilitated habit of body. It acts by facilitating the expectoration of the mucus which is too abundantly secreted. In this country, however, it is very seldom used by regular practitioners.

IBERIS AMARA. *Bitter candytuft.* A small herbaceous plant, indigenous in Europe, where it is cultivated in gardens, on account of its bright milk-white flowers. The leaves, stem, and root are said to possess medicinal properties; but the seeds are the most efficacious. The plant appears to have been employed by the ancients in rheumatism, gout, and other diseases. It has recently been brought into notice by Dr. Silvester, who ascribes to the late Dr. Williams, of St. Thomas's Hospital, England, the merit of having first ascertained its real therapeutic value. In large doses it produces giddiness, nausea, and diarrhœa; but its virtues do not seem to be associated with any perceptible physiological effect. It is thought to exercise a happy influence over the excited actions of the heart, and is especially useful in hypertrophy. Much advantage is also said to have accrued from it in asthma, bronchitis, and dropsy. The dose of the seeds is from one to three grains. (*Prov. Med. and Surg. Journ.*, July 28, 1847.)

ILEX. *Holly.* Several species of Ilex are employed in different parts of the world. The *I. Aquifolium*, or *common European holly*, has attracted much attention in France. It is usually a shrub, but in some places attains the magnitude of a middling-sized tree. Different parts of it are used. The viscid substance called birdlime is prepared from the *inner bark.* The *leaves*, which are of a bitter, somewhat austere taste, were formerly much esteemed as a diaphoretic, and in the form of infusion were employed in catarrh, pleurisy, small-pox, gout, &c. A few years since they gained some reputation in France as a cure for intermittents, and were considered by some as equal to Peruvian bark; but the first reports in their favour have not been fully confirmed. They were used in powder, in the dose of a drachm two hours before the paroxysm; and this dose was sometimes repeated frequently during the apyrexia. Their febrifuge virtues are said to depend on a bitter principle, for which the name of *ilicin* has been proposed. M. Labourdais obtained this principle by boiling a filtered decoction of holly leaves with animal charcoal, allowing the charcoal to subside, washing it, then treating it with alcohol, filtering off the alcoholic solution, and evaporating it to a syrupy consistence. The liquid thus obtained was very bitter, and on being allowed to evaporate spontaneously, yielded an amorphous substance, having the appearance of gelatin, which was the principle in question. (*Am. Journ. of Pharm.*, xxi. 89, from *Ann. de Chim. et de Phys.*) The *berries* are about the size of a pea, red and bitter, and are said to be purgative, emetic, and diuretic. Ten or twelve of them will usually act on the bowels, and sometimes vomit. Their expressed juice has been used in jaundice.

The *Ilex opaca*, or *American holly*, is a middling-sized evergreen tree, growing throughout the Atlantic section of the United States, and especially abundant in New Jersey. It is so similar to the European plant, that it is, by some writers, considered as the same species. It is said to possess the same medical properties.

The *Ilex Paraguaiensis*, or *I. Mate* of St. Hilaire, yields the celebrated *Paraguay tea*, so extensively consumed as a beverage in the interior of South America. The leaves, which are the part used, have a balsamic odour and a bitter taste, and are usually at first disagreeable to the palate. They have a pleasant corroborant effect upon the stomach; but, when very largely taken, are said to purge and vomit. They are used in the form of infusion. According to the experiments of Stenhouse, these leaves contain a principle identical with the caffein of tea and of coffee; and like them contain also tannic acid; so that a close analogy exists in composition as well as effects between these three products, so little allied botanically, and so far separated in place of growth.

The *Ilex vomitoria* of Aiton and Linn., the *I. Cassina* of Michaux, is a handsome evergreen shrub, growing in our Southern States, and especially abundant along the southern coast of Florida. It is the *cassina* of the Indians, who formerly employed a decoction made from the toasted leaves, called *black drink*, both as a medicine, and as a drink of etiquette at their councils. It acts as an emetic. The leaves of the *Ilex Dahoon* of Walter and Michaux have similar properties, and are also said to have entered into the composition of the black drink.

ILLICIUM FLORIDANUM. *Florida Anise-tree.* This is an evergreen shrub or small tree, growing in Florida, along the coast which bounds the Gulf of Mexico. The bark,

leaves, and probably also the seed vessels, are endowed with a spicy odour and taste, analogous to those of anise, and might, perhaps, be used for the same purposes as that aromatic. It is a question worthy of investigation whether the capsules of this plant might not be substituted for those of the *Illicium anisatum* or *star aniseed*, which yield much of the oil used in this country under the name of *oil of anise*. (See *Anisum*.) Another species, the *I. parviflorum*, a shrub found by Michaux in the hilly regions of Georgia and Carolina, has a flavour closely resembling that of sassafras root.

IMPATIENS FULVA and IMPATIENS PALLIDA. *Touch-me-not. Jewel-weed. Balsam-weed.* These two species of Impatiens are indigenous, annual, succulent plants, from two to four feet high, growing in low moist grounds in all parts of the Union, and flowering in July and August. They may be known by their tender, juicy, almost transparent stems; by their yellow flowers, which in one species are pale and sparingly punctate, in the other, are deeper coloured and crowded with dark spots; and by their capsules, which burst elastically, and curl up with the slightest pressure. They probably possess properties similar to those of the *I. Noli-me-tangere* of Europe, which has an acrid burning taste, and, when taken internally, acts as an emetic, cathartic, and diuretic, though considered dangerous, and therefore little used. The late Dr. Ruan, of Philadelphia, informed us that he had employed with great advantage, in piles, an ointment made by boiling the American plants, in their recent state, in lard. The flowers may be used for dyeing yellow. The *I. Balsamina* or *balsam-weed, touch-me-not, &c.* of the gardens, resembles the other species in its effects.

IMPERATORIA OSTRUTHIUM. *Masterwort.* An umbelliferous plant, indigenous in the South of Europe. The root has a strong odour, similar to that of angelica, and a pungent, biting, aromatic taste, attended with a flow of saliva, and followed by a glowing warmth which remains long in the mouth. It was formerly considered alexipharmic, stomachic, corroborant, emmenagogue, diuretic, and diaphoretic; and was used in a wide circle of complaints with so much supposed success as to have gained for it the title of *divinum remedium*. The fact, however, appears to be, that it is merely a stimulant aromatic, analogous but inferior to angelica, which has nearly superseded it in European practice. In this country, it is unknown as a remedy, and its vulgar name has been applied to another plant.

INDELIBLE INK. This is prepared by dissolving two drachms of nitrate of silver and a drachm of gum Arabic in a fluidounce of distilled water, coloured with a little Indian ink. It is used for writing with a pen on linen and muslin. The place to be marked is prepared by being moistened with a solution of two ounces of crystallized carbonate of soda and two drachms of gum Arabic in four fluidounces of water, and then dried. The alkaline solution serves to decompose the nitrate, and to protect the cloth from the action of the free nitric acid. At the end of twenty-four hours, the spot is to be washed.

Mr. Redwood, of London, proposes the following indelible ink, not requiring the use of a mordant. Dissolve an ounce of nitrate of silver, and an ounce and a half of crystallized carbonate of soda, separately, in distilled water, and mix the solutions. Wash the precipitated carbonate of silver, and, having introduced it, still moist, into a Wedgwood mortar, rub it with eight scruples of tartaric acid, until effervescence ceases. Then add strong solution of ammonia, just sufficient to dissolve the tartrate of silver formed (about two fluidounces). Lastly, having mixed in half a fluidounce of archil, half an ounce of white sugar, and an ounce and a half of powdered gum Arabic, add sufficient distilled water to make the whole measure six fluidounces. M. Soubeiran formerly published the following formula for indelible ink, which he considers simpler than Mr. Redwood's. Dissolve 8 parts of crystallized nitrate of silver, 3 of nitrate of copper, and 4 of carbonate of soda, in 100 parts of water of ammonia, and add to the solution a small quantity of gum. The marks, produced by nitrate of silver on linen or muslin, may be completely removed by moistening them with a solution of corrosive sublimate in 30 parts of distilled water, and afterwards washing them with ordinary water.

M. Jules Guiller has devised the three following formulæ for marking inks for linen. 1. Nitrate of silver 11 parts; distilled water 85; powdered gum Arabic 20; carbonate of soda 22; solution of ammonia 20. Dissolve the carbonate of soda in the water, rubbing the solution with the gum, and the nitrate of silver in the ammonia. Mix the solutions, and gradually heat the mixture in a flask until it boils. This ink flows readily from a pen. 2. Nitrate of silver 5 parts; distilled water 12; powdered gum Arabic 5; carbonate of soda 7; solution of ammonia 10. The ingredients are treated as in the preceding formula, with the exception that the mixed solution is heated until it becomes of a very dark colour, and is reduced about one-twentieth in volume by evaporation. This ink is suitable for marking on linen with stamps. 3. Nitrate of silver 17 parts; distilled water 85; pow-

dered gum Arabic 20; carbonate of soda 22; solution of ammonia 42; sulphate of copper 33. Dissolve the nitrate of silver in the ammonia, the carbonate of soda in 25 parts of the water, and the gum in the remaining 60 of the water. Then mix with the soda solution, first the gum solution, and afterwards the silver solution. Lastly, add the sulphate of copper. This ink has a blue, instead of the dark-brown colour of the others. (See *Am. Journ. of Pharm.*, Jan. 1853, p. 33.)

Herberger recommends the following indelible ink for other purposes than marking linen. Dissolve wheat gluten, carefully freed from starch, in a little weak acetic acid, and dilute the solution with rain water, so as to have about the strength of wine vinegar. For every four ounces of the solution, add ten grains of the best lampblack, two grains of indigo, and a little oil of cloves. This ink has a beautiful black colour, and cannot be removed by chlorine or dilute acids. (*Chem. Gaz.*, No. 70, p. 394.)

INDIAN RED. A purplish-red pigment, brought from the island of Ormus in the Persian Gulf. It is a *red ochre*, and owes its colour to the red oxide of iron.

INDIAN YELLOW. This is a pigment manufactured from a yellow substance from India, called *purree*. Purree occurs in commerce in balls, of from three to four ounces in weight, which are dark-brown externally, and deep-orange within. It has a peculiar smell, closely resembling that of castor. This circumstance gave rise to the belief that it was of animal origin; but Dr. Stenhouse, who examined it chemically, finds that it contains no nitrogen, and from this and other facts is led to the opinion that it is a vegetable substance. Upon analysis he found it to consist of magnesia, united with a peculiar acid, which he names purreic (*euxanthic acid* of Erdmann), and which forms nearly one-half of the crude substance. *Purreic acid* is in small crystals of a light-yellow colour, dissolving sparingly in cold water, pretty readily in boiling water, and abundantly in hot alcohol. It has at first a sweetish, and then a slightly bitter taste, and possesses, in appearance, considerable resemblance to berberin. When acted upon by boiling nitric acid, it is finally converted into a new acid, crystallizing in yellow needles, called by Erdmann, *oxypicric acid*. The ultimate constituents of purreic acid are carbon, hydrogen, and oxygen. From his examination of purree, Dr. Stenhouse concludes that it is probably the juice of some plant, saturated with magnesia, and boiled down to a solid consistence. (See his paper in the *Philos. Mag.*, xxv. 321.)

INDIGO. This well-known and highly important dye-stuff is obtained from various species of *Indigofera*, especially *I. tinctoria*, *I. Anil*, and *I. argentea;* and is said to be afforded also by other plants, such as *Wrightia tinctoria*, *Polygonum tinctorium*, *Galega tinctoria*, &c. In the process of preparing it, the plant is macerated in water; fermentation takes place; the liquor becomes of a greenish colour, and in due time is decanted; the colouring principle dissolved by the water absorbs oxygen from the air, and assumes a blue colour, becoming at the same time insoluble; a gradual precipitation takes place, favoured by the addition of lime-water or an alkaline solution; and finally the precipitated matter, having been washed upon linen filters, is dried, shaped usually into cubical masses, and sent into market. Most of the indigo consumed in dyeing is brought from the East Indies, though considerable quantities are imported also from Guatemala, and the northern coast of South America. It is of an intensely blue colour, but assumes a coppery or bronze hue when rubbed by a smooth hard body, as the nail. Heated to 550°, it emits a reddish-violet vapour, which condenses in minute crystals. It is insoluble in water, or alcohol, but is readily dissolved by sulphuric acid, which, without destroying its blue colour, so far alters its nature as to render it freely soluble in water, and thus affords a convenient method of applying it to the purposes of dyeing. The solution in sulphuric acid is kept in the shops under the name of *sulphate of indigo*. According to Berzelius, indigo contains, among other ingredients, four distinct principles;—1. a substance resembling gluten; 2. a brown colouring substance; 3. a red colouring substance; and 4. a blue colouring substance, which is the principle upon which its value as a material for dyeing depends, and which seldom constitutes so much as one-half of the indigo of commerce. This blue colouring matter is called *indigotin*. By deoxidizing agents it is deprived of its blue colour, which it recovers by exposure to the air, in consequence of the absorption of oxygen. Chlorine also destroys the blue colour. M. Preisser has concluded, from an elaborate examination of the *colouring principles* of plants, 1. that these principles are colourless in the young plants, 2. that they acquire colour by combination with oxygen, 3. that all the colouring matters, extracted from any one plant, are produced by the oxidation in different degrees of a single principle, 4. that they are deprived of colour by substances having a strong affinity for oxygen, and reacquire it by contact with oxidizing bodies, and 5. that these colouring principles are acids, and the lakes which they form genuine salts. (*Journ. de Pharm.*, 3*e sér.*, v. 263.) For modes of testing the value of any specimen of indigo, the reader is referred to the *Chemical Gazette* (vii. 463, viii. 443, and x. 159); also to the *Am. Journ. of Pharm.* (xxv. 223).

Indigo has been introduced to the notice of the profession as a remedial agent. It was at first chiefly employed by the German physicians, from whose statements our knowledge of its physiological action and therapeutical application was derived. Though without odour and taste, it is said, in most individuals, to produce nausea and vomiting, frequently to operate upon the bowels, giving a bluish-black colour to the stools, to render the urine of a dark-violet or dark-green colour, without increasing its quantity, and sometimes to stimulate the secretory function of the uterus. From these statements it would appear to act as an irritant to the alimentary mucous membrane. The character of its general influence upon the system has not been well ascertained. In some instances, it is asserted to have been given in very large doses without any obvious effect. The complaints in which it has been employed, with supposed advantage, are epilepsy, infantile convulsions, chorea, hysteria, and amenorrhœa. It is given, usually, in connexion with some aromatic powder, in the dose of a scruple three times a day, which may be increased to a drachm or more; and from half an ounce to an ounce has daily been employed for months together without disadvantage. (See *Am. Journ. of Med. Sci.*, xx. 487.)

IODIDE OF AMMONIUM. *Ammonii Iodidum. Hydriodate of Ammonia.* This salt is best prepared by the following method, devised by Mr. John A. Spencer, of London. Add to a portion of iodine, placed in a flask with a little water, a solution of hydrosulphate of ammonia, until the mixture loses its red colour, and is turbid from the separation of sulphur only. Shake the flask, which causes the sulphur, for the most part, to agglomerate; and, having poured off the liquid, boil it until all odour of sulphuretted hydrogen and of ammonia is lost. Then filter the liquid, and, constantly stirring, evaporate it, first with a naked flame until it becomes pasty, and then in a water bath until it forms a dry salt. Iodide of ammonium, as thus prepared, is a crystalline powder, which is beautifully white at first, but becomes, in a few weeks, yellowish, and, at last, brown. It may, however, be easily restored by dissolving the coloured salt in water, treating the solution with a little sulphuretted hydrogen water, until it is rendered colourless, filtering, and evaporating to dryness. (See *Am. Journ. of Pharm.*, March, 1853, p. 134.) Latterly, this salt has been used as a substitute for iodide of potassium. By Dr. Pennock it is considered as a good remedy in certain cases of lepra and psoriasis, made into an ointment. (*Am. Journ. of Med. Sci.*, xv. 374.) The proportions employed are from a scruple to a drachm of the salt to an ounce of lard; the weaker preparation being used when the disease is recent, the stronger when it is chronic. The ointment is employed in frictions in the amount of half an ounce, morning and evening. As the iodide is decomposed by the air, the ointment should be kept in well stopped bottles. Iodide of ammonium is used in photography.

IODIDE OF BARIUM. *Barii Iodidum.* This compound may be formed by double decomposition, by adding carbonate of baryta to a boiling solution of iodide of iron. M. Henry, jun., obtains it by decomposing a solution of sulphuret of barium (see *page* 908) by a concentrated alcoholic solution of iodine. Sulphur is precipitated, which is separated by filtration, and iodide of barium formed in solution, from which it is obtained in the solid state by a rapid evaporation to dryness. It crystallizes in small, colourless needles, which deliquesce slightly, and are very soluble in water. The solution promptly undergoes decomposition by exposure to the air, carbonate of baryta being precipitated, and iodine set free, which colours the solution. It has been used with advantage by Jahn, as an alterative, in scrofulous affections and morbid growths. Lugol employed it in scrofulous enlargements. The dose is the eighth of a grain three times a day, gradually increased to three grains. Biett applied it to scrofulous swellings in the form of ointment, made with four grains of the iodide to an ounce of lard.

IODIDE OF SILVER. *Argenti Iodidum.* This compound is formed by double decomposition, by adding a solution of iodide of potassium to one of nitrate of silver. It is a greenish-yellow powder, nearly insoluble in ammonia. It possesses the general medical properties of nitrate of silver, and, according to Dr. Charles Patterson, of Dublin, may be used without any danger of producing the discoloration of skin which sometimes follows the use of that salt. Dr. Patterson found it generally successful in curing the stomach affections of the Irish peasantry, in the treatment of which nitrate of silver had been previously found useful. He succeeded with it in curing several cases of hooping-cough in a short time, and in greatly relieving a case of dysmenorrhœa of three years' standing. Its effects in epilepsy were least satisfactory. The dose is one or two grains, three times a day, given in the form of pill; for children, from an eighth to a fourth of a grain, according to the age.

IODIDE OF STARCH. Dr. A. Buchanan, of Glasgow, proposed this compound as a means of administering iodine in large doses without causing irritation of the stomach. He prepares it by triturating twenty-four grains of iodine with a little water, adding gradually an ounce of very finely powdered starch, and continuing the trituration until

the compound assumes a uniform blue colour. The iodide is then dried by a gentle heat, and kept in a well stopped bottle. The dose is a heaped teaspoonful, given in water gruel, three times a day, and afterwards increased to a tablespoonful. No nicety is necessary in apportioning the dose. In some cases Dr. Buchanan has given half ounce doses of the iodide three times a day, immediately increased to an ounce. Exhibited in this state of combination, iodine produces, according to this writer, little or no irritation of the alimentary canal; but is freely absorbed, as is proved by its detection in large quantity in the secretions. Dr. Buchanan conceives that, by means of the starch, the iodine is converted into hydriodic acid, and in this form of combination enters the circulation. He prefers the iodide of starch to any other preparation of iodine for obtaining the alterative apart from the irritant effects of this substance. (*Am. Journ. of Med. Sci.*, xx. 213 and 217.) See *Hydriodic Acid*, page 1341.

It is a point of importance to have the iodide of starch soluble in water. This advantage is gained by roasting the starch moderately, whereby it is converted into dextrine, before it is mixed with the iodine. The process of M. Magnes-Lahens, of Toulouse, with whom this plan originated, is as follows. Take of iodine *one part*, starch, properly roasted and afterwards exposed to the air to recover its original hygrometric state, *nine parts*. Reduce the iodine to fine powder, and, by a rapid trituration, rub the starch with it, added by small portions at a time. Expose the mixture to heat in a closed flask, by means of a water bath, until from being gray, it becomes of an intensely blue colour, and then wash it with alcohol to separate all traces of free iodine. The *soluble iodide of starch*, thus formed, may be converted into a *syrup*, by dissolving 25 parts of it in 325 parts of water, by means of a water bath, and adding to the solution 650 parts of sugar. This syrup is perfectly limpid, entirely exempt from the odour of iodine, and of a splendid violet-blue colour. It contains two and a half per cent. of soluble iodide of starch, and about a quarter of one per cent. of iodine. (*Journ. de Pharm.*, April, 1851, p. 243.)

M. Magnes-Lahens has since abandoned the use of torrefied starch, and the washing with alcohol, and contents himself with making an intimate mixture of iodine and starch, slightly moistened, which he subjects to the heat of a water bath until it is converted into the iodide of starch, forming a solution with water of a magnificent blue colour. The heat, thus regulated, disaggregates the starch, without completely transforming it into dextrine, and gives a preparation, in the form of a black powder, resembling the soluble iodide of starch prepared by M. Quesneville by a secret process. M. Seput, of Constantinople, has also given a formula for this soluble iodide, and for a syrup to be made from it. (See *Journ. de Pharm.*, March, 1852, p. 202.) M. Soubeiran has reported upon these preparations to the Paris Society of Pharmacy, and deems them ineligible on account of their variable strength in iodine, arising from the greater or less loss of this element during the necessary exposure to heat. Nevertheless, as the syrup is called for, he recommends the following process for making it, availing himself of the observations of his predecessors, which he had occasion to cite in his report. The quantities of the ingredients will be stated in French grammes, each of which weighs about fifteen grains. Triturate thoroughly, in a porcelain mortar, 36 grammes of nitric starch with 4½ grammes of iodine, dissolved in three times its weight of ether, and added in successive portions, until, after the evaporation of the greater part of the ether, a blue powder remains. Introduce this into a weighed, stoppered flask, and, having added 520 grammes of water, expose the whole to the heat of a water bath, with the stopper at first removed, in order to complete the dissipation of the ether. Afterwards the stopper is replaced, being loosely tied with a packthread, so as to permit of its being raised without being driven out; and the heat is continued for about an hour and a half, when the iodide of starch will be completely formed. The flask is then weighed, and a quantity of water added to it, equal to that lost by evaporation. Lastly, 1040 grammes of sugar are added to the liquid, and dissolved by a gentle heat. By this formula a syrup is prepared, containing a quarter of one per cent. of iodine, a small part of which is in the state of hydriodic acid. The *nitric starch* is used by M. Soubeiran, because it unites with the iodine in much less time than the ordinary starch. It is made by mixing ordinary starch, in the cold, with 150 parts of water, to which 1 part of nitric acid has been added, and allowing the whole to dry in the open air. Three grains of this syrup, diluted with a pint of water, communicate to the solution a sensible blue tint. This test may serve to determine whether the preparation is of full strength. (*Journ. de Pharm.*, May, 1852, p. 329.) The dose of this syrup is from one to four tablespoonfuls a day.

IODIDE OF ZINC. *Zinci Iodidum.* This iodide may be formed by digesting an excess of zinc, in small pieces, with iodine diffused in water. Combination takes place, and, by evaporation, a deliquescent, very soluble saline mass is obtained, having a metallic styptic taste, resembling that of sulphate of zinc. It may also be obtained by heating in a matrass a mixture of 20 parts of zinc and 170 of iodine, and subliming into a vial. When

thus prepared, it is in the form of white needles. This salt is very liable to undergo spontaneous decomposition.

Iodide of zinc is tonic and astringent. It has been lately tried by Dr. Barlow, in Guy's Hospital, in cases of chorea, scrofula, cachexia, and in some forms of hysteria. (*Med. Times and Gaz.*, Nov., 1853, p. 501.) The best form of administration is *syrup*, to protect it from change, originally proposed by the late Dr. A. T. Thomson, and made on the same plan as the syrup of iodide of iron. (See *page* 1005.) Mr. A. B. Taylor, of Philadelphia, proposes to form it by gently heating, in an evaporating dish, *twelve drachms and two scruples* of iodine, and *an ounce* of finely granulated zinc, with *nine fluidounces* of water, until they unite, filtering the solution, while hot, on *a pound* (avoird.) of sugar, contained in a wide-mouthed bottle holding a little more than a pint, and adding, through the filter, sufficient water to make the whole measure a pint. This syrup is perfectly clear and colourless, is styptic to the taste, and contains a drachm of iodide of zinc in each fluidounce. (*Am. Journ. of Pharm.*, Jan., 1852, p. 33.) The dose of this syrup is from 20 to 50 drops, sufficiently diluted with water, three times a day.

Iodide of zinc has been used for many years as an external application. Dr. J. J. Ross, of Scotland, employed a solution, containing from 10 to 30 grains to the fluidounce of water, with great advantage in enlarged tonsils, applied by means of a piece of sponge tied to a quill. After the use of the solution for some time, he applied the iodide, rendered liquid by deliquescence, by means of a camel's hair brush. A solution containing one or two grains to the fluidounce of water, has been used as an astringent injection in gonorrhœa. An ointment, made of a drachm of the iodide with an ounce of lard, has been proposed by Dr. Ure as a substitute for the ointment of iodide of potassium in the treatment of tumours, applied in the quantity of a drachm twice a day.

IODIDES OF CALOMEL. These iodides, comprising a subiodide and protiodide, were brought forward as remedies by M. Boutigny. They are formed by the action of one eq. of iodine on two and one eqs. severally of calomel, the combination being aided by a gentle heat. Both these iodides are active preparations, and have been employed with success in syphilitic, scrofulous, and cancerous affections. The *subiodide* may be given in pill, in the dose of the twenty-fifth of a grain. The *protiodide* is used externally only, and should be applied with caution. It acts as a caustic, and may be cast into sticks, like nitrate of silver. An ointment may be made of it, by rubbing one part with twenty of fresh lard. A portion of the ointment, the size of a large pea, may be rubbed daily on a scrofulous tumour, in the arm pits, or on the inner part of the thigh. The composition assigned by M. Boutigny to these compounds requires confirmation. (*Ann. de Thérap.*, 1848.)

IODOFORM. *Iodoformum. Teriodide of Formyle.* (C_2HI_3.) This is formed, according to the process of MM. Cornélis and Gille, of Liege, by adding to an alcoholic solution of iodide of potassium, heated to 104° F., chlorinated lime, in successive portions, stirring after each addition, until the liquid ceases to assume a dark-red colour. On cooling, a mass of confused crystals is deposited, consisting of iodoform and iodate of lime. By treating these with boiling alcohol of 90 per cent., the iodoform alone is dissolved; and the alcoholic solution, as it cools, deposits the iodoform in crystals. (*Journ. de Pharm.*, Sept., 1852, p. 196.) It is in the form of yellow crystals, having a strong saffron-like odour, insoluble in water, but readily soluble in alcohol and ether. According to M. Righini, iodoform possesses remarkable antiseptic and antispasmodic properties. He also attributes to it the power of retarding the progress of phthisis, when inhaled in ethereal solution.

IODOHYDRARGYRATE OF POTASSIUM. It has been found by chemists that different iodides will unite together in different proportions, forming compounds which are called by Berzelius double iodides. Bonsdorff, of Finland, and Dr. Hare, of this city, with greater reason, have viewed these combinations as a peculiar kind of salts, in which one of the iodides performs the part of an acid, the other of a base. The substance, the name of which is placed at the head of this article, is one of these compounds, and was presented to the notice of the profession, as a new remedy of remarkable powers, in February, 1834, by Dr. William Channing, of New York. (*Am. Journ. of Med. Sci.*, xiii. 388.) It consists of biniodide of mercury acting as an acid, and iodide of potassium as a base. But as these iodides combine in at least two proportions, it is necessary to indicate the particular combination employed by Dr. Channing.

In a difficult case of pectoral disease, in which the ordinary remedies had failed, Dr. Channing determined to make trial of one of the iodides of mercury. He selected the biniodide; and, in order to have it in the liquid form, it being insoluble in water, he dissolved it in a solution of iodide of potassium. He was struck with the chemical changes which the compound solution underwent; and, on pursuing his observations, he found that the two iodides really united by the intervention of the water; for, with the aid of

an operative chemist, he was enabled by evaporation to obtain them in union in the form of straw-coloured, needleform, deliquescent crystals. He next found, upon consulting the European authorities, that Bonsdorff, who had taken the lead in investigating similar compounds, had discovered the salt in 1826.

Dr. Channing analyzed the salt with which he experimented, and found that it consisted of one eq. of biniodide of mercury, and two of iodide of potassium. This he determined by ascertaining that an aqueous solution of a little more than eight grains of iodide of potassium would dissolve, and combine with, eleven grains of biniodide of mercury, without being liable to decomposition when largely diluted with water. The combination here indicated corresponds with one of the double iodides of mercury and potassium, described by Thenard. (*Traité de Chimie, 6ème ed.*, iii. 493.) The other is represented by this author as consisting of a single eq. of each iodide. When copiously diluted with water, every two eqs. of this iodide let fall one eq. of the mercurial iodide; thus evidently converting the salt into the medicinal double iodide. The same decomposition by the use of abundance of water is noticed by Dr. Channing. For remarks on these double iodides see a paper by Mr. Ambrose Smith, *Am. Journ. of Pharm.*, xii. 265.

Dr. Channing attributes to this preparation the effects of diffusing excitement, and equalizing the circulation. In the different cases in which he tried it, he thought he saw evidence of its favourable influence on the lungs, in allaying cough and improving expectoration; on the alimentary canal, in restoring the healthy secretions; on the kidneys, in reviving their activity; on the skin and cellular tissue, in cicatrizing superficial ulcerations; and on the absorbent and exhalant systems, in causing the disappearance of effused fluid. The principal diseases in which he found it useful were chronic bronchitis, hooping cough, tonsillitis, chronic gastro-enteritis, dyspepsia, ascites, anasarca, amenorrhœa, leucorrhœa, eruptions, and scrofula. In some cases of phthisis, it mitigated the symptoms, and appeared to prolong life. Dr. Hildreth, of Ohio, has tried this preparation, and reports favourably of its effects in ordinary dyspepsia unattended by organic disease, enlargement of the spleen, amenorrhœa, dysmenorrhœa, leucorrhœa, scrofulous affections, ascites, and general dropsy. (*Am. Journ. of Med. Sci.*, xxvi. 312.)

The average dose of the remedy may be stated at the twelfth of a grain three times a day; but in peculiar constitutions, not more than the forty-eighth, the ninety-sixth, or the two hundreth of a grain daily can be borne. For the convenience of physicians who may wish to make trial of the remedy, we give the following formula, deduced from the statements in Dr. Channing's paper.—Take of iodide of potassium three and a half grains; biniodide of mercury (red iodide), four and a half grains; distilled water a fluidounce. Dissolve first the iodide of potassium and then the biniodide of mercury in the water. The compound salt in this solution may be assumed to amount to eight grains, though there is a small excess of the iodide of potassium. Of this solution, from two to five drops, containing from the thirtieth to the twelfth of a grain, may be given three times a day. It may be administered in the compound syrup of sarsaparilla, which does not decompose it.

IONIDIUM MARCUCCI. This name has been conferred by Dr. Bancroft upon a South American plant, supposed to be the source of a medicine used with great asserted advantage in Maracaibo and elsewhere, in some of the horrible cutaneous affections, especially elephantiasis, to which the inhabitants of the tropical regions of this continent are subject. A specimen, however, received from Dr. Bancroft, was found by Sir W. Hooker to be identical with the *Ionidium parviflorum* of Ventinat. The medicine is called by the Indians *cuichunchulli*, and grows in the neighbourhood of Riobamba, a small town at the foot of the great mountain of Chimborazo. It is said to be diaphoretic, diuretic, occasionally sialagogue, and in large doses emetic and cathartic. The root is the part used. It is highly probable that other vegetable emeto-cathartics, having the same property of stimulating the secretions, would be found equally effectual. For an account of what is known in relation to this medicine, the reader is referred to a paper by Dr. Bancroft, republished in the *Am. Journ. of Pharm.*, iii. p. 125.

ISATIS TINCTORIA. *Woad. Pastel.* A biennial plant, indigenous in Europe, where it is also cultivated. The leaves have a fugitive pungent odour, and an acrid very durable taste, and have been used in scorbutic affections, jaundice, and other complaints; but the plant is valuable only as the source of a blue dye stuff, called *woad*, which has been long employed in Europe, though at present nearly superseded by indigo. The leaves are prepared by grinding them to a paste, which is made into balls, placed in heaps, and allowed to ferment. When the fermentation is at an end, the mass falls into a coarse powder, which is the dye-stuff in question.

KALMIA LATIFOLIA. *Laurel. Mountain Laurel. Broad-leafed Laurel. Calico-bush.* This well-known evergreen inhabits all sections of the United States, but is particularly abundant on the sides of hills and mountains, which it adorns in summer with its elegant

flowers. It is from three to ten feet in height. The leaves are possessed of poisonous, narcotic properties, and have been used in medicine. They have been analyzed by Mr. Charles Bullock, of Philadelphia, and found to contain gum, tannic acid, resin, chlorophylle, fatty matter, a substance resembling mannite, an acrid principle, wax, extractive, albumen, yellow colouring matter, lignin, and salts of potassa, lime, and iron. (*Am. Journ. of Pharm.*, xx. 264.) They are said to prove fatal to sheep and some other animals, but are eaten with impunity by deer, goats, and partridges. Dr. Barton states in his "Collections," that the Indians sometimes use a decoction of the leaves to destroy themselves. It is said that death has been occasioned by eating the flesh of partridges and pheasants which have fed upon them during winter. Dr. N. Shoemaker published, in the *North American Medical and Surgical Journal*, two cases of poisoning which resulted from eating a pheasant, in the craw of which laurel leaves were found. The symptoms were nausea, temporary blindness, pain in the head, dyspnœa, pallid countenance, cold extremities, and a very feeble pulse, which in one case was for some time absent at the wrist, in the other beat only forty strokes in the minute. In both cases relief was afforded by vomiting, produced by a tablespoonful of flour of mustard mixed with warm water.

Dr. Barton was informed that the powdered leaves were employed by an empiric with success in certain states of fever; and Dr. Thomas, in an inaugural dissertation, published at Philadelphia, A. D. 1802, states that an obstinate case of diarrhœa was cured by a decoction, made by boiling an ounce of the leaves in eight ounces of water down to four ounces. Thirty drops were given six times a day; but this quantity produced vertigo, and the dose was afterwards repeated only four times daily. The leaves are said to have been used advantageously in syphilis. Externally applied, in the shape of ointment or decoction, they have been found useful in tinea capitis, psora, and other cutaneous affections; but caution is necessary in their application, as, according to Dr. Barton, nervous symptoms have resulted from the external use of the decoction. Dr. Bigelow has seen the recently powdered leaves given in doses of from ten to twenty grains, without perceptible effect.

It is probable that the other species of Kalmia, as *K. angustifolia*, or *sheep-laurel*, and *K. glauca*, or *swamp-laurel*, have properties identical with those of the *K. latifolia*. A decoction of the leaves of K. angustifolia is used by the negroes of North Carolina as a wash for ulcerative affections between the toes.

KOOSSO. The flowers of *Brayera anthelmintica* (Kunth), *Hagenia Abyssinica* (Lamarck), *Bancksia Abyssinica* (Bruce), a tree about twenty feet high, belonging to the family of Rosaceæ, growing on the table land of Abyssinia, at an elevation of not less than six or seven thousand feet. The Abyssinian name of the medicine has been variously spelled by European writers kosso, kousso, cusso, cosso, &c.; but that at the head of this article is deemed the most appropriate English title, as it indicates the proper pronunciation of the word. The flowers are small, greenish becoming purple, and arranged in repeatedly dichotomous clusters. The following is their botanic character. "*Calyx* with the tube bibracteolate at the base, turbinate; throat internally constricted by a membranous ring: the limb with two series of segments, each five in number, the outer much larger. *Petals* five, inserted in the throat of the calyx, small, linear. *Stamens* from 15 to 20, inserted with the petals. *Filaments* free, unequal. *Anthers* bilocular, dehiscing longitudinally. *Carpels* two at the bottom of the calyx, free, unilocular, containing one or two pendulous ovules. *Styles* terminal, exserted from the throat of the calyx, thickened upward. *Stigmas* subpeltate, dilated, crenate, oblong." The flowers are said to be diœcious; though the male have well developed carpels. The petals are apt to be wanting in the dried flowers. They are brought from Abyssinia packed in boxes, the clusters being unbroken though compressed. The general colour of the mass is greenish-yellow. As the medicine in consequence of its high price is apt to be adulterated, it should if possible be procured in the unpowdered state, when the botanical characters of the flower will sufficiently test its genuineness.

The flowers have a fragrant balsamic odour; and their taste, little perceptible at first, becomes in a short time somewhat acrid and disagreeable. Analyzed by Wittstein, they were found to contain, in 100 parts, 1·44 of fatty matter and chlorophylle, 2·02 of wax, 6·25 of bitter acrid resin, 0·77 of tasteless resin, 1·08 of sugar, 7·22 of gum, 24·40 of tannic acid, 40·97 of lignin, 15·71 of ashes, with 0·14 parts loss.

Koosso is highly valued in Abyssinia as a vermifuge. Bruce speaks of it in his travels, and gives a figure of the plant. Dr. Brayer, a French physician practising in Constantinople, employed the medicine effectively, and published a treatise on it at Paris, so long ago as 1823. It was in his honour that Kunth adopted his generic title of the plant. Much attention has recently been attracted to this medicine; and trials made with it have proved that it has extraordinary efficacy in the destruction and expulsion of the tapeworm. Its effects when taken internally are not very striking. In the ordinary dose it sometimes produces heat of stomach, nausea, and even vomiting, and shows a tendency to act on the

bowels, though this effect is not always produced. It appears to operate exclusively as a poison to the worms; and has been found equally effectual in both kinds of tapeworm. The high price demanded for it has tended very much to restrict the use of the remedy; but, should the demand continue, it will no doubt be supplied at a reasonable cost, as it is brought by caravans from Abyssinia into Egypt; and the monopoly which was at first the cause of its expensiveness cannot be long maintained. The medicine is taken in the morning upon an empty stomach, a light meal having been made the preceding evening. A previous evacuation of the bowels is also recommended. The flowers are given in the form of powder, mixed with half a pint of warm water; the mixture being allowed to stand for fifteen minutes, then stirred up, and taken in two or three draughts at short intervals. The medicine may be preceded and followed by lemonade. The medium dose for an adult is half an ounce, which may be diminished one-third for a child of 12 years, one-half for one of 6, and two-thirds for one of 3. Should the medicine not operate on the bowels in three or four hours, a brisk cathartic should be administered. One dose is said to be sufficient to destroy the worm. Should the quantity mentioned not prove effectual, it may be increased to an ounce or more.

LABDANUM. *Ladanum.* A resinous substance obtained from various species of Cistus, especially *C. Creticus*, *C. ladaniferus*, and *C. laurifolius*, small evergreen shrubs, inhabiting the islands of the Grecian Archipelago, and the different countries bordering on the Mediterranean. Upon the leaves and branches of these shrubs a juice exudes, which is collected by means of an instrument resembling a rake, with leather thongs instead of teeth, which is drawn over the plant. The juice adheres to the pieces of leather, and is afterwards separated. It is said that labdanum was formerly collected by combing the beards of goats which had been browsing upon the leaves of the cistus; and Landerer states that it is at the present time gathered in the same way in Cyprus from sheep, whose fleeces become loaded with it while they are pasturing. (See *Pharm. Journ. and Trans.*, xi. 6.) It comes chiefly from the Grecian islands. Two varieties exist in commerce. The *purest labdanum* is in masses of various sizes, sometimes weighing several pounds, enclosed in bladders, dark-red almost black externally, grayish internally when first broken, of the consistence of a plaster, softening in the hand and becoming adhesive, of an agreeable balsamic odour like that of amber, and of a bitter, balsamic, somewhat acrid taste. It is very inflammable, burning with a clear flame. On exposure it becomes dry, porous, and brittle. Little of this variety is found in the markets. *Common labdanum* is in pieces of a contorted or spiral form, light, porous, blackish-gray, hard and brittle, not softening between the fingers, similar in odour and taste to the preceding variety, but less inflammable, and mixed with much sand and other earthy matter, which are obvious to the sight. Guibourt found in 100 parts of the labdanum in masses, 86 parts of resin with a little volatile oil, 7 of wax, 1 of watery extract, and 6 of earthy substances and hair. In the contorted variety, Pelletier found 20 per cent. of resin, 3·6 of gum with malate of lime, 0·6 of malic acid, 1·9 of wax, 1·9 of volatile oil including loss, and 72 of ferruginous sand.

Labdanum is a stimulant expectorant, and was formerly given in catarrhal and dysenteric affections. At present it is employed only in plasters, and seldom even for that purpose in the United States. It is sometimes used in fumigation.

LAC. A resinous substance obtained from several trees growing in the East Indies, particularly from *Croton lacciferum*, and two species of Ficus, *F. religiosa* and *F. Indica*. It is found in the form of a crust surrounding the twigs or extreme branches, and is generally supposed to be an exudation from the bark, owing to the puncture of an insect belonging to the genus *Coccus*, and denominated *C. Lacca*. By some it is thought to be an exudation from the bodies of the insects themselves, which collect in great numbers upon the twigs, and are embedded in the concreted juice, through which the young insects eat a passage and escape. Several varieties are known in commerce. The most common are *stick lac*, *seed lac*, and *shell lac*.

Stick lac is the resin as taken from the tree, still encrusting the small twigs around which it originally concreted. It is of a deep reddish-brown colour, of a shining fracture, translucent at the edges, inodorous, and of an astringent, slightly bitterish taste. Its external surface is perforated with numerous minute pores, as if made by a needle; and when broken it exhibits many oblong cells, often containing the dead insect. When chewed it colours the saliva beautifully red, and, when burnt, diffuses a strong agreeable odour. It is in great measure soluble in alcohol.

Seed lac consists of minute irregular fragments, broken from the twigs, and partially exhausted by water. It is of a light or dark-brown colour, inclining to red or yellow, feebly shining, almost tasteless, and capable of imparting to water less colour than the stick lac, sometimes scarcely colouring it at all. It is occasionally mixed with small fragments of the twigs.

Shell lac is prepared by melting the *stick* or *seed lac* previously deprived of its soluble

colouring matter, straining it, and pouring it upon a flat smooth surface to harden. It is in thin fragments of various sizes, from half a line to a line thick, often somewhat curved, of a lighter or darker brown colour inclining more or less to red or yellow, shining, more or less transparent, hard and brittle, inodorous and insipid, insoluble in water, but easily and almost entirely soluble in alcohol, especially with the aid of heat.

A variety of lac is mentioned by writers in the form of cakes, called *cake* or *lump lac* (*lacca in placentis*); but this is at present rare in commerce.

According to John, lac consists of resin, colouring matter, a peculiar principle insoluble in alcohol, ether, or water, called *laccin*, a little wax, and various saline matters in small proportion. The resin, according to Unverdorben, consists of several distinct resinous principles differing in their solubility in alcohol and ether. The laccin is nearly or quite wanting in the *shell lac*, which also contains scarcely any of the colouring principle. Mr. Hatchett found in *stick lac* 68 per cent. of resin and 10 of colouring matter; in *seed lac* 88·5 per cent. of resin, and 2·5 of colouring matter; in *shell lac* 90·9 per cent. of resin and 0·5 of colouring matter. The other constituents, according to this chemist, are wax and gluten, besides foreign matters.

Lac in its crude state is slightly astringent, and was formerly used in medicine. At present it is not employed. Shell lac is wholly inert. Stick lac and seed lac are used on account of the colouring principle which they contain. Shell lac, as well as the other varieties deprived of their colouring matter, is applied to numerous purposes in the arts. It is the chief constituent of sealing wax. The best *red sealing wax* is made by melting together, with a very gentle heat, 48 parts of shell lac, 19 of Venice turpentine, and 1 of balsam of Peru, and mixing with the melted mass 32 parts of finely powdered cinnabar. But common resin is often substituted in part for the lac, and a mixture of red lead and chalk for the cinnabar. The best *black sealing wax* consists of 60 parts of lac, 10 of turpentine, and 30 of levigated bone black: the best *yellow sealing wax*, of 60 parts of lac, 12 of turpentine, and 24 of chromate of lead. (*Berzelius.*) Lac is also used as a varnish, and forms an excellent cement for broken porcelain and earthenware. It has been highly recommended as an adhesive material for the dressing of wounds, ulcers, &c. It is prepared for use by dissolving, with the aid of a gentle heat, in alcohol contained in a glass bottle, sufficient lac to give it a gelatinous consistence, and then closing the bottle. It is used by simply spreading it on the bandages.

LACTATE OF IRON. *Ferri Lactas. Lactate of Protoxide of Iron.* MM. Gélis and Conté introduced this preparation to the notice of the profession. As it was admitted by many physiologists, that lactic acid was the cause of the acidity of the gastric juice, and the fact seemed to be proved by MM. Bernard and Barreswil, MM. Gélis and Conté concluded that the ordinary ferruginous preparations, when efficacious, are dissolved by this acid in the stomach, and were led to suppose that lactate of iron, ready formed, might prove a valuable remedy. Their anticipations appear to have been realized; for several French physicians of note, among whom were MM. Fouquier, Bally, and Bouillaud, the committee appointed on their memoir by the French Academy of Medicine, reported favourably in relation to its therapeutic powers.

M. Louradour recommends the following process for obtaining lactate of iron. Ferment whey by keeping it at a temperature between 70° and 80°, whereby it becomes charged with a considerable quantity of lactic acid. Evaporate the liquor to a third of its bulk, decant and filter, and then saturate with milk of lime. This converts the lactic acid into lactate of lime, remaining in solution, and throws down a precipitate, consisting principally of phosphate of lime. The liquor is filtered again, and precipitated by oxalic acid, which throws down the lime as oxalate of lime, and sets free the lactic acid. By a new filtration a solution of lactic acid is obtained, containing lactin (sugar of milk) and certain salts, but pure enough for conversion into lactate of iron. For this purpose iron filings are digested with it on a sand-bath at a gentle heat. At the end of six or seven hours, the liquor is made to boil; after which it is filtered, concentrated, and allowed to cool and crystallize. The lactin and foreign salts remain in the mother-water. The crystals are drained in a funnel, washed with alcohol, dried rapidly, and then transferred to a bottle which must be well stopped. A better process for preparing lactate of lime, preparatory to its conversion into lactic acid and lactate of iron, is that of M. Gobley, as follows.—Add to 2 pints of skim-milk, diluted with twice its bulk of water, and contained in an earthen pan, 64 drachms of powdered lactin, and 51 drachms of powdered chalk. Allow the whole to ferment for eleven or twelve days, at a temperature of from 80° to 90°, supplying water as it evaporates. Transfer the liquor to a capsule, heat it gradually to boiling, and stir it constantly. Boil for a quarter of an hour to coagulate casein, allow the insoluble matters to subside, and strain the liquid through flannel. The clear liquid is a solution of lactate of lime. In this process the casein of the milk, acting as a ferment, converts not only the lactin of the milk, but the lactin added, into lactic

acid; a result which would not take place were it not for the presence of the chalk, which saturates the lactic acid as it is formed, and prevents it from uniting with the casein, whereby the power of the latter as a ferment would be destroyed. (*Journ. de Pharm.*, 3e *sér.*, vi. 54.) Lactate of lime may be converted into lactate of iron more expeditiously than by the method of M. Louradour by the following process of M. Lepage. Dissolve 100 parts of lactate of lime, obtained by M. Gobley's process, in 500 parts of boiling water; and 68 parts of pure crystallized sulphate of protoxide of iron in 500 parts of cold distilled water. Mix the filtered solutions in a matrass, acidulate slightly with lactic acid, and heat in a water bath, stirring frequently until the double decomposition is completed. Then filter to separate the sulphate of lime, and evaporate rapidly to one-half, either in an iron vessel, or in a porcelain capsule containing a few turnings of iron. Filter again, and set aside to crystallize; and, having washed the crystals in a funnel with a little alcohol, dry them on bibulous paper. (*Journ. de Pharm.*, 3e *sér.*, ix. 272.) In relation to the precautions to be observed in preparing this lactate, so as to prevent the partial sesquioxidation of the iron, see the paper of M. C. J. Thirault in the *Journ. de Pharm.*, copied into the *Am. Journ. of Pharm.* for Nov., 1853, p. 556.

Lactate of iron is in white crystalline plates, undergoing little change in the air. When in the form of a yellowish or greenish-white powder it is impure. It is but sparingly soluble in water, requiring forty parts of boiling water to dissolve it. It has an acid reaction, and possesses a mild ferruginous taste. The aqueous solution quickly becomes yellow, in consequence of the iron passing to a higher state of oxidation. M. Louradour has observed several samples of this lactate, variously adulterated; as with effloresced sulphate of iron, starch, and lactin; the sophistication being concealed by the sale of the salt in powder. These impurities may be detected by appropriate reagents; but M. Louradour recommends, as a simpler way of avoiding them, the rejection of the salt when not in crystalline plates.

Medical Properties. Lactate of iron has the general medical properties of the ferruginous preparations. It has a marked effect in increasing the appetite. The disease in which it was principally tried in Paris was chlorosis, with or without amenorrhœa; and in this disease, Andral, Fouquier, Bouillaud, and others obtained very favourable results. The dose is one or two grains, repeated at intervals and gradually increased. As much as 12 or even 20 grains may be given in the course of the day. It may be administered in lozenge, pill, or syrup. The *lozenge* may be made of one grain of the lactate to twelve of sugar; and the *pill*, of one grain of the salt, with an equal weight of some inert powder free from astringent matter, and sufficient honey. The following is the formula for a *syrup* proposed by M. Cap, expressed in the nearest weights and measures used in this country. Take of lactate of iron *a drachm;* white sugar *twelve ounces and a half;* boiling distilled water *six fluidounces and a half.* Rub the salt to powder with half an ounce of the sugar; and dissolve the mixture quickly in the boiling water. Pour the solution into a matrass placed on a sand-bath, and add to it the rest of the sugar in small pieces. When the sugar is dissolved, filter the syrup, and, as soon as it is cold, transfer it to bottles which must be well stopped. This syrup has a very light amber colour, and contains about four grains of the salt to the fluidounce. The dose is from two to four fluidrachms. Bread, called *chalybeate bread*, containing lactate of iron in the proportion of about a grain to the ounce, has been used with advantage by chlorotic patients in one of the hospitals of Paris. The bread is not injured in taste or quality. Dr. Brainard, of Chicago, has treated, with success, a large erectile tumour of the orbit, by infiltrating it by injection with a fluidrachm of a solution of lactate of iron, containing eight grains of the salt. (See *Ranking's Abstract*, xviii. 253.)

LACTIC ACID. *Acidum Lacticum.* This acid was discovered by Scheele. It is interesting as having been found in a number of the secretions, including the healthy gastric juice, in which its presence has been incontestably proved to exist by Bernard and Barreswil. It is a product of the viscous or lactic fermentation of rice-water, and of the juices of the beet, turnip, and carrot. Indeed, it is formed whenever sugar, in solution, of whatever kind, is placed in contact with an alkaline or earthy carbonate, in presence of a ferment, as, for example, the casein of milk. (*Pelouze.*) It may be conveniently obtained from the solution of impure lactic acid, mentioned in the last article, by concentrating it to a syrupy consistence, and treating it with alcohol, which dissolves the acid and precipitates the lactin and foreign salts. The solution is filtered, and the lactic acid is obtained pure by distilling off the alcohol. It is a colourless syrupy liquid, having a very sour taste, and the sp. gr. 1·215. When heated to 480°, the greater part of it is converted into a new body called concrete lactic acid, or *lactide.* Lactic acid coagulates albumen, and dissolves a large quantity of freshly precipitated phosphate of lime, a property which, doubtless, renders it of importance in the animal economy. The formula of the hydrated acid is $C_6H_5O_5+HO$. The acid obtained from the fluids of the flesh of animals by Liebig, was found to have the same per centage composition as lactic acid, but still to differ from it

in the proportion of water in the zinc and lime salts. Dr. W. Heintz considers the acid from flesh to be isomeric with lactic acid, and proposes to call it *paralactic acid.* (*Chem. Gaz.*, Mar. 1, 1849.) The lactic acid of the stomach is ordinary lactic acid. (Heintz, *Ibid.*, Nov. 1, 1849.)

Lactic acid was proposed by Magendie on theoretical grounds as a remedy in certain forms of dyspepsia, and for the removal of phosphatic deposits in the urine. It is most conveniently given in solution sweetened with sugar, prepared like lemonade. From one to three drachms may be taken in the course of the day.

LAKES. These are compounds of vegetable or animal colouring principles with alumina or other metallic oxides, and are usually obtained by adding alum, or perchloride of tin, to the solution of the colouring matter in water, and precipitating by means of an alkali. The alumina or oxide of tin unites with the colouring matter at the moment of separation, and forms an insoluble compound. Lakes are obtained in this way from cochineal, madder, Brazil wood, seed lac, French berries, &c. They are used in painting.

LEDUM PALUSTRE. *Marsh Tea. Rosmarinus sylvestris.* A small evergreen shrub, growing in swamps and other wet places, in the northern parts of Europe, Asia, and America, and in the mountainous regions of more southern latitudes. The leaves have a balsamic odour, and an aromatic, camphorous, bitter taste; and contain, among other ingredients, volatile oil and tannin. They are thought to possess narcotic properties, and have been employed in exanthematous diseases to allay irritation, in hooping cough, in dysentery, and in various cutaneous affections, particularly leprosy and scabies. In complaints of the skin, they are used both internally and externally in the form of decoction. When placed among clothes, they are said to prevent the attacks of moths. In Germany they are sometimes substituted for hops in the preparation of beer. *Ledum latifolium*, or *Labrador tea*, which is a larger plant than the preceding, is a native of North America, growing in damp places in Canada and the northern parts of the United States. The leaves have an agreeable odour and taste, and are esteemed pectoral and tonic. They are said to have been used as a substitute for tea during the war of independence.

LEEK. *Porrum.* The bulb of *Allium Porrum.* The leek is a biennial bulbous plant, growing wild in Switzerland, and cultivated in the gardens of Europe and this country for culinary purposes. All parts of it have an offensive pungent odour, and an acrid taste, dependent on an essential oil, which is in a great measure dissipated by decoction, and may be obtained separate by distillation. The bulb, which is the medicinal portion, consists of concentric layers, like the onion, which it resembles in medical properties, though somewhat milder. It is gently stimulant, with a peculiar direction to the kidneys. The expressed juice may be given in the dose of a fluidrachm, mixed with syrup. This species of Allium is not used medicinally in the United States.

LEPTANDRA VIRGINICA. Nuttall. *Veronica Virginica.* Linn. *Culver's Physic.* This is an indigenous perennial plant, with an herbaceous stem three or four feet high, furnished with leaves in whorls, and terminating in a long spike of white flowers. A variety was seen by Pursh with purple flowers. This was described and figured as a distinct species by Rafinesque, under the title of *L. purpurea.* The plant grows throughout the United States, affecting particularly calcareous hills and sunny exposures, and flowering in August. The root, which is the part used, is bitter and nauseous, and yields its active properties to boiling water. When recent it is said to act violently as a cathartic, and sometimes as an emetic. In the dried state it is more uncertain. The dose of the powder is from twenty grains to a drachm. It was formerly recognised in the U. S. Pharmacopœia, but was omitted in the edition of 1840.

LIATRIS SPICATA. *Gay-feather. Button Snakeroot.* An indigenous perennial plant, growing in natural meadows and moist grounds throughout the Middle and Southern States. It has a tuberous root, and an erect annual stem, which terminates in a spike of beautiful, purple, compound flowers, which appear in August. The root is said by Schoepf to have a terebinthinate odour, and a warm, bitterish, terebinthinate taste; to be possessed of diuretic properties; and to be useful in gonorrhœa and sorethroat, being employed internally in the shape of decoction in the former complaint, and as a gargle in the latter. Pursh informs us that *L. scariosa* and *L. squarrosa* are known in Virginia, Kentucky, and the Carolinas, by the name of *rattlesnake's master;* and that their roots are employed to cure the bite of the rattlesnake, being bruised and applied directly to the wound, while their decoction in milk is taken internally. According to Dr. William P. C. Barton, all the tuberous rooted species of Liatris are active plants, and appear to be diuretic.

LIGUSTICUM LEVISTICUM. *Lovage.* An umbelliferous plant, growing wild in the South of Europe, and cultivated in gardens. The whole plant has a strong, sweetish,

aromatic odour, and a warm pungent taste. When wounded it emits a yellow opaque juice, which concretes into a brownish resinous substance, not unlike opopanax. The roots, stem, leaves, and seeds have all been employed; but the last have the aromatic properties of the plant in the highest degree. They are small, ovate oblong, somewhat flattened, curved, strongly ribbed, and of a yellowish-brown colour. The medical properties of lovage are closely analogous to those of angelica. It is a stimulant aromatic, and has been employed as a carminative, diaphoretic, and emmenagogue. The best form for administration is that of infusion.

LIGUSTRUM VULGARE. *Privet.* A shrub from four to ten feet in height, growing wild both in Europe and the United States, usually in hedges and by the roadside. The *leaves* which have an astringent, bitter taste, and the *flowers*, which are small, snow-white, and of an agreeable odour, have been used, in the form of decoction, in sorethroat, and aphthous and scorbutic ulceration of the mouth. The *berries* are black, have a sweetish, bitter taste, and are said to possess purgative properties, and to colour the urine brown. They are sometimes used for dyeing. The bark was analyzed by M. G. Potex, who found a peculiar substance which he denominated *ligustrin*, besides mannite, sugar, muco-saccharine matter, starch, chlorophylle, bitter extractive, bitter resin, tannin, albumen, and salts. (*Am. Journ. of Pharm.*, xii. 347.)

LILIUM CANDIDUM. *Common White Lily.* This well-known plant is a native of Syria and Asia Minor, but has been long cultivated in gardens The bulb, which consists of imbricated fleshy scales, is without odour, but has a peculiar, disagreeable, somewhat bitter, and mucilaginous taste. It contains much mucilage, and a small proportion of an acrid principle, which is dissipated or destroyed by roasting or boiling. In the recent state it is said to have been employed with advantage in dropsy. Boiled with water or milk it forms a good emollient cataplasm, more used in popular than in regular practice. The flowers have an agreeable odour, which they impart to oil or lard; and an ointment or liniment is sometimes prepared from them, and used as a soothing application in external inflammations.

LIQUIDAMBAR STYRACIFLUA. *Sweet-gum.* An indigenous tree, growing in different parts of the United States from New England to Louisiana, and flourishing also in Mexico, where, as well as in our Southern States, it sometimes attains a great magnitude. In warm latitudes a balsamic juice flows from its trunk when wounded. This has attracted some attention in Europe, where it is known by the name of *liquidamber*, or *copalm balsam*, and is sometimes, though erroneously, called *liquid storax*. It is not yielded by the trees which grow in the Middle States, and is obtained from Mexico and Louisiana. It is a liquid of the consistence of thin honey, more or less transparent, of a yellowish colour, of a peculiar, agreeable, balsamic odour, and a bitter, warm, and acrid taste. By cold it becomes thicker and less transparent. It concretes also by time, assuming a darker colour. According to M. Bonastre, it contains a colourless volatile oil, a semi-concrete substance which rises in distillation and is separated from the water by ether, a minute proportion of benzoic acid, a yellow colouring substance, an oleo-resin, and a peculiar principle, insoluble in water and cold alcohol, for which M. Bonastre proposes the name of *styracine*. The proportion of benzoic acid is greatly increased by time. Mr. Hodgson obtained from a specimen which he examined 4·2 per cent. (*Journ. of the Phil. Col. of Pharm.*, vi. 190.)

Another product is said to be obtained from the same tree by boiling the young branches in water, and skimming off the fluid which rises to the surface. It is of a thicker consistence and darker colour than the preceding, is nearly opaque, and abounds in impurities. This also has been confounded with liquid storax, which it resembles in properties, though derived from a different source.

Liquidamber may be employed for the same purpose as storax, but is very seldom used, and is almost unknown in the shops of the United States.

Liquidambar Altingia is said to exude a balsam in the Tennasserim Provinces of India, bearing some resemblance to liquid storax. (See *Pharm. Journ. and Trans.*, viii. 243.)

LITHIA. *Protoxide of Lithium.* This is the protoxide of a metallic radical called lithium, and ranks with potassa and soda as one of the fixed alkalies. It is a constituent of several minerals (petalite, spodumene, lepidolite, &c.), and has been found in a number of the mineral waters of Europe, principally in the state of carbonate or bicarbonate. *Carbonate of lithia* in solution in water has been proposed by Mr. A. Ure as a solvent for uric acid calculi, injected into the bladder. By experiments made out of the body, conducted at the heat of the blood, it was found that a solution of this salt was a better solvent of uric acid than either borax or the carbonates of potassa and soda. It is a white powder, soluble in 100 parts of cold water, but insoluble in alcohol. Its effects

when exhibited by the stomach have not been tried; but it is supposed that it might prove useful in the uric acid diathesis. According to Aschenbrenner it may be given in doses of from five to ten grains daily.

LITHOSPERMUM OFFICINALE. *Gromwell. Milium Solis.* A European perennial, the seeds of which are ovate, of a grayish-white or pearl colour, shining, rather larger than millet seeds, and of a stony hardness, from which the generic name of the plant originated. From an opinion formerly prevalent, that nature indicates remedies adapted to certain diseases by some resemblance between the remedy and the character of the complaint or of the part affected, the seeds of this plant were applied to the treatment of calculous disorders; and they retained their ground in the estimation of physicians as a diuretic, useful in complaints of the urinary passages, long after the fanciful notion in which their use originated had been abandoned. But they are at present considered nearly inert, and are not employed.

LONICERA CAPRIFOLIUM. *Honeysuckle.* This ornament of our gardens is a native of the South of Europe. Its sweet-scented flowers are sometimes used in perfumery; and a syrup prepared from them, has been given in asthma and other pectoral affections. The expressed juice of the plant has been recommended as a remedy for the stings of bees, being rubbed directly on the injured spot. The fruit of all the species of Lonicera is said to be emetic and cathartic. (*Mérat et De Lens, Dict. de Mat. Med.*, iv. 144.)

LYCOPODIUM CLAVATUM. *Club-moss.* The capsules of this moss, and of others belonging to the same genus, contain a fine dust or powder, which is collected in Switzerland and Germany, and used in the shops of Europe under the name of *lycopodium*, or *vegetable sulphur*. This powder is considered by some as the pollen of the plant, by others as the seed. It is extremely fine, very light, of a delicate yellow colour, inodorous and tasteless, and exceedingly inflammable, so much so that it takes fire like gunpowder when thrown upon a burning body. It is said to be often adulterated with the pollen of the pines and firs, and sometimes with talc and starch. In medicine, it is used as an absorbent application to excoriated surfaces, especially those which occur in the folds of the skin in infants. In pharmacy, it answers the purpose of facilitating the rolling of the pilular mass, and of preventing the adhesion of the pills when formed. It is not much used in this country. The moss itself has been esteemed diuretic, antispasmodic, &c.; and has been employed in the form of decoction, in rheumatism, epilepsy, and complaints of the lungs and kidneys; but it has fallen into discredit.

LYTHRUM SALICARIA. *Loosestrife. Purple Willow-herb.* This is an elegant perennial plant, two or three feet high, with an erect, quadrangular, hexagonal, downy, herbaceous stem, bearing opposite, ternate, sessile, lanceolate leaves, cordate at the base, and downy on the under surface and at the margin. The flowers are axillary, forming a leafy verticillate spike. The calyx is red, with unequal segments, the petals purple and undulate, the fruit a small elliptical capsule. The plant grows wild in all parts of Europe, and is found in New England and Canada. It prefers meadows, swamps, and the banks of streams, which it adorns in July and August with its showy purple flowers. The whole herbaceous part is medicinal, and is dried for use. In this state it is inodorous, and has an herbaceous somewhat astringent taste. It renders boiling water very mucilaginous, and its decoction is blackened by the sulphate of iron. Loosestrife is demulcent and astringent, and may be advantageously given in diarrhœa and chronic dysentery, after due preparation by evacuating treatment. It has long been used in Ireland in these complaints, and is said to be a popular remedy in Sweden. The dose of the powdered herb is about a drachm two or three times a day. A decoction of the root, prepared by boiling an ounce in a pint of water, may be given in the dose of two fluidounces.

MALAMBO or MATIAS BARK. A bark received from S. America by Dr. Alexander Ure, under the name of *matias bark*, was found to have the characters of the *malambo bark*, which is held in high esteem in New Granada where it is produced, and has been long known to the French pharmacologists. It is described by Dr. Ure as being three or four lines thick, brittle though somewhat fibrous, of a brown colour, and covered with an ash-coloured tuberculous epidermis. It has an aromatic odour, and a bitter pungent taste, and yields these properties to water and alcohol. Its active ingredients appear to be a volatile oil, and a bitter extractive matter. According to Dr. Mackay, it has been used successfully in intermittents, convalescence from continued fever, hemicrania, dyspepsia, and other cases in which tonic remedies are useful, and also as an adjuvant to diuretics. It is probably nothing more than an aromatic tonic. Dr. Ure has often administered it with good effect as a substitute for Peruvian bark. (*Pharm. Journ. and Trans.*, iii. 169.)

MANDRAGORA OFFICINALIS. *Atropa Mandragora.* Linn. *Mandrake. Mandragora.* A perennial European plant, with spindle-shaped root, which is often forked beneath, and

is therefore compared, in shape, to the human figure. In former times this root was supposed to possess magical virtues, and was used as an amulet to promote fecundity, &c.; and the superstition is still cherished by the vulgar in some parts of Europe. The plant is a poisonous narcotic, somewhat similar in its properties to belladonna, to which it is botanically allied. It was much used by the ancients with a view to its narcotic effects; and the root has been recommended by some eminent modern physicians, as an external application to scrofulous, scirrhous, and syphilitic tumours It is said to have been used by the ancients as an anæsthetic agent before surgical operations. (*Journ. de Pharm. et de Chim.* xv. 290.) It is unknown as a remedy in the United States.

MANGANESE. *Manganesium.* This metal and its compounds with oxygen (three regular oxides and two acids) have been already described. See *Manganesii Oxidum.* Several of its combinations have been proposed as medicines, and the therapeutic trials, thus far made with its preparations, place them alongside of those of iron as tonic and anti-anemic remedies. It will be recollected that manganese as well as iron is always present, in minute proportion, in healthy blood; and it is probable that the former is as necessary to its normal constitution as the latter. According to an analysis by M. Burin-Dubuisson, the amount of the manganese in the blood corpuscles is about one-twentieth that of the iron. Besides, manganese has been detected in the gastric juice, the bile, the brain, the hair, and in healthy pus. It is stated as an advantage of the preparations of manganese, that they may be prescribed in conjunction with tannic acid and the various astringent medicines, which are all incompatible with the preparations of iron. Of the oxides of manganese, the *protoxide* alone is strongly salifiable; and this is the oxide present in the ordinary salts of the metal. It may be obtained by precipitation as a white hydrate from any of the soluble salts of manganese by the addition of a caustic alkali. This, according to M. Hannon, is a good medicinal preparation; but a strong objection to it is that it rapidly absorbs oxygen, and passes to the state of the brown hydrated sesquioxide. The officinal deutoxide (native black oxide) is described at *page* 463, where its medical properties are also noticed. This oxide is the source, directly or indirectly, of all the preparations of manganese.

Sulphate of Manganese. This salt may be prepared by heating the native black oxide with concentrated sulphuric acid. Oxygen is evolved, and the sulphate of the protoxide is formed. The product, upon being exhausted by water, furnishes a solution which must be heated to nearly the boiling point, and treated with carbonate of manganese, added by small portions at a time, which will precipitate any iron present as a carbonate, and change the colour of the liquid from a dark-red to a pale-rose tint. The liquid is then filtered, evaporated to the consistence of a thin syrup, and set aside to crystallize. Sulphate of manganese is in the form of pale rose-coloured crystals, which contain different proportions of water of crystallization, according to the temperature at which they are produced. Its taste is astringent and bitterish. It is very soluble in water, but insoluble in alcohol. This salt, if carelessly prepared, is apt to contain copper and arsenic, as well as iron. As it is the source of nearly all the preparations of manganese, it is of importance that it should be pure. Hence, the sulphate, as first obtained, should be calcined at a low red heat at least twice, to render the contaminating metals insoluble, and then tested in solution, to be sure of its purity. According to M. A. Gorgeu, copper and iron, as well as nickel and cobalt, are completely precipitated by sulphuret of manganese. In applying this reagent, the impure solution is shaken for about a quarter of an hour with the sulphuret, and then boiled for a few minutes. (*Chem. Gaz.*, July 1, 1853, p. 249.) C. G. Gmelin found sulphate of manganese to produce an extraordinary secretion of bile when given to the inferior animals, and its effects as a cholagogue have been observed in man. According to the late Dr. Thomas Thomson, of Glasgow, it resembles sulphate of soda both in taste and effect. The dose as a purgative is one or two drachms; as an alterative, from five grains to a scruple.

Iodide of Manganese. This iodide may be administered in syrup or in pill. Prof. Procter has proposed the following formula for the *syrup.* Dissolve *sixteen drachms* of sulphate of manganese, and *nineteen drachms* of iodide of potassium, separately, in *three fluidounces* of water, each portion of water being previously sweetened with *two drachms* of syrup. Mix the solutions in a glass stoppered bottle, and, when the crystals of sulphate of potassa have ceased to precipitate, throw the liquor on a strainer of fine muslin, and allow it to filter into a pint bottle containing *twelve ounces* of powdered sugar. When the solution has ceased to pass, wash the filter with a little sweetened water, and add sufficient of that liquid to make the whole measure *a pint.* Lastly, agitate the liquid until the sugar is dissolved. Prof. Procter states that this syrup contains about a drachm of iodide of manganese in each fluidounce, and corresponds in strength to the officinal solution of iodide of iron. The small proportion of sulphate of potassa which remains dissolved in the syrup, does not interfere with its medicinal efficacy. The dose is from ten to thirty drops, re-

peated several times a day. (*Am. Journ. of Pharm.*, Oct. 1850.) M. Hannon makes the *pill of iodide of manganese* by double decomposition between equal weights of iodide of potassium and crystallized sulphate of manganese. The salts are perfectly dried, accurately mixed in powder, and then rubbed up with honey, so as to reduce the whole to a pilular mass, which may be divided into four-grain pills. Assuming that the honey added compensates the loss of water in drying, each pill will consist of about two grains of iodide of manganese, one of sulphate of potassa, and one of honey and of sulphate of manganese in excess. The dose is one pill daily, gradually increased to six. According to M. Hannon, iodide of manganese is particularly useful in the anemia attendant on scrofula, phthisis, and cancer, and in syphilitic cachexy. Given in conjunction with cinchona it rapidly removes the enlargement of the spleen, which so often follows protracted fevers.

Carbonate of Manganese. This salt may be obtained by the following formula, which is that of M. Hannon, accommodated to the weights and measures of the U. S. Pharmacopœia. Dissolve *seventeen ounces* of crystallized sulphate of manganese and *nineteen ounces* of carbonate of soda, separately, in two pints of water, *a fluidounce* of syrup having been previously added to each pint, and, having mixed the solutions in a well stopped bottle, allow the precipitate to subside. Decant the supernatant liquid, wash the precipitate with sweetened water, allow it to drain from a cloth saturated with syrup, express, mix with *ten ounces* of honey, and evaporate rapidly to form a pilular mass, which is to be divided in four-grain pills. By a double decomposition between the sulphate of manganese and carbonate of soda, carbonate of manganese is precipitated, and sulphate of soda remains in solution. The sulphate is washed away, and the carbonate is brought to a pilular consistence with honey, which, together with the syrup, prevents the protoxide of manganese in the pill from rising to a higher stage of oxidation. The dose is from two to ten pills daily. Carbonate of manganese was tried by M. Hannon as a medicine on himself. After its use for fifteen days he found his appetite improved, and his pulse increased in force; and he experienced a feeling of sanguineous plethora. He afterwards exhibited the remedy in several anemic cases with the effect of exciting the functions to a more healthy action, increasing the strength, and improving the blood.

Phosphate, *tartrate*, and *malate of manganese* have also been proposed by M. Hannon as useful remedies. The phosphate is prepared by double decomposition between sulphate of manganese and phosphate of soda.

Hypermanganate of Potassa. Permanganate of Potassa. This salt may be formed by mixing equal parts of very finely powdered deutoxide of manganese and chlorate of potassa with rather more than one part of hydrate of potassa, dissolved in a little water, and exposing the whole, after evaporation to dryness, to a temperature just short of redness. The mass is treated with hot water, the insoluble oxide separated by decantation, and the deep-purple liquid concentrated by heat, until crystals begin to form upon its surface, when it is left to cool and crystallize. The crystals have a dark-purple colour, and are soluble in sixteen parts of water. The salt is represented by the formula KO,Mn_2O_7. Hypermanganate of potassa has been used successfully by Mr. Sampson, of London, in diabetes. The dose is three grains, three times a day, given in three or four tablespoonfuls of water, and gradually increased. (*Pharm. Journ. and Trans.*, July 1, 1853, p. 18.)

Ferro-manganic Preparations. M. Hannon conceives that manganese is peculiarly suited to the treatment of anemic cases in which iron has failed, or acts very slowly. But, instead of passing at once from the use of iron to that of manganese, he prefers to give intermediately a mixture of the two metals. For this purpose he recommends the following formula. Take of crystallized sulphate of iron *six drachms and a half;* crystallized sulphate of manganese *two drachms;* carbonate of soda *nine drachms;* honey *five drachms.* Rub together, and with syrup make a mass, to be divided into four grain pills. In this pill both the metals are present as carbonates; and as the sulphate of soda is not washed away, it contains that salt also. The dose is from two to ten pills daily. See the paper of M. Hannon (*Journ. de Pharm.*, 3e sér., xvi. 41 and 189; also a note of the favourable results obtained by M. Pétrequin, of Lyons, *Ibid.*, xvi. 381). Further experience has confirmed the favourable opinion of M. Pétrequin in relation to the therapeutic value of the ferro-manganic preparations. A number of formulæ have been devised by M. Burin-Dubuisson, of Lyons, for making them, containing the metals variously combined; but the most important of them is the *syrup of iodide of iron and manganese*, for the preparation of which we prefer the following formula of Prof. Procter. Take of iodide of potassium 1000 grains; sulphate of protoxide of iron 630; sulphate of protoxide of manganese 210; iron filings 100; sugar, in coarse powder, 4800. Powder the iodide and sulphates separately, and, having mixed them with the filings, add half a fluidounce of distilled water, and triturate to a uniform paste. Then add another half fluidounce of distilled water to the paste, and triturate again; and, after an interval of fifteen minutes, add a third half fluidounce, and mix. Next transfer the

magma of salts to a moistened filter, supported on a funnel, and allow them to drain into a bottle, holding a little more than twelve fluidounces, and containing the sugar. After they have drained, add boiled cold water by small portions at a time, until the solution of the iodides has been displaced and washed from the crystalline magma of sulphate of potassa. Finally, add sufficient boiled cold water to make the whole measure *twelve fluidounces*. The object of the iron is to prevent the liberation of iodine. This syrup has a very pale straw colour. It necessarily contains a little sulphate of potassa, which does not injure it as a therapeutic agent. If the salts have not been all decomposed during their reaction, it will be greenish. Each fluidounce contains fifty grains of the mixed iodides, in the proportion of three parts of iodide of iron to one of iodide of manganese. The dose is from ten drops to half a fluidrachm. (*Am. Journ. of Pharm.*, May, 1853, p. 198.) This syrup is considered by M. Pétrequin to be particularly suited to the treatment of anemia resulting from obstinate intermittent fevers, from prolonged suppuration, and from scrofulous, syphilitic, and cancerous affections.

Dr. T. S. Speer, of Cheltenham, in imitation of the practice of M. Hannon and M. Pétrequin, has employed the combined carbonates of iron and manganese with excellent effects; but, instead of using the carbonates in pill, protected by honey and syrup, as M. Hannon has done, he prefers a saccharine carbonate of the two metals, in imitation of the London saccharine carbonate of iron, made by the following formula. Dissolve *three ounces and one drachm* of sulphate of iron, *one ounce and one scruple* of sulphate of manganese, and *five ounces* of carbonate of soda, each, in *thirty Imperial fluidounces* of water, and thoroughly mix the solutions. Collect the precipitated carbonates on a cloth filter, and wash them immediately with cold water, to separate the sulphate of soda. Then press out as much water as possible, and, without delay, triturate the pulp with *two and a half ounces* of finely powdered sugar. Lastly, dry the mixture at a temperature not exceeding 120° F. The *saccharine carbonate of iron and manganese*, as thus prepared, is a reddish-brown powder, devoid of all taste, except that imparted by the sugar. The dose is five grains, gradually increased to a scruple, three times a day, given with the meals, or immediately after them. (See *Am. Journ. of Pharm.*, March, 1854, p. 127, from the *Med. Times and Gaz.*)

MEAT BISCUIT. This alimentary substance, containing much nutriment in a small bulk, is the invention of Mr. Gail Borden, jun., of Texas. It is made by mixing a concentrated fluid extract of flesh, strained through wire-cloth, and freed from fat, with good wheat flour or other meal, and baking the dough into a biscuit, which must be preserved, in mass or coarse powder, free from moisture, in gutta percha bags, or air-tight casks or cases. To make the dough, about two parts of the extract are mixed with three of the flour; and about twenty per cent. is lost in baking. The extract contains the soluble ingredients of the flesh, not coagulable by heat; namely, gelatin, kreatin, kreatinin, phosphoric, lactic, and inosinic acid, and certain salts. Of course it contains no albumen or fibrin, unless in some altered state in which they are rendered soluble at a boiling temperature. In this nutritious biscuit, the absence of albumen and fibrin is supposed to be supplied by the vegetable fibrin (gluten) of the flour. The meat biscuit is said to be greatly superior in nutritive qualities to *pemmican*, used by the Hudson Bay Company and others, and which is made by mixing muscular flesh, cut in thin strips, thoroughly dried, and reduced to powder, with melted fat. To prepare a pint of palatable soup, an ounce of the powdered biscuit, first made into a thin paste with cold water, is added, with constant stirring, to sufficient boiling water, and the whole boiled for twenty minutes. Salt and pepper are then added to suit the taste. The meat biscuit forms an important resource in all cases in which food must be carried on long journeys for daily consumption.

MEDEOLA VIRGINICA. *Gyromia Virginica.* Nutall. *Indian Cucumber.* An indigenous perennial herb, growing in all parts of the United States. The root, which in shape and flavour bears a strong resemblance to a small cucumber, is said by Pursh to be eaten by the Indians. According to the late Professor Barton, it has been thought useful in dropsies, and probably possesses diuretic properties. It is figured and described by Dr. William P. C. Barton in his Medical Botany.

MELILOTUS OFFICINALIS. *Melilot.* An annual or biennial plant, indigenous in Europe, and growing also in this country. We have two varieties, one with yellow, the other with white flowers, which are considered by some as distinct species. The plant, when in flower, has a peculiar sweet odour, which, by drying, becomes stronger and more agreeable, somewhat like that of the tonka bean. Indeed, according to M. Guillemette, the odorous principle of the two substances is identical. (*Journ. de Pharm.*, xxi. 172.) The taste of melilot is slightly bitterish. It has little medical power, and, though formerly recommended in various diseases, is at present not employed internally. As a local application, it is used, in the form of decoction or cataplasm, in moderate inflammations, though probably with little other advantage than such as results from the combination of warmth and moisture.

MENISPERMUM CANADENSE. This is a climbing plant, growing in various parts of the United States, from the northern boundary to the Gulf of Mexico. It is described in the Flora of North America by Torrey and Gray (vol. i. p. 48). In an unpublished inaugural dissertation by Dr. Geo. F. Terrell (Feb. 1844), it is stated that the root of this plant is considerably employed in Virginia, both in domestic practice and by physicians, as a substitute for sarsaparilla, in scrofulous affections. It has a bitter taste, and is said to be a gently stimulating tonic.

MESEMBRYANTHEMUM CRYSTALLINUM. *Ice-plant.* A biennial plant, growing spontaneously in the South of Europe, and cultivated as a curiosity in colder countries, by the aid of artificial warmth. The stem and under surface of the leaves are covered with crystalline drops, which give the plant the appearance of being coated with ice. The herb is without smell, and has a saline somewhat nauseous taste. It is considered demulcent and diuretic, and has been highly lauded as a remedy in various complaints, especially in those affecting the mucous membrane of the lungs and urinary passages. It has also been used in dropsy. The expressed juice is the form in which the remedy has been generally employed.

MOMORDICA BALSAMINA. *Balsam Apple. Balsamina.* An annual climbing plant, a native of the East Indies, but cultivated in our gardens for the sake of the fruit. This is ovate, attenuated towards each extremity, angular, warty, not unlike a cucumber in appearance, of a lively red or orange-yellow colour, easily falling when touched, and spontaneously separating into several pieces. It was formerly highly esteemed as a vulnerary, and is still in use among the common people. A liniment formed by infusing the fruit, deprived of its seeds, in olive or almond oil, is applied to chapped hands, burns, old sores, piles, prolapsus ani, &c.; and the fruit itself is sometimes mashed and used in the form of poultice. According to M. Descourtlitz, it is poisonous when taken internally, having proved fatal to a dog in the quantity of two or three drachms. An extract prepared from it is said to be useful in dropsy, in the dose of from six to fifteen grains.

MONESIA. Under this name, a vegetable extract from South America was, a few years since, introduced to the notice of the medical profession in France by M. Bernard Derosne, and for a time attracted much attention. Its origin was for some time uncertain; but it appears to have been ascertained to be derived from the bark of *Chrysophyllum glycyphlæum*, a tree of middling size, growing in the forests near Rio Janeiro, and elsewhere in Brazil (Virey, *Journ. de Pharm.*, 3*e sér.*, vi. 63.) Specimens of the bark were obtained along with the extract.

The bark is in pieces, some of which are three or four lines thick, is very compact and heavy, of a deep-brown or chocolate colour, contrasting strongly with the grayish colour of the epidermis when this remains, and of smooth fracture. The extract was received from S. America in cakes weighing rather more than a pound, from three-quarters of an inch to an inch in thickness, of a dark-brown almost black colour, very brittle, of a fracture neither very dull nor very shining, and of a taste at first sweet, then astringent, and ultimately acrid; the acrimony being very persistent, and especially felt in the fauces. It is entirely soluble in water. The bark was analyzed by MM. Derosne, Henry, and Payen, and found to contain in 100 parts, 1·2 of stearin, chlorophylle, and wax, 1·4 of glycyrrhizin, 4·7 of an acrid principle analogous to saponin, called *monesin*, 7·5 of tannic acid, 9·2 of a red colouring substance, 1·3 of malic acid and malate of lime, 3·0 of various salts, including silica and oxides of iron and manganese, and 71·7 of pectic acid or pectin and ligain, including loss, besides traces of an aromatic principle, and of gum. *Monesin* was obtained by treating the bark or extract with alcohol, adding to the tincture an excess of hydrate of lime in fine powder, filtering, evaporating the clear liquor to dryness, treating the residue with water and animal charcoal, filtering, and again evaporating to dryness. Thus procured it was in transparent yellowish scales, which were easily pulverized, forming a white powder. It was readily dissolved by alcohol and water, to the latter of which it gave the property of frothing; but was insoluble in ether. It could not be made to crystallize. It had no power to saturate acids, was without odour, but had a slightly bitterish taste, followed by a very decided and permanent acrimony in the posterior mouth and fauces. (*Journ. de Pharm.*, Janvier, 1841.) Monesia owes its activity probably to this principle and to tannic acid.

The effects of this medicine upon the system appear to be those of a moderate stomachic excitant, a general alterative, and a feeble astringent. In over-doses, it is said to produce heat in the epigastrium with obstinate constipation and tenesmus. It has been used internally with asserted advantage in diarrhœa, hæmoptysis, menorrhagia, scrofula, scurvy, the chronic catarrh of old people, and dyspepsia. As a local remedy it has been found useful in leucorrhœa, ulcerations of the mouth and fauces, spongy and scorbutic gums, carious teeth, and obstinate scrofulous, and otherwise unhealthy ulcers upon the surface.

The extract may be given in pill or powder, in aqueous solution, in tincture, or in syrup. The dose of it is from two to ten grains, repeated every hour, two, or three hours, or less frequently. From ten grains to a drachm may be given daily. In scrofulous affections, it must be given in large quantities, and persevered in for several weeks, in order to obtain its curative effects. Monesia is applied to ulcers either by being sprinkled in powder upon the surface, or in the form of ointment made with one part of the extract and seven parts of simple ointment. Monesin, or the acrid principle, has been given internally in the dose of about half a grain, and has also been applied to ulcers.

Mr. Dupuy, of New York, states that specimens of an extract sold as monesia, which have come under his notice, bear so close a resemblance to extract of logwood as to suggest the inquiry, whether they might not really have been the product of the same plant. (*N. Y. Journ. of Pharm.*, i. 167.)

MOXA. The term *moxa* is employed to designate small masses of combustible matter intended, by being burnt in contact with the skin, to produce an eschar. They are of various forms, and made of different materials. The Chinese moxa is in small cones from eight to twelve lines in height, and is prepared from the leaves of one or more species of Artemisia. *A. Chinensis* and *A. Indica* were indicated by the Dublin College; but Lindley states that it is the *A. Moxa* of De Candolle which is employed. According to some authors, the part used is the down which covers the leaves and stems; but others, with greater probability, assert that it is a fine lanuginous substance, prepared from the leaves by beating them in a mortar. A coarser and a finer product are obtained, the former of which is used for tinder, the latter worked up into moxa. A similar moxa has been made in France, by a similar process, from the leaves of *A. vulgaris*.

Various substitutes have been proposed for the Chinese moxa, all composed of some light, porous, soft, inflammable substance, which burns slowly, and thus allows the heat to be regulated according to the effect desired. Linen rolled into a cylinder, cotton formed into the same shape and enclosed in a piece of linen, cords of cotton in small masses of various shapes, and even common spunk made from the agaric of the oak, have been employed by different persons with the desired effect. But all these bodies are subject to the inconvenience of requiring to be constantly blown upon, in order that their combustion may be sustained. To remedy this defect, cotton impregnated with nitre has been recommended; and the moxa usually employed is prepared from that substance. It is important that the impregnation should be uniform; as otherwise different parts of the cylinder, burning with different degrees of rapidity, would produce unequal effects upon the skin. The following process is recommended. One pound of cotton is introduced into a vessel containing two ounces of nitre dissolved in half a gallon of water, and a moderate heat applied, till all the liquid is evaporated. The cotton when perfectly dry is formed into thin, narrow sheets, which are rolled round a central cord of linen, so as to form a cylinder from half an inch to an inch in diameter, and several inches long. This is enclosed in a covering of silk or linen sewed firmly around it; and, when used, may be cut by a razor into transverse slices a few lines in length. By leaving a hole in the centre of the cylinder, the combustion will be rendered more vigorous, and a deeper eschar produced.

The pith of the *Helianthus annuus*, or common sun-flower, has been proposed by M. Percy for the preparation of moxa, for which it is well adapted by the nitre which it contains, and which enables it to burn without insufflation. The stem, when perfectly mature, is cut into transverse sections about half an inch in thickness, which must be carefully dried, and kept in a perfectly dry place. They have this advantage, that, in consequence of the retention of the cortical portion, they may be held with impunity, while burning, between the fingers of the operator. They are, however, frequently defective in consequence of an insufficiency of nitre in the pith, or of the unequal inflammability of different parts of it.

M. Robinet has perfected the preparation of moxa, by combining the advantages of the two kinds last described. He rolls cotton round a small central cylinder of pith, and envelopes the whole in a piece of muslin, which is more or less firmly applied, according to the degree of compactness required. The cylinders thus made, burn without assistance, uniformly, and with a rapidity proportionate to their firmness.

Dr. Jacobson, of Copenhagen, has proposed, as a substitute for the ordinary forms of moxa, small cylinders formed out of strips of paper imbued with a solution of chromate of potassa; and cotton, impregnated with the solution of chlorate of potassa instead of nitre, is said to answer an excellent purpose. (*Journ. de Pharm.*, xix. 608.) Small cylinders made out of strips of coarse muslin imbued with the same solution are also employed. M. Guepratt proposes paper or cotton dipped into the solution of subacetate of lead, and afterwards dried. (*Med. Exam.*, N. S., iii. 455, from *London Lancet.*)

Lime in the act of slaking has been employed by Dr. Osborne for the purposes of

moxa. A portion of powdered quicklime, half an inch in thickness, and of suitable lateral dimensions, is applied to the skin, and confined by some convenient arrangement. A few drops of water are then added, and a degree of heat is soon evolved sufficient for a caustic effect, if the lime be allowed to remain as long as the heat continues. This may be increased or diminished by increasing or diminishing the quantity of lime employed. The eschar formed is somewhat more than double the extent of the base of the moxa. (*Dublin Journ.*, Jan. 1842.)

Medical Use. Cauterization by fire, in the treatment of disease, has been commonly practised among savage and half civilized nations from the earliest periods of history, and has not been unknown as a remedy in the most polished communities. The ancient Egyptians and Greeks were acquainted with the use of moxa; and in China, Japan, and other countries of Asia, it appears to have been employed from time immemorial. From these countries the early Portuguese navigators introduced it into Europe; and the term *moxa* is said to have been derived from their language, though supposed by some to be of Chinese origin. The true Chinese name is said to be *kiew*. (*Percy and Laurent.*) Some years since, the remedy became very popular in France, and attracted some attention in this country. It acts on the principle of revulsion; relieving deep-seated inflammation, and local irritation whether vascular or nervous, by inviting the current of excitement to the skin. In some cases it may also operate advantageously by the propagation of a stimulant impression to neighbouring parts.

The celebrated Larrey was among those who contributed most to bring this remedy into repute. The diseases in which it was recommended by this author were amaurosis, loss of taste, deafness, paralytic affections of the muscular system, asthma, chronic catarrh and pleurisy, phthisis, chronic engorgement of the liver and spleen, rachitis, diseased spine, coxalgia, and other forms of scrofulous and rheumatic inflammation of the joints. It has also been used advantageously in neuralgia, and is applicable to chronic complaints generally in which powerful external revulsion is indicated.

The parts of the body upon which, according to Larrey, it should not be applied, are the cranium where protected only by the skin and pericranium; the eyelids, nose, and ears; the skin over the larynx, trachea, and mammary glands, over superficial tendons, projecting points of bones, and articular prominences in which the capsular ligament might be involved; the anterior surface of the abdomen; and the genitals.

As a general rule it should be applied as near as possible to the seat of the disease; and, in neuralgic or paralytic cases, at the origin or over the course of the nerves proceeding to the part affected. Some advise that the cylinder be attached to the skin by some adhesive liquid; but a more general practice is to retain it in the proper position by a pair of forceps or other instrument. Larrey recommends that the skin around it be covered with a piece of moistened lint, having a hole in the centre to admit the base of the cylinder. The moxa should be set on fire at the summit, and the combustion sustained if necessary by the breath, the blow-pipe, or the bellows. The size of the cylinder should vary, according to the effect desired, from half an inch to an inch or more in diameter, and from a few lines to an inch in height. Any degree of effect may be obtained, from a slight inflammation to the death of the skin, by regulating the time during which the moxa is allowed to burn. When a slough is required, it should be suffered to burn until consumed. The first sensation experienced is not disagreeable; but the operation becomes gradually more painful, and towards the close is for a short time very severe.

MURIATIC ETHER. *Æther Muriaticus. Muriate of Etherine. Chloride of Ethyle.* This ether was discovered by Rouelle, but first obtained in sufficient quantities to permit the examination of its properties by Basse. It may be procured by several processes, but the following is the best.—Distil a mixture of equal measures of concentrated muriatic acid and alcohol, and receive the product, by means of a curved glass tube, in a tubulated bottle, half filled with water at a temperature between 70° and 80°, and connected by means of a second tube with another bottle, loosely corked, and surrounded by a mixture of common salt with snow or pounded ice. The ether which comes over into the first bottle, is mixed with alcohol and acid, which are retained by the water, while the pure ether passes forward, and is condensed in the refrigerated bottle. This ether must be kept in strong bottles, well secured with ground stoppers covered with leather. Before being opened, the bottle should be cooled down to the freezing point.

Muriatic ether is colourless, has a strong, slightly saccharine, alliaceous taste, and a penetrating, ethereal, alliaceous smell. Its sp. gr. at the temperature of 41° is 0·774. It is extremely volatile, entering into ebullition at 54°; so that in summer it may be collected in the gaseous state, in bell-glasses over water. Its density in the state of vapour is 2·22. When kindled as issuing from a fine orifice, it burns with an emerald-green flame without smoke, diffusing a strong odour of muriatic acid; but when set on fire in quantities, it burns with a greenish-yellow smoky flame. Water dissolves one-fiftieth of its weight of

this ether, and acquires a sweetish, ethereal taste, and alcohol unites with it in all proportions. These solutions are not precipitated by nitrate of silver, showing that the chlorine present is in a peculiar state of combination. Like sulphuric and nitric ether, it dissolves sulphur and phosphorus, the fat and volatile oils, and many other substances. It consists of one eq. of muriatic acid 36·42, and one of etherine 28=64·42; or, in volumes, of two volumes of the acid, and one volume of the vapour of etherine, condensed into two volumes. Viewed as the chloride of ethyle, its formula is C_4H_5Cl.

Muriatic ether, like the other substances of this class, is a diffusible stimulant; but, owing to its extreme volatility, cannot be kept in the shops. It may, however, be preserved in a cool cellar, the temperature of which does not rise above 45° or 50°, being well secured in bottles, which should be placed reversed. When used as a medicine, it is generally mixed with an equal bulk of alcohol, forming what is called *alcoholic muriatic ether*. The dose is from five to thirty drops, given in sweetened water, or other convenient vehicle.

MUSHROOMS. *Fungi.* This extensive family of cryptogamous plants is interesting to the physician, from the consideration, that, while some of them are very largely consumed as food, others are deleterious in their nature, and capable, when eaten, of producing poisonous effects. Their substance is made up of a cellular tissue, which is usually of that soft consistence denominated fungous, but is sometimes corky, ligneous, or even gelatinous. Many of them have an agreeable odour and taste, while others are unpleasant or offensive both to the nostrils and palate. Their juice generally exhibits an acid reaction. According to Braconnot, most of them contain, among other substances, a peculiar principle denominated *fungin*, a peculiar acid called *fungic acid* usually combined with potassa, and a peculiar saccharine matter less sweet than the other varieties of sugar, less soluble in alcohol and water than that of the cane, and distinguished by some writers as the *sugar of mushrooms*. M. Bolby found *mannite* in two different species, with *oxalic acid* in one, an acid which he supposed to be the *fumaric* in a second, and the *lichenstearic acid* in a third. (*Journ. de Pharm.*, 3e *sér.*, xxiv. 236.) *Fungin* constitutes the basis of these vegetables, and is the principle upon which their nutritive properties chiefly depend. It is the fleshy substance which remains when they are treated with boiling water holding a little alkali in solution. It is whitish, soft, and insipid; inflammable; insoluble in water, alcohol, ether, weak sulphuric acid, and weak solutions of potassa and soda; soluble in heated muriatic acid; decomposed by nitric acid, and by concentrated alkaline solutions; and converted by destructive distillation into substances resembling those which result from the distillation of animal matters.

It is highly important for those who employ mushrooms as food, to be able to distinguish those which are wholesome from the poisonous. The following general rules were given by M. Richard in the *Dictionnaire des Drogues*. Those should be rejected which have a narcotic or fetid odour, or an acrid, bitter, or very acid taste; which occasion a sense of constriction in the throat when swallowed; which are very soft, liquefying, changing colour, and assuming a bluish tint upon being bruised; which exude a milky, acrid, and styptic juice; which grow in very moist places, and upon putrefying substances; in fine, all such as have a coriaceous, ligneous, or corky consistence. The last, however, are injurious in consequence rather of their indigestible than of their poisonous nature. Even mushrooms which are usually edible, may prove poisonous, if collected too late, or in places which are too moist. It is said, moreover, that the poisonous species sometimes become innocent when they grow under favourable circumstances. Immense quantities of mushrooms are eaten in France, Germany, Italy, and other parts of continental Europe; and they are said to constitute the chief food of the people in certain provinces.

Some experiments of M. Gerard would tend to show that poisonous mushrooms may be rendered innocent, by treating them with water slightly acidulated with vinegar, before cooking them. About a pound avoirdupois of poisonous mushrooms, cut into pieces, are to be macerated for two hours in a quart of water, acidulated with two or three spoonfuls of strong vinegar, and afterwards to be washed with a large quantity of water. Next day they are to be put into cold water, boiled for half an hour, then taken out, washed, and dried. They are now fit for food. (See *Am. Journ. of Pharm.*, xxv. 274.) But subsequent experiments by MM. Demartis and Corne, of Bordeaux, have proved that this method is not always to be relied on; as certain mushrooms, after having been treated in the manner suggested, have nevertheless produced fatal effects on animals to which they were given; and as the same mushrooms may be poisonous at one season, or in one situation, and innocent in another, the inference is that those experimented on by M. Gerard, though ordinarily poisonous, may not have been so in that particular instance. (*Journ. de Pharm.*, 3e *sér.*, xxi. 468.)

The symptoms produced by the poisonous mushrooms are anxiety, nausea, faintness, vomiting, and, if they are not rejected from the stomach, somnolence, stupor, small and

intermittent pulse, tension of the abdomen, cold extremities, livid skin, and death in thirty-six or forty-eight hours. Sometimes violent pains in the stomach and bowels are experienced; and occasionally severe vomiting and purging occur, and save the patient. The remedies are emetics, if the physician is called in time, accompanied with the free use of warm drinks, and followed by cathartics. After the evacuation of the alimentary canal, demulcent and nutritive beverages should be given, and the strength of the patient sustained by mild tonics or stimulants. Ether is particularly recommended.

Some of the poisonous species have been used as medicines; but in this country they are never employed; and too little seems to be precisely known of their modes of action, and their qualities, even in the same species, vary too much, according to the circumstances of their growth and situation, to justify their introduction into the materia medica, without further investigation. A species of *Lycoperdon* or puff-ball, *L. proteus*, has been proved by Mr. B. W. Richardson, of London, to have remarkable narcotic and anæsthetic properties. Having noticed that the smoke of this fungus was used in the country for stupefying bees, he made experiments with the fumes upon various animals, which, when caused to inhale them, became insensible, and could be operated on without evincing any signs of pain. When carried far, they caused death. He had himself inhaled the fumes clarified by passing them through water, and experienced symptoms of intoxication and drowsiness. They were procured by burning the fungus. (*Lond. Med. Times and Gaz.*, June, 1853, p. 610.)

MUSK, ARTIFICIAL. *Moschus Factitius.* This is prepared, according to M. Elsner, by adding, by small portions at a time, one part of rectified oil of amber to three parts of fuming nitric acid. The resulting resin is washed with water to separate acid, and brought to the consistence of a firm extract in a water bath. Thus prepared it is a dark brownish-red substance, having a burning, bitter, aromatic taste, and a musky odour. It is very soluble in alcohol, ether, and the volatile oils; its alcoholic solution reddening litmus. Triturated with caustic potassa, it gives off ammonia. When set on fire, it burns with a very smoky flame, and leaves a shining, porous charcoal. Its formula, deduced from its combination with protoxide of lead, is $N_2C_{15}H_8O_7$. Comparing its composition with that of the oil of amber, the action of the nitric acid evidently consists in eliminating a portion of carbon and hydrogen, adding to the oxygen, and furnishing nitrogen. M. Elsner found oil of amber to consist of several oily principles, having different boiling points, one of which, resembling eupione, he calls *amber eupione*. As this substance yields artificial musk by the action of fuming nitric acid, he believes the property possessed by oil of amber of yielding the same substance is due to its presence. (*Journ. de Pharm.*, 3e *sér.*, ii 144.) During the reaction of nitric acid with oil of amber, Dr. John T. Plummer, of Indiana, has observed that oxalic acid is generated. (*Am. Journ. of Pharm.*, Jan. 1852, p. 36.)

Dr. S. W. Williams gives the following formula for the preparation of artificial musk. Add gradually, drop by drop, *three drachms and a half* of concentrated nitric acid to *a drachm* of rectified oil of amber, contained in a glass tumbler, or very large wineglass. The mixture grows hot, and emits offensive fumes, which the operator must avoid. When the ordinary nitric acid is employed, which is not of full strength, the reaction must be assisted by heat; in which case Dr. Williams recommends that the vessel containing the mixed ingredients be placed in a plate before the fire, they being, meanwhile, continually stirred with a glass rod. After the mixture has remained at rest for twenty-four hours, it acquires a resinous appearance, and divides into two portions, an acid liquid below, and a yellow resin above resembling musk in smell. This being thoroughly washed, first with cold and then with hot water, until all traces of acid are removed, is the artificial musk. (*Am. Journ. of Pharm.*, viii. 14, from the *Boston Med. and Surg. Journ.*)

Artificial musk is an antispasmodic and nervine, and possesses the general therapeutic properties of the natural substance, though in a weaker degree. It is praised by Dr. Williams in the treatment of hooping-cough, typhoid states of fever, and nervous diseases generally. When combined with water of ammonia, compound spirit of lavender, or laudanum, he found no remedy so efficient in the sinking faintness occurring in the last stage of pulmonary consumption. The average dose for an adult is ten grains; for a child of two years old, from half a grain to a grain, repeated, in each case, every two or three hours. It may be prepared as the musk mixture, or with almonds in the form of emulsion. According to Berzelius, the tincture is formed by dissolving *a drachm* of artificial musk in *an ounce* of alcohol, equivalent to *ten fluidrachms* of the sp. gr. 0·835. Of this the dose for an adult is a teaspoonful. Though artificial musk is not equal in power to the natural substance when genuine, yet it is in all probability superior to the adulterated article, so frequently sold under the name of musk.

MYROBALANS. *Myrobalani.* These are the fruits of various East India trees, particularly of different species of Terminalia. They are noticed here partly on account of

their ancient reputation, partly because they are still occasionally to be found in the shops, though seldom, if ever used in medicine. Five varieties are distinguished by authors. 1. *Myrobalani bellericæ.* These are obtained from *Terminalia Bellirica.* They are roundish or ovate, from the size of a hazelnut to that of a walnut, of a grayish-brown colour, smooth, marked with five longitudinal ribs, and sometimes furnished with a short, thick footstalk. They consist of an exterior, thin, firm, resinous, brown, fleshy portion, and an interior kernel, which is light-brown, inodorous, and of a bitterish very astringent taste. 2. *Myrobalani chebulæ.* This variety is produced by *Terminalia Chebula.* The fruit is oblong, pointed at each extremity, from fifteen to eighteen lines in length, of a dark-brown colour, smooth and shining, with five longitudinal wrinkles, but without footstalks. In their internal arrangement and their taste, they resemble the preceding. 3. *Myrobalani citrinæ* vel *flavæ.* These are from a variety of the same tree which affords the last-mentioned myrobalans, from which they differ only in being somewhat smaller, of a light-brown or yellowish colour, and of a taste rather more bitter. They were formerly sometimes sold in the shops in Philadelphia, under the name of *white galls*, to which, however, they bear no other resemblance than in taste. 4. *Myrobalani Indicæ* vel *nigræ.* These are thought to be the unripe fruit of *Terminalia Chebula*, or *T. Bellirica.* They are ovate-oblong, from four to eight lines long, and from two to three lines thick, of a blackish colour, wrinkled longitudinally, and presenting, when broken, a thick brown mass, without kernel, but with a small cavity in the centre. They are sourish and very astringent. 5. *Myrobalani emblicæ.* This variety is wholly different from the preceding, and derived from a plant having no affinity to the Terminaliæ, namely, the *Phyllanthus Emblica* of Linnæus. It is often in segments, as kept in the shops. When the fruit is entire, it is blackish, spherical, depressed, of the size of a cherry, presenting six obtuse ribs with as many deep furrows, and separating into six valves, and has a strongly astringent and acidulous taste.

These fruits were in high repute with the Arabians, and were long employed by European practitioners, as primarily laxative and secondarily astringent, in various complaints, particularly diarrhœa and dysentery. Their dose was from two drachms to an ounce. They are not now employed as medicines. We have been told that they have been used as a substitute for galls in the preparation of ink-powder.

NAPHTHALINE. This may be obtained by subjecting coal-tar to distillation, when it passes over after the coal-naphtha. It is a white, shining, concrete, crystalline substance, fusible at 176° and boiling at 423°. It is soluble in alcohol, ether, naphtha, and the oils, but insoluble in water. It has been proposed by Dupasquier as an expectorant, and has been found, on trial, to act decidedly as such. In the impending suffocation, sometimes occurring in the chronic pulmonary catarrh of old persons, and in humoral asthma, it facilitated expectoration in a remarkable degree. Being a stimulating remedy, it is not proper in acute bronchitis, or where pulmonary inflammation exists. The dose is from eight to thirty grains, given in emulsion or syrup, and repeated at intervals of a quarter of an hour, until an abundant expectoration takes place. (*Journ. de Pharm.*, 3*e sér.*, ii. 513.) M. Rossignon considers naphthaline to act like camphor, and to be capable of replacing it on many occasions as a remedy. It produces excellent effects in verminose affections. It has been found useful by M. Emery, in the form of ointment made by mixing a scruple of naphthaline with five drachms of lard, in dry tetter, psoriasis, and lepra vulgaris. (*Annuaire de Thérap.*, 1843, pp. 64 and 66.)

NAPLES YELLOW. A yellow pigment prepared by calcining a mixture of lead, sulphuret of antimony, dried alum, and muriate of ammonia, or a mixture of carbonate of lead, diaphoretic antimony, dried alum, and muriate of ammonia. (*Gray.*)

NARCISSUS PSEUDO-NARCISSUS. *Daffodil.* This well-known bulbous plant is a native of Europe, but is very common in the gardens of this country, where it attracts attention by the early appearance of its conspicuous yellow flowers. Both the bulb and flowers have been used in medicine. The latter have a feeble peculiar odour, and both have a bitter mucilaginous taste. They are emetic, though uncertain in their operation. It is probable that the flowers of the wild plant are more powerful than those of the cultivated. They may be given dried and powdered, or in the form of extract. The dose of the powder, to produce an emetic effect, varies, according to the statements of different physicians, from a scruple to two drachms; while the extract is said to vomit in the dose of two or three grains. It is conjectured that the emetic property is developed by the agency of water. The bulb is most powerful in the recent state, and, within our own knowledge, is occasionally used as an emetic in domestic practice in this country. When dried and powdered, it has been given in the dose of thirty-six grains without vomiting. The flowers are said also to possess antispasmodic powers, and have been used in France, with supposed advantage, in hooping-cough, epilepsy, and other convulsive affections. It is probable, however, that they operated in these cases by their nauseating or emetic

property. They have, moreover, been advantageously employed in diarrhœa, dysentery, and intermittent fever. Other species of Narcissus are said to possess the same properties, though they have not been so much used.

NARD. *Spikenard.* Several aromatic roots were known to the ancients under the name of *nardus*, distinguished, according to their origin or place of growth, by the names of *nardus Indica*, *nardus Celtica*, *nardus montana*, &c. They are supposed to have been derived from different species of *Valeriana*. Thus the nardus Indica is referred to *V. Jatamensi* of Bengal, the nardus Celtica to *V. Celtica*, inhabiting the Alps, Apennines, &c., and the nardus montana to *V. tuberosa*, which grows in the mountains of the South of Europe. The Indian nard, or spikenard, sometimes also called Syrian nard, is still occasionally to be found in the shops. It is a small delicate root, from one to three inches long, beset with a tuft of soft, light-brown, slender fibres, of an agreeable odour, and a bitter, aromatic taste. It was formerly very highly esteemed as a medicine, but is now almost out of use. Its properties are analogous to those of the officinal valerian.

NASTURTIUM OFFICINALE. R. Brown. *Sisymbrium Nasturtium.* Linn. *Water-cress.* A small, perennial, herbaceous, succulent plant, growing in springs, rivulets, and ponds, in North America, Europe, and some parts of Asia. The fresh herb has a quick penetrating odour, especially when rubbed, and a bitterish, pungent taste, but loses both when dried. In sensible and medical properties it bears some resemblance to scurvy grass, though milder, and on this account is preferred for the table. It is thought to be useful in scorbutic affections, and visceral obstructions. The expressed juice is sometimes given in the dose of one or two ounces; but the herb is more frequently used in the form of a salad. Other species of Nasturtium, as *N. palustre*, or *marsh water-cress*, and *N. amphibium* or *water-radish*, grow in similar situations with the *N. officinale*, and possess similar virtues.

NIGELLA SATIVA. *Nutmeg-flower. Small fennel-flower.* A small annual plant, growing wild in Syria and the South of Europe, and cultivated in various parts of the world. The seeds, which are sometimes kept in the shops under the name of *semen nigellæ*, are ovate, somewhat compressed, about a line long and half as broad, usually three-cornered, with two sides flat and one convex, black or brown externally, white and oleaginous within, of a strong, agreeable, aromatic odour, like that of nutmegs, and a spicy pungent taste. Their chief constituents are a volatile and fixed oil, and a peculiar bitter principle denominated *nigellin*, which exists in the seeds in very minute proportion. (*Journ. de Pharm.*, 3*e sér.*, ii. 128.)

NITRATE OF COPPER. *Cupri Nitras.* This well known salt has been employed with advantage as a caustic, in a severe case of ulceration of the throat and tongue, and in several similar cases, by Dr. William Moore, of Ballymoney, Ireland. The application is attended with no danger, provided the ulcer or part is dried before applying the caustic, and afterwards smeared with oil. (See *Braithwaite's Retrospect*, xxv. 201.)

NITRATE OF SODA. *Cubic Nitre.* This salt may be formed by treating carbonate of soda with nitric acid. It is found naturally, in inexhaustible quantities, in the desert of Atacama and elsewhere, in Peru, where it forms beds of vast extent. Attempts were made between 1820 and 1830 to export it to England and the United States; but the cargoes were unsalable. Soon afterwards, however, its value came to be known; so that at present large quantities are exported from Peru, being consumed in the manufacture of sulphuric and nitric acids, and as a fertilizer. Considerable quantities have been brought to the United States.

Nitrate of soda, when pure, is a white salt, crystallizing in rhomboidal prisms, and having a sharp, cooling, and bitter taste. It attracts moisture slightly from the air, and dissolves in about twice its weight of water at 60°. It has been praised as a remedy in dysentery by two German physicians, Drs. Velsen and Meyer, given in the quantity of from half an ounce to an ounce in the course of the day, dissolved in gum water or other mucilaginous liquid. The crude salt, as it comes from Peru, is in saline lumps, rather soft and friable, and damp on the surface. It is distinguished into varieties, according to its colour and state of aggregation; as *white compact*, *yellow*, *gray compact*, *gray crystalline*, and *white crystalline*; and varies very much in purity, from containing eighty-five to only twenty per cent. of the pure salt. Some of the varieties contain iodine. (See *page* 41.) The impurities consist of common salt, sulphate and carbonate of soda, and chloride of calcium. Occasionally, borate of lime is found, associated with borate of soda, under the beds of the nitrate. (See *page* 687.)

As nitrate of soda has been imposed upon our merchants for nitre, it may be useful to mention that the former salt may be distinguished by its giving rise to an orange-yellow flame when thrown on burning coals, and by the rhomboidal shape of its crystals; those of nitre being long six-sided prisms. (See *page* 590.)

NITROPRUSSIDE OF SODIUM. This is the most interesting of a series of salts, discovered by Dr. Playfair, called *nitroprussides*, which are produced, for the most part, by saturating the acid (*nitroprussic acid*), generated by the action of nitric acid on ferrocyanuret of potassium, with different bases. The sodium salt is best obtained by the process of A. Overbeck, as follows.—Dissolve *four parts* of powdered ferrocyanuret of potassium contained in a flask, in *five and a half parts* of commercial nitric acid, diluted with an equal weight of water. After the action is completed, which generally occupies about ten minutes, and is accompanied by a copious evolution of gases, heat the resulting coffee-brown liquid by a water bath, until a drop of it gives a dingy green, instead of a blue precipitate with a solution of sulphate of protoxide of iron. Then allow the liquid to cool; whereupon the larger part of the nitrate of potassa generated will be deposited in crystals. Pour off the green mother-liquor from these, and separate the remaining nitrate of potassa by repeated concentrations. Next neutralize the liquid, while heated on a water bath, with carbonate of soda, taking care to add the carbonate so long only as a pure blue precipitate is produced. Lastly, filter the solution, and set it aside that crystals may form, which must be washed with water, and dried between blotting paper. (*Chem. Gaz.*, July 15, 1853, p. 271.) This salt is in the form of large ruby-coloured prismatic crystals, very much resembling those of ferridcyanuret of potassium (red prussiate of potassa). It is soluble in two and a half parts of cold water, and in a less quantity of hot water. Its solution, exposed to sunshine, is decomposed, with evolution of nitric oxide gas, and deposition of Prussian blue, at the same time acquiring a green colour. Nitroprusside of sodium, as well as the other soluble nitroprussides, is a most delicate test for the alkaline sulphurets, with which it strikes a beautiful violet colour. (See *page* 716.) Its composition is not certainly known; but the following formula, given by Gerhardt, is probably the correct one. ($Na_2,Fe_2Cy_5NO_2+4HO$.) Nitroprussic acid is the nitroprusside of hydrogen, with the formula $H_2,Fe_2Cy_5NO_2$.

NITROSULPHATE OF AMMONIA. This compound, discovered by Pelouze in 1835, may be formed by passing nitric oxide through a solution of sulphate of ammonia in five or six times its volume of water of ammonia. A large number of crystals are formed, which must be quickly washed with liquid ammonia previously refrigerated, and dried without heat. Nitrosulphate of ammonia has been used at the Hotel Dieu in Paris, in doses of twelve grains, with apparent advantage, in typhoid fevers. Its composition corresponds with one eq. of nitric oxide, one of sulphurous acid, and one of ammonia; but as the salt is not precipitated by barytic water, Pelouze conceives that the nitric oxide and sulphurous acid, together, form a peculiar acid which he calls *nitrosulphuric acid*, consisting of one eq. of nitrogen, one of sulphur, and four of oxygen.

NITROUS OXIDE. This well known gas, generally called the laughing gas, from its power to cause a transient intoxication when breathed, is capable of producing anæsthetic effects; but even if these were as safely induced as by ether, the comparative expense of the gas would prevent its employment. The late Mr. Horace Wells, dentist, of Connecticut, tried to introduce it as an anæsthetic; but his first experiments were unsuccessful, and further attempts were superseded by the discovery of etherization.

Water, impregnated by pressure with about five times its volume of this gas, forms the *nitrous oxide water*, known in England under the name of Searle's patent oxygenous aërated water, which has been used to some extent as an internal remedy. Sir H. Davy tried the aqueous solution, made without pressure, and thought it acted as a diuretic, and promoted digestion; and Serullas used it in Asiatic cholera with apparent advantage. The patent water is asserted to be suited to the treatment of torpor, debility, depression of spirits, asthma, and dyspepsia; but to be contra-indicated in inflammatory and plethoric states of the system. Dr. George J. Ziegler, of Philadelphia, has made a number of therapeutic trials with nitrous oxide water, charged with five times its volume of the gas, and finds it to possess tonic, resolvent, exhilarant, and diuretic properties. He has observed, however, that its free and prolonged use is apt to produce emaciation. Dr. Ziegler has also made some interesting experiments, tending to show the antidotal and revivifying properties of nitrous oxide. In these experiments, dogs were asphyxiated or poisoned with carburetted hydrogen, chloroform, carbonic acid, hydrocyanic acid, and other agents, and, when in a state of suspended animation more or less complete, were generally revived by the nitrous oxide water, injected into the bowels in the amount of from two to three pints. When administered by the stomach, the dose of the water is from half a pint to a pint and a half, taken in the course of the day. Dr. Ziegler concludes from his observations and experiments that nitrous oxide is a powerful arterial, nervous, and cerebral stimulant, possessing, at the same time, valuable antidotal powers. (*Boston Med. and Surg. Journ.*, xlvi. 453 and xlvii. 383.)

NYMPHÆA ODORATA. *Sweet-scented Water-lily.* An indigenous herbaceous perennial, growing in most parts of the United States, in fresh water ponds and the borders

of streams, and distinguished by the beauty and delicious odour of its large, white, many-petaled flowers. Its root is large and fleshy in the recent state, but becomes light, spongy, and friable by drying. It is very astringent and bitter, and, according to Dr. Bigelow, contains much tannin and gallic acid. It is sometimes employed, in the form of poultice, as a discutient application. The root of the *Nymphæa alba*, or European *white water-lily*, was esteemed aphrodisiac by the ancients, but has long lost this reputation. Like that of the American plant, it is bitter and styptic, and may have been useful by its astringency in some cases of leucorrhœa, gonorrhœa, dysentery, &c., in which it was formerly employed for its reputed sedative virtues.

OCHRES. These are native mixtures of argillaceous or calcareous earth and oxide of iron, employed in painting. They are prepared for use by agitating them with water, decanting the turbid liquor after the coarser particles have subsided, then allowing it to rest in order that the finer parts may be deposited, and, lastly, drying the sediment which forms. The colour of the ochres varies with the state of oxidation of the iron, and with the proportion which it bears to the other ingredients, and is sometimes artificially modified by the agency of heat. Several varieties are kept in our shops under different names, according to their colour or place of origin. Such are the *brown ochre*, the *yellow ochre*, the *red ochre*, the *Roman ochre* of a brownish-yellow changing by heat to a purple-red, the *Oxford ochre* of a brownish-yellow colour less deep than the Roman, and the *French ochre* which is yellow. The *Indian red* from the Persian Gulf, the *Spanish brown*, may also be ranked in this class of pigments. Sometimes ochres come in a powdery state, and sometimes in hard masses; in the latter state they are called *stone ochres*.

OCIMUM BASILICUM. *Basil.* An annual plant, a native of India and Persia, and cultivated in Europe and in this country in gardens. The whole plant has a strong, peculiar, agreeable, aromatic odour, which is improved by drying. The taste is aromatic, and somewhat cooling and saline. Basil has the ordinary properties of the aromatic plants, and is in some places considerably used as a condiment. The seeds are said by Ainslie to be used in India, in the form of infusion, as a remedy in gonorrhœa and nephritic affections.

ŒNANTHE CROCATA. *Hemlock Water-dropwort.* A perennial umbelliferous aquatic European plant, exceedingly poisonous both to men and inferior animals. The root, which has a sweetish, not unpleasant taste, is sometimes eaten by mistake for other roots, with the most dangerous effects; and numerous instances of fatal results are on record. The symptoms produced are such as attend irritation or inflammation of the stomach, united with great cerebral disturbance, indicated by giddiness, convulsions, and coma. Externally applied, the root produces redness and irritation of the skin, with an eruptive affection. It is said to be sometimes used empirically as a local remedy in piles; and a case is recorded in which an obstinate leprosy was cured by the continued use of the juice of the plant. Other species of *Œnanthe* are poisonous, and the whole genus should be regarded among the suspected plants. We have two or three indigenous species. The proper remedies, in cases of poisoning from these plants, are emetics, followed, after the stomach has been thoroughly evacuated, by demulcent drinks. A peculiar resinoid principle, denominated *œnanthin*, has been found by M. Gerding in Œnanthe fistulosa, of which half a grain, given to an adult, produced long-continued irritation of the fauces, with hoarseness, and a grain occasioned vomiting. (See *Am. Journ. of Pharm.*, xxi. 68.)

ŒNANTHE PHELLANDRIUM. Sprengel. *Phellandrium aquaticum.* Linn. *Fine-leaved Water-hemlock.* A biennial or perennial, umbelliferous, European water plant, the fresh leaves of which are said to be injurious to cattle, producing a kind of paralysis when eaten. By drying, they lose their deleterious properties. The *seeds* have been used in Europe to a considerable extent in the treatment of disease. They are from a line to a line and a half in length, ovate-oblong, narrow above, somewhat compressed, marked with ten delicate ribs, and crowned with the remains of the calyx, and with the erect or reverted styles. Their colour is yellowish-brown; their odour peculiar, strong, and disagreeable; their taste acrid and aromatic. Among their constituents is a volatile oil, upon which their aromatic flavour depends. By different writers they are described as aperient, diuretic, emmenagogue, expectorant, and sedative. They probably unite mild narcotic properties with the stimulant powers which are common to most of the aromatics, and may be directed, according to circumstances, to different secretory organs. In over-doses they produce vertigo, intoxication, and other narcotic effects. They appear to have been used most successfully in chronic pectoral affections, such as bronchitis, pulmonary consumption, and asthma. They have been given also in dyspepsia, intermittent fever, obstinate ulcers, &c. The dose of the seeds, to commence with, is five or six grains, so repeated as to amount to a drachm in twenty-four hours. They should be given in powder. A tincture and alcoholic extract of the seeds have been prepared, of which the former, containing the

virtues of half a drachm of the seeds in a fluidounce, is given in the dose of from f℥ss to f℥j, and the latter in that of three to five grains. (*Pharm. Journ. and Trans.*, xii. 591.)

ŒNOTHERA BIENNIS. *Tree Primrose.* A biennial indigenous plant, growing in fields and along fences, from Canada to the Carolinas. It is from two to five feet high, with a rough stem, alternate, ovate-lanceolate leaves, and fine yellow flowers, which make their appearance in July and August. Schoepf states that it is esteemed useful as a vulnerary. The late Dr. R. E. Griffith found a strong decoction of the small branches, with the leaves and cortical part of the stem and larger branches, very beneficial in eruptive complaints, especially tetter. He applied the decoction several times a day to the affected part. He believed the virtues of the plant to reside in the cortical part, which has a mucilaginous taste, and leaves a slight sensation of acrimony in the fauces. (*Journ. of the Phil. Col. of Pharm.*, iv. 292.)

OIL OF ANDA. A fixed oil procured by expression from the seeds of *Anda Brasiliensis* (Radde), *Anda Gomesei* (Ad. Jussieu), a tree of Brazil, belonging to the family of Euphorbiaceæ. The bark yields on being wounded a milky juice, which is said to be poisonous, and to be used for stupefying fish. The fruit, which is about as large as an apple, ash-coloured, with two larger and two smaller angles, encloses a two-celled nut, containing two seeds, about the size of a chestnut. Like the seeds of other Euphorbiaceous plants, these are actively purgative; one seed, according to Martius, being the dose for a man. By expression these seeds yield a pale-yellow transparent oil, with little smell or taste, which is said to be used in Brazil for burning and painting. Dr. Norris, who tried the oil at the Pennsylvania Hospital, found it to operate on the bowels moderately in the dose of fifty drops, and copiously, when more largely given. (*Cyclopædia of Pract. Med. and Surg.*, i. 470.) Dr. Alexander Ure, who has experimented with it in several cases, states that, in the average dose of twenty drops, it usually operates mildly, without producing heat or pain in the throat, and seldom causing nausea or vomiting.

OIL OF BEN. This is a fixed oil extracted from the seeds of the *Moringa pterygosperma* and *M. aptera* of *Gærtner*, confounded by Linnæus under the name of *Guilandina Moringa*. *Hyperanthera Moringa* (Vahl) is a synonyme of the former species. These are trees belonging to the family of *Leguminosæ*, inhabiting different parts of India, Arabia, Syria, &c., and introduced into the W. Indies. The leaves and other parts have an acrid property, which has probably given the name of *horseradish tree* to M. pterygosperma. The oil of the seeds has long been known, though used rather in the arts than in medicine. Most of it is prepared in Europe from seeds brought from Egypt (*Merat and De Lens*); but it is said also to be extracted in the W. Indies. It is inodorous, clear, and nearly colourless, and keeps long without becoming rancid. It is employed for similar purposes with olive oil. Merat and De Lens say that it is purgative; but most of the fixed oils are so in sufficient doses. According to Völker the oil contains margarin, olein, and a peculiar fatty matter yielding an acid by saponification, which he proposes to call *benic acid.* (*Journ. de Pharm. et de Chim.*, xvi. 77.)

OIL OF CADE. *Oleum Cadinum. Huile de Cade.* French. This is a kind of tar obtained by distillation *per descensum* from the interior reddish wood of *Juniperus communis*, or more strictly of *J. Oxycedrus*, which grows in the South of France where the substance is prepared. It is a thick liquid, black, and of a smell analogous to that of common tar. It has long been employed in the treatment of the cutaneous diseases of horses, sheep, &c.; and was also applied by the peasantry to their own skin affections. Recently it has acquired much reputation in these complaints, in consequence of its extensive and successful use in the hospitals of Paris. M. Bazin has employed it with success in psora, lichen agrius, the different scaly affections, the advanced stage of eczema, and favus. In most of these complaints we have long been in the habit of employing common tar ointment, and with probably equal success. A kind of soap is prepared from the oil of cade, which affords a convenient method of applying it. In the *Ed. Monthly Journ. of Med. Sci.* for July, 1852 (*page* 66), it is stated that the soap is made by distilling the tar, incorporating the volatile oil thus obtained with a fixed oil, and then saponifying this with soda. It is in the form of black balls, which readily unite with water, and may be applied to the surface like any other soap. The best plan is probably to apply it at bedtime, and wash it off next morning.

OIL OF EUPHORBIA. A fixed oil, obtained from the seeds of *Euphorbia Lathyris*, a biennial plant growing wild in this country, though believed to have been introduced from Europe. It is often found near gardens and in cultivated fields, and is generally called *mole plant*, under the impression that moles avoid the grounds where it grows. (*Pursh.*) It is the *Caper plant* of England. (*Loudon's Encyc. of Plants.*) Like the other species of Euphorbia, it contains a milky juice, which is extremely acrid; and the whole plant possesses the properties of a drastic purge; but the oil of the seeds is the only part used in

regular practice. This may be extracted by expression, or by the agency of alcohol or of ether. In the first case, the bruised seeds are pressed in a canvass or linen bag, and the oil which escapes is purified by decanting it from the whitish flocculent matter which it deposits upon standing, and by subsequent filtration. By the latter process, the bruised seeds are digested in alcohol or macerated in ether, and the oil is obtained by filtering and evaporating the solution. According to Soubeiran, however, the oils obtained by these different processes are not identical. That procured by expression is probably the purest.

Oil of euphorbia is colourless, inodorous, and, when recent, nearly insipid; but it speedily becomes rancid, and acquires a dangerous acrimony. Soubeiran has ascertained that it has a complex composition, containing, besides the pure oil, four distinct proximate principles. (*Journ. de Pharm.*, xxi. 259.) From 40 to 44 parts are obtained by expression from 100 of the seed.

This oil is a powerful purge, operating with much activity in a dose varying from five to ten drops. It was, some years since, much used by certain Italian and French physicians, who did not find it to produce inconvenient irritation of the stomach and bowels. Its want of taste, and the smallness of the dose, recommended it especially in the cases of infants. It was said to be less acrid and irritating than the croton oil, over which it also had the advantage of greater cheapness. Some trials which have been made with it on this side of the Atlantic have not tended to confirm these favourable reports. It was found uncertain in its cathartic effect, and very liable to vomit. (Scattergood, *Journ. of the Phil. Col. of Pharm.*, iv. 124.) It may be given in pill with the crumb of bread, or in emulsion.

OIL OF JASMINE. This oil is obtained from the flowers of *Jasminum officinale* or *common white jasmine*, and from those also of *J. Sambac* and *J. grandiflorum*. Alternate layers of the fresh flowers, and of cotton saturated with *oil of ben* (see *page* 1370), or perhaps other fixed oil, are exposed in a covered vessel to the warmth of the sun; the flowers being occasionally renewed till the oil becomes impregnated with their odour, when it is separated from the cotton by pressure. This method is necessary, as the flowers do not yield their aroma by distillation. The oil of jasmine is used only as a perfume.

OLIBANUM. Olibanum, the *frankincense* of the ancients, was erroneously ascribed by Linnæus to *Juniperus Lycia*. There appear to be two varieties of olibanum, one derived from the countries bordering on the Red Sea, and taken to Europe by way of the Mediterranean, the other brought directly from Calcutta. The tree producing the former has not been botanically described, though believed by some writers to be a species of Amyris. Captain Kempthorne, of the E. India Company's Navy, saw it growing upon the mountains, on the African coast, between Bunder Maryah and Cape Guardafui. According to his statement, it grows upon the bare marble rocks composing the hills in that region, without any soil or the slightest fissure to support it, adhering by means of a substance thrown out from the base of the stem. This rises forty feet, and sends forth near the summit short branches, covered with a bright green, singular foliage. The juice, which exudes through deep incisions made into the inner bark, is at first of the colour and consistence of milk, but hardens on exposure. (*Pharm. Journ. and Trans.*, iv. 37.) The India olibanum has been satisfactorily ascertained to be the product of the *Boswellia serrata* of Roxburgh, a large tree growing in the mountains of India, and found by Mr. Colebrook abundant in the vicinity of Nagpur. The tree belongs to the class and order *Decandria Monogynia*, and to the natural order *Terebintaceæ* of Kunth.

The Arabian or African frankincense is in the form of yellowish tears, and irregular reddish lumps or fragments. The tears are generally small, oblong or roundish, not very brittle, with a dull and waxy fracture, softening in the mouth, and bearing much resemblance to mastich, from which, however, they differ in their want of transparency. The reddish masses soften in the hand, have a stronger smell and taste than the tears, and are often mixed with fragments of bark, and small crystals of carbonate of lime.

The Indian frankincense, or olibanum, consists chiefly of yellowish, somewhat translucent, roundish tears, larger than those of the African, and generally covered with a whitish powder produced by friction. It has a balsamic resinous smell, and an acrid, bitterish, somewhat aromatic taste. When chewed it softens in the mouth, adheres to the teeth, and partially dissolves in the saliva, which it renders milky. It burns with a brilliant flame, and a fragrant odour. Triturated with water it forms a milky imperfect solution. Alcohol dissolves nearly three-fourths of it, and the tincture is transparent. From 100 parts, Braconnot obtained 8 parts of volatile oil, 56 of resin, 30 of gum, and 5·2 of a glutinous matter insoluble in water or alcohol, with 0·8 loss. Various saline substances were found in its ashes. The oil may be separated by distillation, and resembles that of lemons in colour and smell.

Medical Properties. Olibanum is stimulant like the other gum-resins; but is now never

used internally. It is chiefly employed for fumigations, and enters into the composition of some unofficinal plasters.

ONION. *Cepa.* The bulb of *Allium Cepa.* This is a perennial bulbous plant, with a naked scape, swelling towards the base, exceeding the leaves in length, and terminating in a simple umbel of white flowers. The leaves are hollow, cylindrical, and pointed. The original country of the onion is unknown. The plant has been cultivated from time immemorial, and is now diffused over the whole civilized world. All parts of it have a peculiar pungent odour, but the bulb only is used. This is of various size and shape, ovate, spherical, or flattened, composed of concentric fleshy and succulent layers, and covered with dry membranous coats, which are reddish, yellowish, or white, according to the variety. It has, in a high degree, the characteristic odour of the plant, with a sweetish and acrid taste. Fourcroy and Vauquelin obtained from it a white acrid volatile oil holding sulphur in solution, albumen, much uncrystallizable sugar and mucilage, phosphoric acid both free and combined with lime, acetic acid, citrate of lime, and lignin. The expressed juice is susceptible of the vinous fermentation.

The onion is stimulant, diuretic, expectorant, and rubefacient. Taken moderately, it increases the appetite and promotes digestion, and is much used as a condiment; but in large quantities it is apt to cause flatulence, gastric uneasiness, and febrile excitement. The juice is occasionally given, made into syrup with sugar, in infantile catarrhs and croup, in the absence of much inflammatory action. It is also recommended in dropsy and calculous disorders. Deprived of its essential oil by boiling, the onion becomes a mild esculent; and it is much more used as food than as medicine. Roasted and split, it is sometimes applied as an emollient cataplasm to suppurating tumours.

OPOPANAX. The concrete juice of *Pastinaca Opopanax* (Willd.), *Opopanax Chironium* (De Candolle). This species of parsnep, usually called *rough parsnep*, has a thick, yellow, fleshy, perennial root, which sends up annually a strong branching stem, rough near the base, about as thick as a man's thumb, and from four to eight feet in height. The leaves are variously pinnate, with long sheathing petioles, and large, oblong, serrate leaflets, of which the terminal one is cordate, others are deficient at their base upon the upper side, and the whole are hairy on their under surface. The flowers are small, yellow, and form large flat umbels at the termination of the branches. The plant is a native of the Levant, and grows wild in the South of France, Italy, and Greece. When the base of the stem is wounded, a juice exudes, which, when dried in the sun, constitutes the opopanax of commerce. Some authors state that it is obtained from the root. A warm climate appears necessary for the perfection of the juice; as that which has been collected from the plant in France, though similar to opopanax, is of inferior quality. The drug is brought from Turkey. It is said to come also from the East Indies; but Ainslie states that he never met with it in any Indian medicine bazaar.

It is sometimes in tears, but usually in irregular lumps or fragments, of a reddish-yellow colour, speckled with white on the outside, paler within, and, when broken, exhibiting white pieces intermingled with the mass. Its odour is strong, peculiar, and unpleasant; its taste bitter and acrid. Its sp. gr. is 1·622. It is inflammable, burning with a bright flame. In chemical constitution it is a gum-resin, with an admixture of other ingredients in small proportion. The results of its analysis by Pelletier were from 100 parts, 33·4 of gum, 42 of resin, 4·2 of starch, 1·6 of extractive, 0·3 of wax, 2·8 of malic acid, 9·8 of lignin, 5·9 of volatile oil and loss, with traces of caoutchouc. Water by trituration dissolves about one-half of the gum-resin, forming an opaque milky solution, which deposits resinous matter on standing, and becomes yellowish. Both alcohol and water distilled from it retain its flavour; but only a very minute proportion of oil can be obtained in a separate state.

Opopanax was formerly employed, as an antispasmodic and deobstruent, in hypochondriasis, hysteria, asthma, and chronic visceral affections, and as an emmenagogue in suppression of the menses; but it is now generally regarded as a medicine of very feeble powers, and in this country is scarcely ever used. The dose is from ten to thirty grains.

ORANGE RED. *Orange Mineral. Sandix.* Red oxide of lead, prepared by calcining carbonate of lead. It is of a brighter colour than *minium*, and is used as a pigment.

OROBANCHE VIRGINIANA. *Epifagus Americanus.* Nuttall. *Beech-drops. Cancer-root.* This is a parasitic, fleshy plant, with a tuberous, scaly root, and a smooth stem, branched from the base, from twelve to eighteen inches high, furnished with small ovate scales, of a yellowish or purplish colour, and wholly destitute of verdure. It is found in all parts of North America, growing upon the roots of the beech tree, from which it obtained its popular name. Is is in some places very abundant. The plant has a bitter, nauseous, astringent taste, which is said to be diminished by drying. It has been given internally in bowel affections; but its credit depends mainly upon the idea that it is useful

in obstinate ulcers of a cancerous character, to which it is directly applied in the state of powder. The late Professor Barton conjectured that it was an ingredient of a secret remedy, at one time famous as *Martin's cancer powder*, of which, however, the most active constituent was arsenious acid.

Other species of Orobanche, growing in America and Europe, have been employed. They are all parasitic, fleshy plants, without verdure, and of a bitter, nauseous taste. In Europe they are called *broom-rape*. The *O. Americana* and *O. uniflora*, of this country, are said to be used for the same purposes as the species above noticed, and like it are called *cancer-root*.

ORPIMENT. *King's Yellow.* A native tersulphuret of arsenic, consisting of one eq. of metal 75 and three eqs. of sulphur 48 = 123. It is in masses of a brilliant lemon-yellow colour, composed of flexible laminæ, and slightly translucent. It exists in various parts of the world, but is obtained for use from Persia and China. (*Guibourt.*) It is sometimes mixed with realgar, which gives it a reddish or orange hue. A similar sulphuret may be made artificially by passing sulphuretted hydrogen through a solution of arsenious acid in muriatic acid. There is reason to believe that neither the native sulphuret, nor the artificial, when prepared in the manner just mentioned and well washed, is poisonous; at least in a degree at all comparable to other arsenical compounds.

Artificial orpiment is prepared for use by fusing together equal parts of arsenious acid and sulphur. (*Turner.*) In Germany, according to Guibourt, it is prepared by subliming a mixture of these two substances. In this case, however, it retains a large portion of the acid undecomposed, and is therefore highly poisonous. Guibourt found a specimen which he examined to contain 94 per cent. of arsenious acid, and only 6 per cent. of the sulphuret of arsenic.

Orpiment is an ingredient of certain depilatories. *Atkinson's depilatory* is said to consist of one part of orpiment and six parts of quicklime, with some flour and a yellow colouring matter. (*Ann. der Pharm.*, xxxiii. 348.) But this arsenical sulphuret is chiefly used in fireworks, and as a pigment.

ORYZA SATIVA. *Rice.* This is an annual plant, originally, perhaps, derived from the East Indies, but now cultivated in all parts of the globe where the climate and soil are adapted to its growth. The rice of commerce consists of the seeds of the plant deprived of their husk. Carolina rice was found by Braconnot to contain 85·07 per cent. of starch, 3·60 of gluten, 0·71 of gum, 0·29 of uncrystallizable sugar, 0·13 of fixed oil, 4·80 of vegetable fibre, 5·00 of water, and 0·40 of saline substances. This grain is highly nutritious and of easy digestion, and constitutes the almost exclusive diet of whole nations. Being wholly free from laxative properties, it is admirably adapted to cases of weak bowels, in which there is a strong tendency to diarrhœa. Care, however, should be taken that it be boiled till it becomes soft. A decoction of rice, usually called *rice-water*, is a good nutritive drink in fevers, and inflammatory affections of the bowels, lungs, and kidneys. There appears to be no ground for the opinion, which has been entertained by some, that a diet of rice is injurious to the eyes.

OXALIC ACID. *Acidum Oxalicum.* This acid is found both in animals and vegetables. It is generated occasionally in consequence of a diseased action in the kidneys, and deposited in the bladder as oxalate of lime, forming a peculiar concretion, called from its appearance the *mulberry calculus*. In vegetables, it occurs in a free state in the bristles of the chick-pea (*Cicer arietinum*), combined with potassa as a supersalt in the *Rumex acetosa* or common sorrel, and the *Oxalis Acetosella* or wood-sorrel, and united with lime in several species of lichen, and in the roots of rhubarb, valerian, and several other plants. It is from the generic appellation *Oxalis*, that it takes its name.

Preparation. The usual process for obtaining oxalic acid consists in decomposing sugar by nitric acid. Four parts of sugar are acted upon by twenty-four of nitric acid of the sp. gr. 1·24, and the mixture is heated so long as any nitric oxide is disengaged. A part of the carbon of the sugar is converted into carbonic acid, by oxygen derived from the nitric acid, which is thereby partially converted into nitric oxide. The undecomposed nitric acid, reacting on the remaining elements of the sugar, generates oxalic and saccharic (oxalhydric) acids; the former of which crystallizes as the materials cool, while the latter remains in solution. The crystals being removed, a fresh crop may be obtained by further evaporation. The thick mother-water which now remains is a mixture of saccharic, nitric, and oxalic acids; and, by treating it with six times its weight of nitric acid, the greater part of the saccharic acid will be converted into oxalic acid. The new crop of crystals, however, will have a yellow colour, and contain a portion of nitric acid, the greater part of which may be got rid of by allowing them to effloresce in a warm place. From the experiments of Mr. L. Thompson, of Newcastle-on-Tyne, it appears probable that, in the reaction occurring between nitric acid and sugar, half the carbon of the latter is converted into carbonic acid, and the other half into oxalic acid.

The manufacturing chemists are said to obtain oxalic acid on a large scale by heating a mixture of 112 lbs. of sugar, 560 lbs. of nitrate of potassa, and 280 lbs. of sulphuric acid. The products are 135 lbs. of oxalic acid, and 490 lbs. of supersulphate of potassa, or *sal enixum*. (*L. Thompson.*)

Many substances, besides sugar, yield oxalic acid by the action of nitric acid; as for example molasses, rice, potato starch, gum wool, hair, silk, and many vegetable acids. In every case in which it is thus generated, the proportional excess of oxygen which it contains, compared with every other organic compound, is furnished by the nitric acid. When the acid is obtained from potato starch, this is first converted into starch sugar by the action of sulphuric acid. The following is an outline of the process, as conducted on a large scale. The pulp of potatoes, obtained by rasping or other suitable means, is washed two or three times by stirring it well with water, allowing it to subside, and running off the water. It is then boiled for some hours with water in wooden boilers, lined with lead and heated by steam; a quantity of sulphuric acid being stirred in the mixture, equal to two per cent. of the weight of the potatoes employed. By this treatment the starch of the potatoes is converted into starch sugar; and the change is known to be completed, when a drop of tincture of iodine, added to a little of the boiling liquor, placed on a piece of glass, ceases to produce a purple colour. The product is then filtered through a horse-hair cloth, and the liquid which passes is carefully evaporated until a gallon of it weighs about fourteen pounds. This liquid consists of a concentrated solution of starch sugar, and is now ready for conversion into oxalic acid by the action of nitric acid. For this purpose it is placed in wooden boilers, lined with lead, eight feet square and three deep, and, having been mixed with the requisite proportion of nitric acid, is heated to a temperature of about 125° F. by means of steam, passed through a coil of lead pipe, until the decomposition is effected. The liquor is then drawn off by a syphon or cock into shallow lead-lined wooden coolers to crystallize. The crystals having formed, the mother-waters are drawn off for use in a subsequent operation. When the manufacture of the acid is conducted in vessels of the size just indicated, the density of the nitric acid should not be less than 1·20 nor higher than 1·27. If the nitric acid be used of undue strength, a part of the oxalic acid at first formed becomes converted into carbonic acid, to the no small diminution of the desired product. (*Chem. Gaz.*, March 15, 1852, p. 112.) The product of oxalic acid from a given quantity of saccharine material has been much understated. If properly treated with nitric acid, 100 lbs. of good sugar will yield from 125 to 130 lbs. of oxalic acid, and the same weight of molasses, from 105 to 110 lbs.

Certain organic substances yield oxalic acid when heated with potassa. Thus shavings of wood, if mixed with a solution of caustic potassa, and exposed to a heat considerably higher than 212°, will be partially decomposed, and converted into oxalic acid, which then combines with the alkali.

Properties. Oxalic acid is a colourless crystallized solid, possessing considerable volatility, and a strong, sour taste. Its crystals have the shape of slender, flattened, four or six-sided prisms, with two-sided summits; and, when exposed to a very dry atmosphere, undergo a slight efflorescence. It dissolves in about nine times its weight of cold, and in its own weight of boiling water. The solution of the crystals takes place with slight crepitation. It dissolves also, but not to the same extent, in alcohol. The presence of nitric acid renders it more soluble in water. It combines with salifiable bases, and forms salts called oxalates. The most interesting of these are the three oxalates of potassa, severally called oxalate, binoxalate, and quadroxalate, and the oxalate of lime. The binoxalate and quadroxalate, both absurdly called *essential salt of lemons*, are employed for removing iron moulds from linen, and act by their excess of acid, which forms a soluble salt with the sesquioxide of iron constituting the stain. Oxalic acid is used for removing ink stains and iron moulds, for cleaning the leather of boot-tops, and for discharging colours in calico-printing.

This acid has a very strong affinity for lime, and forms with it an insoluble precipitate consisting of oxalate of lime, whenever the acid and earth are brought into contact in solution. Hence, oxalic acid and its soluble combinations are the best tests for lime; and, conversely, a soluble salt of lime for oxalic acid. When lime is searched for, oxalate of ammonia forms the most convenient test. So strong is the mutual attraction between this acid and lime, that the former takes the latter even from sulphuric acid. Hence, the addition of a soluble oxalate disturbs the transparency of a solution of sulphate of lime.

Oxalic acid is distinguished from all other acids by the form of its crystals, and by its solution yielding a precipitate with lime-water, insoluble in an excess of the acid.

Composition. Oxalic acid consists of two eqs. of carbon 12, and three of oxygen 24=36. When crystallized, three eqs. of water 27 must be added, making the eq. of the crystals 63. Two eqs. of this water may be driven off by a regulated heat, by which the acid is made to effloresce, but the third cannot be expelled without destroying the

acid itself. Accordingly, we have no knowledge of anhydrous oxalic acid in an uncombined state.

From the constitution of oxalic acid, as above given, it is plain that this acid corresponds in composition to carbonic acid and carbonic oxide taken together, and is, therefore, intermediate in the quantity of oxygen which it contains, between that acid and oxide. Notwithstanding that it contains less oxygen than carbonic acid, it is incomparably stronger as an acid, which circumstance may be accounted for by supposing some peculiarity in the mode in which its constituents are combined. The composition of the acid not only corresponds with the united constituents of carbonic acid and oxide, but there is reason to believe that these two compounds are actually its proximate constituents; for, if treated with strong sulphuric acid, the whole of the water will be abstracted, and the elements of the dry oxalic acid are instantly resolved into equal volumes of carbonic acid and carbonic oxide.

Oxalic acid combines with salifiable bases in two principal ways. Sometimes it drops its essential equivalent of water, which at other times it retains. Thus the oxalate of lead is a compound of the dry acid and the protoxide of lead; while the oxalate of lime retains one equivalent of water.

Medical and Toxicological Properties. Oxalic acid, in *small* doses, largely diluted with water and sweetened to the taste, forms an agreeable, cooling beverage, which may be used in febrile diseases as a substitute for lemonade. M. Nardo recommends it as an antiphlogistic and anodyne remedy in inflammation of the mucous membranes, given in the dose of a grain and a half dissolved in eight fluidounces of liquid. Notwithstanding the safety of its employment in medicinal doses, it is a virulent poison, producing death with great rapidity and certainty. Instances are on record of its proving fatal in ten minutes, and few survive the effects of a poisonous dose beyond an hour. As this acid is generally kept in the shops, and not a few instances are on record of its fatal effect, when taken by design, or by mistake for Epsom salt, we shall feel ourselves justified in being somewhat full on its toxicological relations.

Oxalic acid was first noticed as a poison by Mr. Royston in 1814; since which time it has been principally investigated in this relation by the late Dr. A. T. Thomson, of London, Dr. Percy, of Lausanne, Dr. Coindet, of Geneva, and Dr. Christison, of Edinburgh. Since its properties of certainty and rapidity as a poison have been more generally known, its employment for committing suicide has become more frequent.

From the general resemblance which the crystallized oxalic acid bears to Epsom salt, many fatal mistakes have occurred, in consequence of its being sold for that saline purgative. Nothing, however, can be easier than to distinguish them; for upon tasting a minute portion of the acid, which may be done with perfect safety, it will be found strongly sour, whereas the salt in question is bitter. Unfortunately, however, in the instances of these fatal mistakes, no suspicions being awakened, the solution is swallowed with haste, and the mischief is done before the victim is aware of his danger.

Oxalic acid acts on the economy in two principal ways, according as its solution is concentrated or dilute. When concentrated it causes exquisite pain, followed by violent efforts to vomit, then sudden dulness, languor, and great debility, and finally death without a struggle. When dilute it acts in a different manner. Dissolved in twenty times its weight of water, it possesses no corrosive and hardly any irritating power, and yet operates as a deadly poison, causing death by acting on the brain, spinal marrow, and heart. This statement, however, does not accord with the observations of Dr. Letheby, who asserts that the acid, whether in strong or weak solution, always exercises a corroding or softening power on the animal tissues.

The morbid appearances caused by oxalic acid are various. In a dissection reported by Dr. Christison, the mucous coat of the throat and gullet had an appearance as if scalded, and that of the gullet could be easily scraped off. The inner coat of the stomach was pultaceous, in many points black, in others red, and that of the intestines, similarly but less violently affected. In another case, recorded by the same author, the whole villous coat of the stomach was either softened or removed, as well as the inner membrane of the œsophagus; so that the muscular coat was exposed, and this coat exhibited a dark gangrenous appearance, being much thickened and highly injected. The stomach usually contains a dark fluid, resembling coffee-grounds, consisting chiefly of altered blood. In a few cases after death by this acid, no morbid appearances have been discovered.

In the treatment of poisoning by oxalic acid, the remedial measures must be employed with great promptitude. If the antidotes are not at hand, and vomiting is not free, emetics will be proper. The stomach pump would be useful, but no delay in the application of other remedies is admissible, in the expectation of its use. Dr. Christison objects to the use of warm water to promote vomiting, from a fear that it would increase the danger by promoting the absorption of the poison; but it may be a question whether this evil,

considering the incidental benefit of the water in promoting vomiting, is not less than that of the corrosion of the stomach, which copious dilution has a tendency to prevent. The proper antidote is chalk or magnesia, mixed with water; and as soon as either can be procured, it must be administered in large and frequently repeated doses. Chalk was first proposed for this purpose by Dr. A. T. Thomson. These substances act by neutralizing the poison, forming with it an insoluble oxalate of lime or magnesia, both of which are inert. The soluble salts of oxalic acid, as the oxalate of ammonia, and the oxalates of potassa, are likewise poisonous, and the antidotes for them are the same as for the acid.

The best tests for the detection of oxalic acid in the contents of the stomach, or in the vomited matter, in cases of suspected poisoning by this acid, are chloride of calcium, sulphate of copper, and nitrate of silver. The first causes a white precipitate of oxalate of lime, known by its being soluble in nitric acid; the second, a bluish-white precipitate of oxalate of copper; and the third, a dense white precipitate of oxalate of silver, which, when dried and heated, becomes brown and detonates faintly. When the antidotes have been freely used during life, the poison will be in the state of oxalate either of lime or magnesia. In this case, the oxalate found is to be boiled with a solution of carbonate of potassa, whereby an oxalate of potassa will be generated; and this must then be examined by the reagents above indicated.

OXALIS ACETOSELLA. *Wood-sorrel. Acetosella.* The wood-sorrel is a small, perennial, herbaceous, stemless plant, with numerous radical leaves, which are all ternate, and supported upon slender hairy petioles. The leaflets are obcordate, entire, hairy, of a yellowish-green colour, but frequently purplish on their under surface. The scape or flower-stalk, which usually exceeds the petioles in length, is furnished with two scaly bractes near the middle, and terminates in a large white, or flesh-coloured flower, marked with red streaks. The styles are of the same length with the inner stamens. This plant is a native both of Europe and North America. In this country it is found chiefly in the mountainous regions of the interior. It selects shady places, such as woods, groves, and hedges, and flowers in May. Other indigenous species of Oxalis, more widely diffused than the *O. Acetosella*, might be substituted for it without disadvantage; as they possess similar properties. They all have ternate leaves with obcordate leaflets, and, with the single exception of *O. violacea*, bear yellow flowers. The whole herbaceous portion may be used.

Wood-sorrel is without smell, and has an agreeable sour taste. It owes its acidity to *binoxalate of potassa*, which is sometimes separated for use, and sold under the name of *salt of sorrel*. This is prepared in Switzerland and Germany, from different species of Oxalis and Rumex, by the following process. The plants, previously bruised, are macerated for some days in water, and then submitted to pressure. The liquid thus obtained is mixed with clay, and occasionally agitated for two days. At the end of this time, the clear liquor is decanted, and evaporated so that crystals may form when it cools. These are purified by solution and a new crystallization. Five hundred parts of the plant afford four parts of the acidulous salt. The same salt may be prepared by exactly neutralizing with potassa one part of oxalic acid in solution, then adding one part more of the acid, and evaporating the solution so that it may crystallize upon cooling. Binoxalate of potassa is in rhomboidal crystals, of a sour, pungent, bitterish taste, soluble in forty parts of cold and six parts of boiling water (*Kane*), and unalterable in the air. It contains 72 parts or two equivalents of oxalic acid, 47·2 parts or one equivalent of potassa, and 18 parts or two equivalents of water. *Quadroxalate of potassa* is often substituted for the binoxalate. It is prepared in the same manner, except that, instead of one part, three parts of the acid are added to the original portion neutralized by potassa. Both salts are kept in the shops under the names of *salt of sorrel* and *essential salt of lemons*, and are employed for removing iron mould and ink stains from linen, and sometimes as a test for lime. Both are poisonous, though in a less degree than uncombined oxalic acid.

Medical Properties. This and other species of sorrel are refrigerant; and their infusion, or a whey made by boiling them in milk, may be used as a pleasant drink in febrile and inflammatory affections. A solution of the binoxalate of potassa is used, on the continent of Europe, as a substitute for lemonade. The fresh plant, eaten raw, is said to be useful in scorbutic cases. *Oxalis crassicaulis*, a Peruvian species, yields an edible root, and, by expression from its leaves, a very sour and astringent juice, which is employed in the form of syrup, in hemorrhages, chronic catarrh, bowel affections, and gonorrhœa, with asserted advantage.

OX-GALL. *Fel Bovinum.* The bile of the ox is a viscid fluid, of a green or greenish-yellow colour, a peculiar nauseous odour, and a bitter taste. The exact composition of bile is not yet settled. According to Berzelius, it contains, 1. *bilin*, 2. *cholepirrhin*, to which the bile owes its colour, 3. mucus, 4. extractive matters, 5. a peculiar fatty matter, originally found in biliary calculi, called *cholesterin*, 6. oleate, margarate, and stearate of soda, with

a little fatty matter not saponified, 7. chloride of sodium, sulphate, phosphate, and lactate of soda, and phosphate of lime. Of these substances, the most abundant and essential is *bilin*. This, when pure, is uncrystallizable, colourless, translucent, inodorous, of an acrid and bitter taste with an after-taste of sweetness, inflammable, soluble in all proportions in water and anhydrous alcohol, insoluble in ether, neither alkaline nor acid, and composed partly of nitrogen. One of its most striking properties is the great facility with which it undergoes decomposition; and hence the numerous principles which different chemists have found in bile, many of which are nothing more than metamorphoses of bilin. Under the action of acids, it is changed into two resinous acids called respectively *fellinic acid* and *cholinic acid*, into *taurin*, and ammonia. The union of these two acids with a portion of bilin constitutes the choleïc acid of Demarçay. The colouring principle or *cholepyrrhin* is also readily changed, and gives rise to various new products, among which are *biliverdin*, a green colouring matter resulting from the absorption of oxygen, and *bilifulvin*, a yellow colouring matter, which is a double salt of lime and soda with a peculiar azotized acid. (*Journ. de Pharm.*, 3e sér., iii. 177, from the *Journ. für praktische Chemie.*) E. A. Platner succeeded in separating the chief constituent of bile in a crystalline form, and considered it a compound of soda with a peculiar organic body. Liebig denominated this compound *bilate of soda*. The most recent analysis of bile that we have seen is that of A. Strecker, whose views differ essentially from those of Berzelius. According to Strecker, the bile of the ox, independently of the colouring, fatty, and saline matters above mentioned, consists essentially of a mixture of a nitrogenous acid free from sulphur, which he calls *cholic* acid, and a sulphuretted acid free from nitrogen. Both of these acids are combined with soda. The sulphuretted constituent undergoes decomposition with great facility, yielding a resin, taurin, and ammonia; so that it is with difficulty obtained separate. It is probably this constituent to which the picromel, biliary sugar, and bilin of other chemists may be referred. (*Chem. Gaz.*, A. D. 1848, pp. 154 and 155, from *Ann. der Chem. und Pharm.*)

Bile was formerly highly valued as a remedy in numerous complaints, and was considered peculiarly applicable to cases attended with deficient biliary secretion. It is supposed to be tonic and laxative. It is prepared for use by evaporating it to the consistence of an extract. The dose is from five to ten grains. *Refined ox-gall*, much used by limners and painters, is prepared, according to Gray, in the following manner. Take of "fresh ox-gall one pint; boil, skim, add one ounce of alum, and keep it on the fire for some time; to another pint, add one ounce of common salt in the same manner; keep them bottled up for three months, then decant off the clear; mix them in an equal proportion; a thick yellow coagulum is immediately formed, leaving the refined gall clear and colourless."

PÆONIA OFFICINALIS. *Peony.* This well known plant is a native of Southern Europe, but is everywhere cultivated in gardens for the beauty of its flowers. The root, flowers, and seeds were formerly officinal. The *root* consists of a caudex about as thick as the thumb, which descends several inches into the ground, and sends off in all directions spindle-shaped tubers, which gradually taper into thread-like fibres, by which they hang together. It has a strong, peculiar, disagreeable odour, and a nauseous taste, which is at first sweetish, and afterwards bitter and somewhat acrid. The odour disappears or is much diminished by drying. Peony-root was in very great repute among the ancients, who used it both as a charm and as a medicine in numerous complaints, particularly epilepsy. In modern times it has also been given in epilepsy and various nervous affections, but is at present seldom used. The dose of the fresh root is from two drachms to an ounce, boiled in a pint of water down to half a pint, which should be taken daily. It is said to be less active when dried. The expressed juice of the recent root is recommended in the dose of an ounce. It is milky, of a strong odour, and very disagreeable taste. The *flowers* are usually of a deep-red colour, though in some varieties of a light-red, and even whitish. They have, when fresh, an odour similar to that of the root, but feebler, and an astringent, sweetish, herbaceous taste. When dry they are inodorous. As a medicine they have little power, and are scarcely used. The *seeds* are roundish-oval, about as large as a pea, externally smooth, shining, and nearly black, internally whitish, inodorous when dry, and of a mild, oleaginous taste. By some authors they are said to be emetic and purgative, and by others are considered antispasmodic. They may be given in the same dose with the root, but are not used in regular practice.

PALM OIL. This highly valuable fixed oil is the product of *Elais Guiniensis*, a palm growing on the Western coast of Africa, and cultivated in the West Indies and South America. It is among the handsomest trees of its graceful family which flourish in the tropical regions of Africa. The oil is obtained by expression from the fruit. It is brought to this country chiefly from Liberia, and other places on the African coast, though prepared also in the West Indies, Cayenne, and Brazil. It is not improbable that various species of palms contribute to the supply of this article of commerce.

Palm oil has the consistence of butter, a rich, orange-yellow colour, a sweetish taste, and an agreeable odour, compared by some to that of violets, by others to that of the Florentine orris. By age and exposure it becomes rancid and of a whitish colour. It melts with the heat of the hand, and when perfectly fluid passes readily through blotting paper. Highly rectified alcohol dissolves it at common temperatures, and in ether it is soluble in all proportions. According to M. Henry, it consists of 31 parts of stearin and 69 of olein. But, from the experiments of Frémy and Stenhouse, it appears that the stearin has peculiar properties entitling it to be considered as a distinct principle, and it has accordingly received the name of *palmitin*. This is converted into *palmitic acid* by saponification. (*Kane's Chemistry.*) It appears also that a considerable proportion of this acid, together with some glycerin, exists uncombined in the oil, as ascertained by MM. Pelouze and Boudet; so that the changes which are effected in oils, through the agency of alkalies, in the process of saponification, take place, to a certain extent, spontaneously in palm oil. (*Journ. de Pharm.*, xxiv. 389.) Hence it is more easily saponified than any other fixed oil. It is said to be frequently imitated by a mixture of lard and suet, coloured with turmeric, and scented with Florentine orris. It is much employed in the manufacture of a toilet soap, which retains its pleasant odour. Palm oil is emollient, and has sometimes been employed in friction or embrocation, though not superior for this purpose to many other oleaginous substances.

PARIETARIA OFFICINALIS. *Wall Pellitory.* A perennial European herb, growing on old walls and heaps of rubbish. It is inodorous, has an herbaceous, somewhat rough and saline taste, and contains nitre derived from the walls where it flourishes. It is diuretic and refrigerant, and is said also, but without good reason, to be demulcent and emollient. The ancients employed it in various complaints, and it is still considerably used on the continent of Europe, especially in domestic practice. It is given in complaints of the urinary passages, dropsy, and febrile affections, usually in the form of decoction. The expressed juice is also used, and the fresh plant is applied in the shape of a cataplasm to painful tumours.

PARTHENIUM INTEGRIFOLIUM. *Prairie Dock.* This is an herbaceous perennial, growing abundantly in the prairies of our South-western States. It is recommended by Dr. Mason Houlton as a powerful antiperiodic. The flowering tops are the part used. They have an intensely bitter taste; and two ounces of them in the dried state, given in the form of infusion, are thought by Dr. Houlton to be equivalent to twenty grains of sulphate of quinia. Thirty successive cases of periodic fever were cured by this remedy, without any unpleasant effect on the nervous system. (*Med. Exam.*, N. S., ix. 719, from *Memphis Med. Recorder;* and *Pharm. Journ. and Trans.*, xii. 602, from *N. Y. Journ. of Pharm.*)

PATENT YELLOW. *Mineral Yellow.* A pigment, consisting of chloride combined with protoxide of lead. It is prepared by mixing common salt and litharge with a sufficient quantity of water, allowing the mixture to stand for some time, then washing out the liberated soda, and exposing the white residue to heat.

PAULLINIA. *Guarana.* This is a new medicine introduced into Europe from Brazil, which has attracted some attention from the asserted fact, that it contains a principle identical with caffein. The name of *paullinia* has been bestowed upon it from the generic title of the plant from which it is obtained. That of *guarana*, by which it was previously known, was derived from a tribe of aborigines, called Guaranis, who are said to use it extensively as a corrigent of their vegetable diet. It is prepared from the seeds of the *Paullinia sorbilis* of Martius, a climbing shrub, belonging to the class and order Octandria Trigynia of the Linnæan system, and the natural family of the Sapindaceæ. The seeds, which are contained in a three-celled, three-valved, coriaceous capsule, are lenticular and almost thorny, and invested with a flesh-coloured arillus which is easily separable when dry. They are prepared by powdering them in a mortar, or upon a chocolate stone previously heated, mixing the powder with a little water, exposing it for some time to the dew, then kneading it into a paste, mixing with this some of the seeds either whole or merely bruised, and finally forming the mixture into cylindrical or globular masses, which are dried and hardened in the sun, or by the smoke of a fire. These masses are of a reddish-brown colour, rugose on the surface, very hard, and of a marbled appearance when broken. Paullinia is of a somewhat astringent and bitterish taste, and in this as well as in its odour, bears some resemblance to chocolate, though not oleaginous. It swells up and softens in water, which partially dissolves it. Martius found in it a crystallizable principle, which he named *guaranin*, and which seems to have been proved by the researches of MM. Berthemot and Dechastelus to be identical with *caffein*. The discovery of caffein in four plants belonging to distinct natural families, namely, the coffee and tea plants, the Paraguay tea, and the Paullinia, is a highly interesting result of recent chemical investigations. It is said to be more abundant in the Paullinia than in either of the other vege-

tables. According to Berthemot and Dechastelus, it exists in the seeds united with tannic acid, with which it appears to form two compounds, one crystallizable and soluble in water, the other of a resinoid appearance and insoluble. Besides these ingredients, the seeds contain also free tannic acid, gum, albumen, starch, and a greenish fixed oil. (*Journ. de Pharm.*, xxvi. 514.)

The effects of paullinia upon the system are said to be those of a tonic; but they do not appear to have been very accurately investigated. It is highly probable, both from its composition and the use made of it by the natives of Brazil, that it has an influence over the nervous system similar to that of tea and coffee. It is habitually employed by the Indians, either mixed with articles of diet, as with cassava or chocolate, or in the form of drink prepared by scraping it and suspending the powder in sweetened water. It is considered by them useful in the prevention and cure of bowel complaints. Dr. Gavrelle, who was formerly physician to Don Pedro, in Brazil, and there became acquainted with the virtues of this medicine, called the attention of the profession to it some years since in France. He had found it advantageous in the diarrhœa of phthisis, sick-headache, paralysis, tedious convalescence, and generally as a tonic. By Dr. Ritchie, Surgeon in the British navy, it is highly recommended in irritation of the urinary passages. (*Ed. Month. Journ. of Med. Sci.*, N. S., v. 467.) It may be given in substance, in the quantity of one or two drachms, scraped into powder and mixed with sweetened water; but the most convenient form of administration is that of spirituous extract. According to M. Dechastelus, alcohol is the only agent which completely extracts its virtues; ether and water effecting this object but partially. Of the extract eight or ten grains may be given during the day in the form of pill. Paullinia may also be taken along with chocolate as a drink.

PEACH LEAVES. *Leaves of Amygdalus Persica.* (Willd. *Sp. Plant.* ii. 982.) *Persica vulgaris.* (Miller, Lamarck.) Every one is familiar with the appearance of the common peach tree. It is characterized specifically by having "all the serratures of the leaves acute, and by its sessile solitary flowers." Though its native country is not certainly known, it is generally supposed to have been brought originally from Persia. In no country, perhaps, does it attain greater perfection, as regards the character of its fruit, than in the United States. Peaches are among the most grateful and wholesome of our summer fruits. They abound in saccharine matter, which renders their juice susceptible of the vinous fermentation; and a distilled liquor prepared from them has been much used, in some parts of the country, under the name of peach brandy. The kernels of the fruit bear a close resemblance in appearance and properties, and probably in chemical nature, to bitter almonds, for which they are frequently, and without inconvenience, substituted in our shops. They are employed by distillers in the preparation of *liqueurs*, and by cake-bakers to give flavour to various productions of their ovens; and are said to yield as much amygdalin as bitter almonds. The flowers, leaves, and bark also have the peculiar odour and taste of bitter almonds, and yield hydrocyanic acid. The leaves afford a volatile oil by distillation. The distilled water prepared from them was found, in one instance, to contain 1·407 parts of hydrocyanic acid in 1000, and in another only 0·437 parts in the same quantity. From some experiments it may be inferred that the proportion of acid is greatest where there is the least fruit. (See *Am. Journ. of Pharm.*, xxiv. 172.)

Medical Properties. Peach leaves are said to be laxative; and they probably exert, to a moderate extent, a sedative influence over the nervous system. They have been used as an anthelmintic with great reported success. More recently their infusion has been recommended in irritability of the bladder, in sick stomach, and hooping-cough. Half an ounce of the dried leaves may be infused in a pint of boiling water, and half a fluid-ounce given for a dose three times a day, or more frequently. Dr. Dougos gives, in hooping-cough, a pint of the strong infusion, in small doses, in the course of the day. (*Journ. de Pharm.*, xxiii. 356.) The flowers also are laxative; and a syrup prepared from them is considerably used, in infantile cases, upon the continent of Europe. Woodville states that a drachm of the dried flowers, or half an ounce in their recent state, given in infusion, is the dose as a vermifuge. Cases of fatal poisoning from their use in children are on record. The kernels have more of the peculiar powers of hydrocyanic acid, and therefore require to be used with some caution. Blanched, and rubbed up with hot water, they form an emulsion well adapted to coughs depending on or associated with nervous irritation. The bruised leaves, flowers, or kernels may be used by the apothecary for cleansing his vessels from disagreeable odours. (See *page* 92.) The dried fruit, stewed with sugar, is an excellent laxative article of diet, suitable to cases of convalescence attended with torpid bowels.

PHLORIDZIN. This is a bitter principle, discovered by Dr. Konink, of Germany, in the bark of the apple, pear, cherry, and plum trees. It is most abundant in the bark of

the root, and derived its name from this circumstance (from two Greek words, φλοιός bark, and ῥιζα a root). It is light, white, crystallizable in silky needles, of a bitter taste, soluble in about 1000 parts of cold and in all proportions in boiling water, very soluble in alcohol, scarcely soluble in ether cold or hot, dissolved without change by solutions of the alkalies, especially by ammonia, deprived of its water of crystallization at 212°, and fusible at a somewhat higher temperature. It is without acid or alkaline reaction, and consists of carbon, hydrogen, and oxygen; its formula being, according to G. Roser, when dry, $C_{42}H_{25}O_{20}$, with the addition of 4 eqs. of water when crystallized. When heated with dilute muriatic or sulphuric acid, it is converted into sugar and a peculiar substance called *phloretin*. (See *Chem. Gaz.*, viii. 392.) To obtain it, the fresh bark of the root of the apple tree should be selected, as the dried bark is said to contain it in much smaller proportion. The bark is to be boiled for an hour or two successively in two separate portions of water, each sufficient to cover it, and the decoctions set aside. At the end of thirty hours they will have deposited a considerable quantity of coloured phloridzin, which may be purified by boiling for a few minutes with distilled water and animal charcoal, filtering, repeating this process two or three times, and then allowing the solution to cool slowly. The phloridzin is deposited in the crystalline state. An additional quantity may be obtained by evaporating the decoction to one-fifth of its bulk, allowing it to cool, and purifying the substance deposited in the same manner as before.

Phloridzin is said to possess the anti-intermittent property in a high degree, and to have proved successful where quinia had failed. It was employed by Dr. Konink in the dose of ten or fifteen grains, and in this quantity effected cures in several cases of intermittent fever.

PHOSPHATE OF AMMONIA. *Ammoniæ Phosphas.* There are several phosphates of ammonia; but the one here described is the neutral tribasic phosphate, and consists of one eq. of phosphoric acid, two of oxide of ammonium, and one of basic water ($2NH_4O,HO,PO_5$). It may be made by saturating a somewhat concentrated solution of phosphoric acid with ammonia, applying heat, and setting the solution aside that crystals may form. (See *Acidum Phosphoricum Dilutum.*) Another method of forming it is to saturate the excess of acid in superphosphate of lime by means of carbonate of ammonia. Phosphate of lime is precipitated, and phosphate of ammonia obtained in solution, which, being duly concentrated by a gentle heat, affords the salt in crystals upon cooling. (See the paper of Mr. Charles Ellis on the mode of procuring this salt, in the *Am. Journ. of Pharm.*, xviii. 10.) The method of obtaining the superphosphate of lime is given at *page* 1186. Phosphate of ammonia is a white salt, crystallizing in rhombic prisms with dihedral summits, very soluble in water, but insoluble in alcohol. Exposed to the air it effloresces, loses ammonia, and becomes acid.

This salt was first brought under the notice of the profession, as a remedy for gout and rheumatism, by Dr. T. H. Buckler, of Baltimore, in a paper published in the *Am. Journal of the Medical Sciences*, for Jan. 1846. In this paper a number of cases are reported of these diseases, which were treated mainly by this remedy by Dr. Buckler and several of his medical friends, and with apparently good effects. Dr. Buckler was led to employ the salt on theoretical grounds. He conceives that the "matter of gout" consists of two salts, the urates of soda and lime, existing in the blood; and that the phosphate of ammonia, by reacting with them, would give rise to soluble salts. The new salts formed, if the double decomposition should take place, would be urate of ammonia, and the phosphates of soda and lime. Unfortunately for this theory, as furnishing the means of eliminating uric acid, urate of ammonia is not more soluble than urate of soda. Nevertheless, apart from all theory, the therapeutic powers of phosphate of ammonia deserve to be investigated. Since the publication of Dr. Buckler's paper, several practitioners, both in this country and in Europe, have used the remedy with apparently useful results. The dose of the salt is from ten to forty grains, three or four times a day, dissolved in a tablespoonful of water.

PHOSPHATE OF POTASSA. *Potassæ Phosphas.* The phosphate of potassa which has of late come into use as a medicine, is the neutral tribasic phosphate, having the formula, $2KO,HO,PO_5$, and, therefore, a composition precisely analogous to that of the medicinal phosphates of soda and ammonia. It is derived from the variety of phosphoric acid containing three eqs. of water, by the substitution of two eqs. of potassa for two of water, and is called *neutral* on account of its slight action on test paper, and to distinguish it from the *acid* tribasic phosphate, $KO,2HO,PO_5$, and the *alkaline*, $3KO,PO_5$. It may be formed precisely as phosphate of soda is prepared (see *page* 1186); or by saturating glacial phosphoric acid (HO,PO_5), changed by solution in water and ebullition into $3HO,PO_5$, by means of carbonate of potassa. The medicinal phosphate of potassa is a white, amorphous, deliquescent salt, incapable of crystallization. It has been given as an alterative in scrofula and phthisis, and in some other diseases, with supposed advantage.

The dose is from ten to thirty grains three times a day, dissolved in a tablespoonful of water.

PHYSALIS ALKEKENGI. *Alkekengi. Common Winter Cherry.* A perennial herbaceous plant, growing wild in the South of Europe, and cultivated in our gardens. The fruit is a round red berry, about as large as a cherry, enclosed in the calyx, and containing numerous flat kidney-shaped seeds. All parts of the plant are bitter, especially the leaves and the capsules enveloping the fruit. The berries are very juicy, and have an acidulous, bitterish taste. By drying they shrink, and become of a brownish-red colour. The bitter principle has been isolated by MM. Dessaignes and Chautard, and named by them *physalin.* It is obtained by agitating an infusion of the plant with chloroform, which extracts the bitter principle, and yields it by evaporation. To purify it, dissolve it in hot alcohol, add a little animal charcoal, filter, precipitate by water, and wash the precipitate with the same liquid. It is a light powder, white with a shade of yellow, of a taste slight at first, but in the end permanently bitter, very slightly soluble in cold water, somewhat more soluble in boiling water, and very soluble in alcohol and chloroform, especially with the aid of heat. It consists of carbon, hydrogen, and oxygen. (*Journ. de Pharm.*, 3e *sér.*, xxi. 24.) The berries are said to be aperient and diuretic, and have been recommended in suppression of urine, gravel, and other complaints of the urinary passages. M. Gendron recommends them very highly as a febrifuge. He thinks they are most effective when allowed to ripen and begin to dry on the stem. He usually administers about three drachms daily in two doses. (*Arch. Gén.*, xxiii. 536.) From six to twelve berries, or an ounce of the expressed juice, may be taken for a dose; and much larger quantities are not injurious. They are consumed to a considerable extent in some parts of Europe as food. The berries of the *Physalis viscosa*, of this country, are said by Clayton to be remarkably diuretic.

PICHURIM BEANS. The seeds of an uncertain tree growing in Brazil, Guiana, Venezuela, and other parts of South America. The tree has been supposed to be the *Ocotea Pichurim* of Kunth (*Laurus Pichurim*, Richard, *Aydendron Laurel*, Nees); but this is positively denied by F. Nees von Esenbeck; and the brother of that botanist refers the seeds to *Nectandra Puchury.* The beans are the kernels of the fruit separated into halves. They are ovate-oblong or elliptical, flat on one side, convex on the other, of a grayish-brown colour externally, chocolate-coloured within, of an aromatic odour between that of nutmegs and sassafras, and of a spicy pungent taste. There are two kinds, one about an inch and a half long by half an inch in breadth, the other little more than half as large, rounder, and of a dark-brown colour. Their virtues depend on a volatile oil. In medical properties they resemble the common aromatics, and may be employed for the same purposes. They are rare in this country.

PIMPINELLA SAXIFRAGA. *Small Burnet Saxifrage. Saxifraga.* A perennial umbelliferous European plant, growing on sunny hills, and in dry meadows and pastures. The root is officinal in some parts of Europe. It has a strong, aromatic, yet unpleasant odour, and a sweetish, pungent, biting, aromatic, bitterish taste. Its active constituents are volatile oil, and an acrid resin. It is considered diaphoretic, diuretic, and stomachic; and has been used in chronic catarrh, asthma, dropsy, amenorrhœa, &c. The dose in substance is about half a drachm, and in infusion two drachms. The root is used also as a masticatory in toothache, as a gargle in palsy of the tongue and in collections of viscid mucus in the throat, and externally to remove freckles.

PINCKNEYA PUBENS. Michaux. A large shrub or small tree, growing in South Carolina, Georgia, and Florida, in low and moist places along the sea coast. It is closely allied, in botanical characters, to the Cinchonæ, with which it was formerly ranked by some botanists. The bark is bitter, and has been used with advantage in intermittent fever. Dr. Law, of Georgia, cured six out of seven cases in which he administered it. The dose and mode of preparation are the same with those of cinchona. The chemical composition and medical properties of this bark deserve a fuller investigation than they have yet received.

PISCIDIA ERYTHRINA. *Jamaica Dogwood.* Dr. William Hamilton, of Plymouth, England, in a communication to the *Pharmaceutical Journal and Transactions* (iv. 76, August, 1844), speaks of this plant as a powerful narcotic, capable of producing sleep and relieving pain in an extraordinary manner. He had noticed, when resident in the West Indies, the use of the bark of the root in the taking of fish, upon which, even when of a large size, it exercised a very strong narcotic effect. He was induced to try it as an anodyne in toothache, and found a saturated tincture exceedingly efficacious, not only affording relief when taken internally, but uniformly curing the pain when introduced upon a dossil of cotton into the carious tooth. The bark of the root, to be effectual, should be gathered during the period of inflorescence in April. When chewed it has an unpleasant acrimony like that of mezereon. It yields its virtues to alcohol but not to water. The formula employed by him in preparing the tincture, was to macerate an ounce of the bark, in

coarse powder, in four fluidounces of rectified spirit, for twenty-four hours, and then to filter. The dose is a fluidrachm. He first tried it on himself, when labouring under severe toothache, taking the quantity mentioned in cold water on going to bed. He first felt a violent sensation of heat internally, which gradually extended to the surface, and was followed by profuse perspiration, with profound sleep for twelve hours. On awaking, he was quite free from pain, and without the unpleasant sensations which follow a dose of opium.

PLANTAGO MAJOR. *Plantain.* A well known perennial herb, growing in fields, by the roadsides, and in grassplats, and abounding both in Europe and in this country. The leaves are saline, bitterish, and austere to the taste; the root saline and sweetish. The plant has been considered refrigerant, diuretic, deobstruent, and somewhat astringent. The ancients esteemed it highly, and employed it in visceral obstructions, hemorrhages, particularly from the lungs, consumption, dysentery, and other complaints. In modern times it has been applied to similar purposes, and the root is said to have proved useful in intermittents. At present, however, it is generally believed to be very feeble, and is little used internally. As an external application it has been recommended in ulcers of various kinds, and in indolent scrofulous tumours. Among the vulgar it is still much used as a vulnerary, and as a dressing for blisters and sores. The dose of the expressed juice is from one to four fluidounces. Two ounces of the fresh root or leaves may be boiled in a pint of water, and given during the day. Externally the leaves are applied whole or in decoction. *Plantago media*, and *P. lancifolia* or *rib-grass*, which are also indigenous, possess properties similar to those of P. major, and may be used for the same purposes.

Under the name of *semen psyllii*, the seeds of several species of Plantago, growing in different parts of Europe, are sometimes kept in the shops. The best are obtained from *Plantago Psyllium* or *fleawort*, which grows in the South of Europe and Barbary. They are small, about a line long by half a line in breadth, convex on one side, concave on the other, flea-coloured, shining, inodorous, and nearly tasteless, but very mucilaginous when chewed. They are demulcent and emollient, and may be used internally and externally in the same manner as flaxseed, which they closely resemble in medical properties.

PLATINUM. In 1826 Prof. Gmelin, of Tubingen, made experiments to determine the action of this metal on the economy. In 1841 Dr. Ferdinand Hoefer published some observations on the same subject. The latter experimented chiefly with the bichloride, and the double chloride of platinum and sodium. They are both poisonous; the bichloride in the dose of 15 grains, the double chloride in that of 30 grains. When a concentrated solution of the bichloride is applied to the skin, it produces violent itching, followed by an eruption. Administered internally it irritates the mucous membrane of the stomach, and occasions headache. The double chloride has no action when externally applied, and, when given internally, operates on the system in a less sensible manner than the bichloride. It possesses the power of augmenting the urine. Dr. Hoefer ranks the preparations of platinum with the alteratives, by the side of those of gold, iodine, and arsenic. He considers them particularly suited to the treatment of syphilitic diseases; the bichloride to cases of long standing and inveterate, the double chloride to those which are recent. The dose of the bichloride is from one to two grains twice a day, given in pill. Eight grains may be made into sixteen pills, with a drachm of the extract of guaiacum wood of the French Codex, and sufficient powdered liquorice root. Of these, one, two, or three may be taken morning and evening. The double chloride may be prepared for administration by dissolving five grains of the bichloride and eight of pure chloride of sodium in seven fluidounces of gum-water. This quantity may be taken by tablespoonfuls in the course of twenty-four hours. For frictions on indolent ulcers, Dr. Hoefer used an ointment composed of sixteen grains of the bichloride, thirty-two grains of extract of belladonna, and an ounce of lard. (*Journ. de Pharm.*, xxvii. 213.)

PLUMBAGO EUROPŒA. *Leadwort. Dentellaria.* A perennial, herbaceous plant, growing in the South of Europe. It has an acrid taste, and, when chewed, excites a flow of saliva. This is particularly the case with the root, which has been long used to relieve toothache. Hence the plant derived the name of *dentelaire*, by which it is known in France. A decoction of the root in olive oil has been highly recommended for the cure of the itch. Writers differ much in their statements in relation to the activity of the plant, some speaking of it as rubefacient, vesicatory, and caustic, and, when swallowed, as violently emetic and liable to produce dangerous irritation of the alimentary canal; while others consider it nearly inert. Perhaps the difference may be ascribed in part to the use of the plant in the recent state in one case, and dried or long kept in the other. A crystallizable, acrid principle, called *plumbagin*, has been extracted from the root by Dulong.

POLYPODIUM VULGARE. *Common Polypody.* A fern belonging both to the old and new continents, and growing in the clefts of old walls, rocks, and decayed trunks of trees.

The root, which is the part considered medicinal, is rather long, about as thick as a goose-quill, somewhat contorted, covered with brown, easily separable scales, furnished with slender radicles, and marked by numerous small tubercles. As found in the shops, it is sometimes destitute of the scales and radicles. Its colour is reddish-brown with a tinge of yellow, its odour disagreeably oleaginous, its taste peculiar, sweetish, somewhat bitter, and nauseous. The root of the variety growing upon the oak has been preferred, though without good reason. It was deemed purgative by the ancients, who employed it for the evacuation of bile and pituitous humours, in melancholic and maniacal cases. Modern physicians have used it in similar complaints, and as a pectoral in chronic catarrh and asthma. At present, however, it is scarcely ever employed, being considered nearly inert. It was given in doses varying from a drachm to an ounce, usually in connexion with cathartics.

POLYTRICHUM JUNIPERINUM. *Hair-cap Moss. Robbin's Rye.* This moss is a native of the United States, and abounds in New England. For a particular description of it, the reader is referred to a communication in the *Am. Journ. of Med. Sci.*, N. S. (xxvii. 267), by Dr. Wm. Wood, of East Windsor-Hill, Connecticut, who speaks in very strong terms of its efficacy as a diuretic, having found it the most successful remedy which he has employed in the treatment of dropsy. He infuses a large handful of the whole plant in water, and allows the patient to drink freely of the tea, "the more so the better."

POPULUS. *Poplar.* Several trees belonging to this genus have attracted some attention in a medical point of view. In most of them the leaf buds are covered with a resinous exudation, which has a peculiar, agreeable, balsamic odour, and a bitterish, balsamic, somewhat pungent taste. This is abundant in the buds of *Populus nigra* or the *black poplar* of Europe, which are officinal in some parts of that continent. They contain resin and a peculiar volatile oil. The buds of *P. balsamifera*, growing in the northern parts of N. America and Siberia, are also highly balsamic; and a resin is said to be furnished by the tree, which is sometimes, though erroneously, called *tacamahac*. The virtues of the poplar buds are probably analogous to those of the turpentines and balsams. They have been used in pectoral, nephritic, and rheumatic complaints, in the form of tincture; and a liniment, made by macerating them in oil, has been applied externally in local rheumatism. The *unguentum populeum* of European pharmacy is made, according to the directions of the French Codex of 1837, by bruising in a marble mortar, and boiling in 2000 parts of lard, with a gentle fire, till the moisture is dissipated, 250 parts, each, of the fresh leaves of the black poppy, deadly nightshade, henbane, and black nightshade; then adding of the dried buds of the black poplar, bruised, 375 parts; digesting for 24 hours; straining with strong expression; and finally allowing the ointment to cool after defecation. This is an anodyne ointment, occasionally employed in Europe in painful local affections. It has been ascertained that poplar buds are capable of imparting a principle to ointments, which in a considerable degree obviates their tendency to rancidity.

The bark of certain species of poplar is possessed of tonic properties, and has been used in intermittent fever with advantage. Such is the case with that of the *P. tremuloides* or *American aspen*, and of the *P. tremula* or *European aspen*. In the bark of the latter, Braconnot found *salicin*, and another crystallizable principle which he named *populin*. It is in these, probably, that the febrifuge properties of the bark reside. They may be obtained by precipitating a saturated decoction of the bark with solution of subacetate of lead, filtering, precipitating the excess of lead by sulphuric acid, again filtering, evaporating, adding animal charcoal towards the end of the evaporation, and filtering the liquor while hot. Salicin gradually separates, upon the cooling of the liquor, in the form of crystals. If, when this principle has ceased to crystallize, the excess of sulphuric acid in the liquid be saturated by a concentrated solution of carbonate of potassa, the populin will be precipitated. If this be pressed between folds of blotting paper, and redissolved in boiling water, it will be deposited, upon the cooling of the liquid, in the crystalline state. The leaves of *P. tremula* also afford populin, and more largely even than the bark. It is probable that both principles exist also in the bark of *P. tremuloides*, and other species. Salicin is described under *Salix*. *Populin* is very light, purely white, and of a bitter, sweetish taste, analogous to that of liquorice. When heated it melts into a colourless and transparent liquid. It is soluble in 2000 parts of cold, and about 70 parts of boiling water; and is more soluble in boiling alcohol. Acetic acid and the diluted mineral acids dissolve it, and, upon the addition of an alkali, let it fall unchanged. Piria regards it as a complex body, consisting of benzoic acid, saligenin, and glucose, and states that the effects of reagents on it correspond with this view of its constitution. By boiling it with solution of baryta, and precipitating the excess of baryta from the solution by carbonic acid, he found remaining in the solution only benzoate of baryta and salicin. (See *Am. Journ. of Pharm.*, xxiv. 240.)

PORTULACA OLERACEA. *Garden Purslane.* An annual succulent plant, growing in gardens and cultivated grounds in the United States, Europe, and most other parts of the

globe. It has an herbaceous, slightly saline taste, and is often used as greens, being boiled with meat, or other vegetables. It is considered a cooling diuretic, and is recommended in scurvy, and affections of the urinary passages. The seeds have been thought to be anthelmintic; but they are tasteless and inert.

POTENTILLA REPTANS. *Cinquefoil.* A perennial, creeping, European herb, with leaves which are usually quinate, and have thus given origin to the ordinary name of the plant. The root has a bitterish, styptic, slightly sweetish taste, and was formerly used in diarrhœa, and other complaints for which astringents are usually prescribed.

POWDER OF ALGAROTH. *Pulvis Algarothi. Oxychloride of Antimony. Nitromuriatic Oxide of Antimony.* This powder is formed by dissolving tersulphuret of antimony in muriatic acid, assisting the action, at first, by a gentle heat, which must be gradually increased to ebullition; and then pouring the resulting solution, when cold, into a large quantity of water. By a double decomposition between the tersulphuret and acid, sulphuretted hydrogen is given off copiously by effervescence, and a solution of terchloride of antimony is formed. When this is thrown into water, the greater part of the terchloride is converted, by the elements of that liquid, into muriatic acid which remains in solution, and teroxide of antimony, which precipitates in union with the remainder of the terchloride as the powder of Algaroth.

Properties, &c. This is a white powder, having a crystalline appearance if left long in contact with the solution from which it is precipitated. When exposed to a red heat, it fuses and forms a yellow liquid, which, on cooling, concretes into a grayish crystalline mass of a pearly aspect. It consists of nine eqs. of teroxide of antimony, and two of terchloride. It is used for making tartar emetic in the U. S. and Edinburgh Pharmacopœias, but without being recognised under a distinct name; being formed as the first step of the process adopted in those works, for preparing this antimonial. It was formerly officinal in the Dublin Pharmacopœia, and used for making the same antimonial; but in the last edition of that work, published in 1850, it was dismissed, and the pure teroxide substituted for it. (See *Antimonii Terchloridi Liquor* and *Antimonii Oxidum.*) Powder of Algaroth was formerly used in medicine; but, owing to its unequal operation, has been properly laid aside. It is liable to contain tersulphuret of arsenic (orpiment), unless when obtained from the distilled concrete terchloride of antimony. (Larocque, *Journ. de Pharm.*, March, 1849.)

PRENANTHES SERPENTARIA. *Lion's Foot.* This is a perennial indigenous herb, growing in the mountainous districts of Virginia and North Carolina. It belongs to *Syngenesia Æqualis* in the sexual system, and to the natural family of *Cichoraceæ.* The genus is characterized by its "four-flowered nodding *heads*, its cylindric *involucre* calyculate at the base, its subterate unbeaked *akenes*, its scabrous *pappus* in several series, and its naked *receptacle.*" This particular species has rough dentate leaves, of which the radical are palmate, the cauline with long footstalks, sinuate pinnatifid, disposed to be three-lobed, with the middle lobe three-parted, the upper lanceolate. The racemes are terminal, somewhat panicled, short, and nodding, with an eight-cleft calyx, and twelve florets. (*Pursh.*) Dr. Darlington considers this a variety of *Prenanthes alba.* It is about two feet high, with purple flowers. Pursh speaks of it as in great repute among the inhabitants of the regions it inhabits as a remedy for the bite of poisonous serpents, and relates a case in which he had seen it used effectively. The milky juice of the plant was taken internally, and the leaves steeped in water were applied to the wound and frequently changed. In October, 1849, the author received a specimen of a plant from Dr. Newsom J. Pittman, of N. Carolina, with the information that he had employed it effectually in ten or twelve cases of the bite of the rattlesnake with uniform success. He gave internally a decoction of the root, which is extremely bitter. This plant was the Prenanthes Serpentaria of Pursh.

PRUNELLA VULGARIS. *Self-heal. Heal-all.* A small perennial labiate plant, common both in Europe and the United States, growing especially by the waysides. It is inodorous, but has an austere bitterish taste. The herb in flower was formerly used, in the state of infusion or decoction, in hemorrhages and diarrhœa, and as a gargle in sore-throat. In this country it is not employed in regular practice.

PULMONARIA OFFICINALIS. *Lungwort.* An herbaceous perennial, indigenous in Europe, and sometimes cultivated in this country in gardens. The leaves are inodorous, and have an herbaceous, somewhat mucilaginous, and feebly astringent taste. They have been considered pectoral and demulcent, and employed in catarrh, hæmoptysis, consumption, and other affections of the chest; but their virtues are doubtful, and they were probably used in pectoral complaints as much on account of the supposed resemblance of their speckled surface to that of the lungs, as from the possession of any positively useful properties.

PUMICE STONE. *Pumex.* A very light porous stone, found in the vicinity of active and extinct volcanoes, and believed to have been thrown up during their eruption. The pumice stone of commerce is said to be obtained chiefly from Lipari. It is used whole, in the manner of a file, for removing the outer surface of bodies, or for rubbing down inequalities, and, in the state of powder, for polishing glass, metals, stones, &c.; purposes to which it is adapted by the hardness of its particles.

PYRETHRUM PARTHENIUM. Willd. *Matricaria Parthenium.* Linn. *Chrysanthemum Parthenium.* Persoon. *Feverfew.* A perennial herbaceous plant, about two feet high, with an erect, branching stem, pinnate leaves, oblong, obtuse, gashed, and dentate leaflets, and compound flowers borne in a corymb upon branching peduncles. It is a native of Europe, but cultivated in our gardens. The whole herbaceous part is used. The plant has an odour and taste analogous to those of chamomile, which it resembles also in the appearance of its flowers, and in its medical virtues. Though little employed, it is undoubtedly possessed of useful tonic properties.

PYROACETIC SPIRIT. *Pyroacetic Ether. Acetone.* This substance may be obtained by carefully distilling acetate of lime, and rectifying the product by frequent distillations from quicklime in a water-bath, until the boiling point becomes stationary, whereby it is freed from water and empyreumatic oil. It is a colourless, volatile, inflammable liquid, having a peculiar penetrating smell, and a pungent taste like that of peppermint. Its specific gravity is 0·792, and boiling point 132°. As found in the shops its density is not generally lower than 0·820. It is miscible in all proportions with water, ether, and alcohol, without disturbing its transparency. If it become turbid when mixed with water, the fact shows that it contains empyreumatic oil. It has been confounded with pyroxylic spirit, from which it is distinguished by its inability to dissolve a saturated solution of chloride of calcium, which instantly dissolves in pyroxylic spirit. (*Scanlan.*) Its formula is C_3H_3O; while that of pyroxylic spirit is $C_2H_4O_2$. In constitution it bears considerable resemblance to alcohol. Thus its formula doubled is $C_6H_6O_2$, and that of alcohol is $C_4H_6O_2$. It was thought at one time that the substance brought to the notice of the profession by Dr. John Hastings, under the name of naphtha, as a remedy for pulmonary consumption, was pyroacetic spirit; but it now appears to be settled that what he intended was pyroxylic spirit. (See *Spiritus Pyroxilicus*, p. 701.) There is no doubt that these spirits were used indiscriminately in the therapeutic trials which grew out of the publication of Dr. Hastings's book; but no exact experiments have been made, so far as we know, to determine the precise physiological action of pyroacetic spirit.

REALGAR. This is the bisulphuret of arsenic, consisting of one eq of arsenic 75, and two of sulphur 32=107. It is found native in Saxony, Bohemia, Transylvania, and in various volcanic regions. Realgar is artificially made by melting arsenious acid with about half its weight of sulphur. (*Turner.*) Thus prepared, it is of a crystalline texture, of a beautiful ruby-red colour, of a uniform conchoidal fracture, somewhat transparent in thin layers, and capable of being sublimed without change. Native realgar is said to be innocent when taken internally, while that artificially prepared is poisonous, in consequence, according to Guibourt, of containing a little arsenious acid. Realgar is used only as a pigment.

RED CHALK. *Reddle.* A mineral substance of a deep-red colour, of a compact texture, dry to the touch, adhering to the tongue, about as hard as chalk, soiling the fingers when handled, and leaving a lively red trace when drawn over paper. It consists of clay and oxide of iron, and is intermediate between *bole* and *red ochre*, containing more oxide of iron than the former, and less than the latter. It is used for drawing lines upon wood, &c., and is sometimes made into crayons by levigating and elutriating it, then forming it into a paste with mucilage of gum Arabic, moulding this into cylinders, and drying it in the shade. It has been used internally as an absorbent and astringent.

RESEDA LUTEOLA. *Weld. Dyers' Weed.* An annual European plant, naturalized in the United States. It is inodorous, and has a bitter taste, which is very adhesive. Chevreul obtained from it by sublimation a peculiar yellow colouring matter, which he called *luteolin.* In medicine it has been employed as a diaphoretic and diuretic, but is now neglected. On the continent of Europe it is much employed for dyeing yellow, and, before the introduction of quercitron into England, was extensively applied to the same purpose in that country. The whole plant is used.

RHODODENDRUM CRYSANTHUM. *Yellow-flowered Rhododendron.* This is a beautiful evergreen shrub, about a foot high, with spreading branches, and oblong, obtuse, thick leaves, narrowed towards their footstalks, reflexed at the margin, much veined, rugged and deep-green upon their upper surface, ferruginous or glaucous beneath, and surrounding the branches upon strong petioles. The flowers are large, yellow, on long peduncles, and in terminal umbels. The corolla is wheel-shaped, with its border divided into five roundish,

spreading segments. The plant is a native of Siberia, delighting in mountainous situations, and flowering in June and July. The leaves are the part used. When fresh, they have a feeble odour, said to resemble that of rhubarb. In the dried state they are inodorous, but have an austere, astringent, bitterish taste. They yield their virtues to water and alcohol.

They are stimulant, narcotic, and diaphoretic, producing, when first taken, increase of heat and arterial action, subsequently a diminished frequency of the pulse, and, in large doses, vomiting, purging, and delirium. They have been long employed in Siberia as a remedy in rheumatism; and their use has extended to various parts of Europe. Their action is said to be accompanied with a sensation of creeping or pricking in the affected part, which subsides in a few hours, leaving the part free from pain. They have been recommended also in gout, lues venerea, and palsy. In Siberia they are prepared by infusing two drachms of the dried leaves in about ten ounces of water, in a close vessel, and keeping the liquid near the boiling point during the night. The strained liquor is taken in the morning; and a repetition of the dose three or four days successively generally effects a cure. The remedy is not used in this country.

RIGA BALSAM. *Balsamum Carpaticum. Balsamum Libani.* This is a product of the *Pinus Cembra*, a large tree growing in the mountainous regions and northern latitudes of Europe and Asia. The juice exudes from the extremities of the young twigs, and is collected in flasks suspended from them. It is a thin white fluid, having an odour analogous to that of juniper, and possessing the ordinary terebinthinate properties. In this country it is very rare; but it is occasionally brought from Riga or Cronstadt, in bottles. A similar product, called *Hungarian balsam*, is obtained in the same manner from the *Pinus Pumilio*, growing on the mountains of Switzerland, Austria, and Hungary. It is scarcely known in the United States.

ROTTEN STONE. *Terra Cariosa.* An earthy mineral, occurring in light, dull, friable masses, dry to the touch, of a very fine grain, and of an ash-brown colour. It is obtained from Derbyshire in England, and is used for polishing metals.

SALEP. Though not directed by any of the British Colleges, nor by our national Pharmacopœia, this substance deserves a slight notice, as it is frequently mentioned by writers on the materia medica, and is occasionally to be found in the shops. The name is given to the prepared bulbs of *Orchis mascula* and other species of the same genus. The *male orchis* is a native of Europe, the Levant, and northern Africa. Its bulbs, which are two in number, oval or roundish, internally white and spongy, are prepared by removing their epidermis, plunging them into boiling water, then stringing them together, and drying them in the sun or by the fire. By this process they acquire the appearance and consistence which distinguish them as found in the shops. Landerer, however, denies that as prepared in Greece or Macedonia they are dipped in boiling water, and ascribes their horny character to their being quickly dried in a baking oven. (*Pharm. Journ. and Trans.*, March, 1850.) They were formerly procured exclusively from Macedonia, Asia Minor, and Persia, but are now said to be prepared in France, and perhaps other parts of Western Europe.

Salep is in small, oval, irregular masses, hard, horny, semi-transparent, of a yellowish colour, a feeble odour, and a mild mucilaginous taste. It is sometimes kept in the state of powder. In composition and relation to water it is closely analogous to tragacanth, consisting of a substance insoluble, but swelling up in cold water (*bassorin*), of another in much smaller proportion, soluble in cold water, and of minute quantities of saline matters. It also occasionally contains a little starch. It is highly nutritive, and may be employed for the same purposes as tapioca, sago, &c. The reputation which it enjoyed among the ancients, and still enjoys in the East, of possessing aphrodisiac properties, is wholly without foundation. On account of its hardness, salep, in its ordinary state, is of difficult pulverization; but the difficulty is removed by macerating it in cold water until it becomes soft, and then rapidly drying it. Landerer states that it is sometimes used for adulterating Smyrna opium.

SANDARACH. *Sandaraca.* This is a resinous substance obtained from *Thuya articulata*, an evergreen tree growing in the North of Africa. It is in small, irregular, roundish oblong grains or tears, of a pale-yellow colour, sometimes inclining to brown, more or less transparent, dry and brittle, breaking into a powder under the teeth, of a faint agreeable odour increased by warmth, and of a resinous slightly acrid taste. It melts with heat, diffusing a strong balsamic odour, and easily inflames. It is almost entirely soluble in ordinary alcohol, and entirely so in that liquid when anhydrous, and in ether. Heated oil of turpentine also dissolves the greater part of it, but very slowly. According to Unverdorben, it consists of three different resins, varying in their relations to alcohol, ether, and the oil of turpentine. The *sandaracin* of Geise, which remains after sandarach has

been exposed to the action of ordinary alcohol, is a mixture of two of these resins. Sandarach was formerly given internally as a medicine, and enters into the composition of various ointments and plasters. At present it is used chiefly as a varnish. It is sometimes employed as incense, and its powder is rubbed upon paper in order to prevent ink from spreading, after letters have been scratched out.

SANICULA MARILANDICA. *Sanicle.* An indigenous, umbelliferous, perennial, herbaceous plant, two or three feet in height, growing in woods and thickets, in almost all parts of the United States, as far south as S. Carolina. For its botanical character see *Eaton's Botany*, and *Torrey and Gray's N. Am. Flora* (vol. i. p. 601). The root is the part used, and is popularly known in some parts of the country by the name of *black snakeroot.* It is fibrous and of an aromatic taste, and has been used as a domestic remedy in intermittent fever. Dr. J. B. Zabriskie has found it highly effectual in chorea. He considers it most efficient in substance, and gives the powder to children of eight or ten years old in the dose of half a drachm three times a day. (*Am. Journ. of Med. Sci.*, N. S., xii. 374.)

SANTALUM. *Sandal wood. Saunders.* There are three kinds of wood known by the name of santalum or saunders;—1. *santalum rubrum*, or red saunders, from Pterocarpus Santalinus, already described in this work (*page* 647) under the officinal name of *Santalum;* 2. *santalum album*, or *white saunders*, from the *Santalum album* of Linnæus, growing in the East Indies, the S. Pacific Islands, and South America; and 3. *santalum citrinum*, or *yellow saunders*, formerly supposed to be the inner wood of the tree of which the outer constituted white saunders, but now stated to be from a different tree, the *S. freycinetianum* of M. Gaudichaud, growing in the Sandwich Islands, the Fejee Islands, the Marquesas, on the coast of Malabar, &c. It is the latter which supplies the sandal wood so highly valued by the Chinese. Both kinds have a very agreeable aromatic odour. The white is thought by the East India physicians to be refreshing, and useful in remittent fevers, gonorrhœa, and other complaints. It was formerly used in European pharmacy, and still enters into certain compound syrups, confections, &c. The Chinese employ the yellow saunders chiefly as a perfume, burning it in their temples, sick chambers, &c., and obtain from it a volatile oil by distillation, which they mix with oil of roses. This variety was also formerly used in Europe, and praised as cordial and alexipharmic. The *three saunders* were not unfrequently combined in the same preparation. (*Merat and De Lens.*)

SAPONARIA OFFICINALIS. *Soapwort.* A perennial herbaceous plant, growing wild in this country, in the vicinity of cultivation, but probably introduced from Europe. It is commonly known by the vulgar name of *bouncing bet.* It is one or two feet high, with smooth, lanceolate leaves, and clusters of conspicuous whitish or slightly purplish flowers, which appear in July and August. The root and leaves are employed. They are inodorous, and of a taste at first bitterish and slightly sweetish, afterwards somewhat pungent, continuing long, and leaving a slight sense of numbness on the tongue. They impart to water the property of forming a lather when agitated, like a solution of soap, whence the name of the plant was derived. This property, as well as the medical virtues of the plant, resides in a peculiar proximate principle, obtained from the root by Bucholz, and called by him *saponin.* This principle constitutes, according to Bucholz, 34 per cent. of the dried root, which contains also a considerable quantity of gum and a little bassorin, resin, and altered extractive, besides lignin and water. Saponin is obtained, though not absolutely pure, by treating the watery extract with alcohol and evaporating. It is brown, somewhat translucent, hard and brittle, with a sweetish taste, followed by a sense of acrimony in the fauces. It is soluble in water and officinal alcohol, but is insoluble in anhydrous alcohol, ether, and the volatile oils. Its watery solution froths when agitated. This principle has been found also in various other plants, as different species of Silene, Dianthus, Lychnis, and Anagallis (*Journ. de Pharm.*, 3*e sér.*, x. 339.) It is said to possess poisonous properties. Soapwort has been much used in Germany as a remedy in venereal and scrofulous affections, cutaneous eruptions, and visceral obstructions. It appears to act as an alterative, like sarsaparilla, to which it has been deemed superior in efficacy by some physicians. The plant is given in the form of decoction and extract, which may be freely taken. From two to four pints of the decoction daily are recommended in lues. The inspissated juice, given in the quantity of half an ounce in the course of a day, is said by Andry generally to cure gonorrhœa in about two weeks, without any other remedy. According to Dr. Bonnet and M. Malapert, this and other plants containing saponin are capable of producing poisonous effects. (*Journ. de Pharm.*, 3*e sér.*, x. 339.)

SARCOCOLLA. A peculiar vegetable product, exuding spontaneously from the *Penæa Sarcocolla*, *P. mucronata*, and other species of Penæa, small shrubs growing at the Cape of Good Hope, in Ethiopia, Arabia, &c. It is in the form of small, roundish, irregular grains, sometimes agglutinated in masses, friable, opaque or semi-transparent, of a yel-

lowish or brownish-red colour, inodorous unless heated, when they have an agreeable smell, and of a peculiar, bitter, sweetish, and acrid taste. Sarcocolla, according to Pelletier, consists of 65·3 per cent. of a peculiar substance, considered by Dr. Thomson, as holding an intermediate place between gum and sugar, and called *sarcocollin* or pure sarcocolla, 4·6 of gum, 3·3 of a gelatinous matter having some analogy with bassorin, and 26·8 of lignin, &c. It is said to be purgative, but at the same time to produce serious inconvenience by its acrid properties. The Arabian physicians used it internally; and by the ancients it was employed as an external application to wounds and ulcers, under the idea that it possessed the property of agglutinating the flesh, whence its name was derived. It is at present out of use.

SARRACENIA. *Side-saddle Plant. Fly-trap.* Two southern species of this curious indigenous genus of plants, *S. flava* and *S. variolaris*, have been brought into notice by Dr. F. P. Porcher, in a communication published in the *Charleston Medical Journal and Review*. Dr. Porcher states that the roots of these plants have long been used as a domestic remedy by the inhabitants of the lower portions of South Carolina. The medicine is believed in that region to possess extraordinary powers in dyspepsia; and he received reports from persons entirely deserving of confidence, of its efficacy in sick headache, waterbrash, gastralgia, abdominal distension, &c. In trying the remedy upon himself, he found it to be bitter and astringent to the taste, and in its effects on the system, stimulant to the stomach, the circulation, and in some degree to the brain, and at the same time to a certain extent diuretic, and disposed to operate mildly on the bowels. From the results stated by Dr. Porcher, we should infer that the medicine is a stimulating tonic, with some tendency to act on the brain; and probably well suited to cases of dyspepsia dependent on debility of stomach. Professor Sheppard submitted the root to chemical examination, and found it to contain, lignin, colouring matter, resin, an acid salt of lime, and a salt probably of an organic alkali. The best mode of administration seems not to have been well determined. Invalids chew it as they would chew tobacco; and from Dr. Porcher's statements we should infer that it might be appropriately given in powder in the dose of half a drachm three or four times a day. (See *Wood's Quarterly Retrospect*, ii. 78.)

SASSA GUM. This name has been applied by Guibourt to a gum, occasionally brought into market from the East, and answering so exactly to Bruce's description of the product of a tree which he calls *sassa*, that there is reason to believe in their identity. According to Guibourt's description, it is in mammillary masses, or in convoluted pieces resembling an ammonite, of a reddish colour, and somewhat shining surface, and more transparent than tragacanth. Its taste is like that of tragacanth, but slightly acrid. When introduced into water, it becomes white, softens, and swells to four or five times its original bulk; but it preserves its shape, neither like tragacanth forming a mucilage, nor like Bassora gum separating into distinct flocculi. It is rendered blue by iodine.

SASSY BARK. This bark is interesting chiefly from its employment by the natives of Western Africa as an ordeal in their trials for witchcraft or sorcery. Specimens sent to this country from Liberia were first examined by Mr. C. A. Santos, who published his observations in the *Am. Journ. of Pharm.* (xxi. 97, April, 1849). Other specimens, both of the bark and of the plant producing it, afterwards came under the notice of Professor Procter, who was thus enabled to determine as well the chemical characters as the botanical source of the product. His papers on the subject are contained in the same Journal (xxiii. 301, and xxiv. 195); and in the last is given a botanical description of the tree. To these papers the reader is referred for particular information on the subject. It appears that the bark is the product of a previously undescribed species of *Erythrophleum*, for which Prof. Procter proposes the name of *E. judiciale*. It is a large tree with spreading branches, doubly pinnated leaves, flowers in spike-like racemes, and leguminous fruit. The bark is in pieces more or less curved, with or without epidermis, in the former case somewhat fissured externally, of a dull-red colour diversified by whitish spots, brittle, presenting when cut transversely numerous fawn-coloured spots surrounded by reddish-brown tissue, nearly inodorous, of an astringent taste, and according to M. Santos of the sp. gr. 1·054. Prof. Procter found it to contain tannic acid, insoluble apotheme analogous to that of rhatany, a red colouring matter formed by a combination of the two preceding constituents, gallic acid, gum, a little resin, fatty matter, various salts, and a peculiar substance precipitable by tannic acid, and soluble in alcohol and chloroform. He was unable to isolate the active principle. The bark yields its virtues to water. Its effects on the system have not been accurately studied; but it is certainly emetic and cathartic, and appears to superadd an influence over the nervous system, as it paralyzes muscular power. Professor Procter found three grains of the aqueous extract, given to a cat, to produce great prostration, frothing at the mouth, dilatation of the pupils, and total loss of inclination to eat. Largely taken the bark often causes death. The powder snuffed up the nostrils occasions violent sneezing.

SATUREJA HORTENSIS. *Summer Savory.* An annual labiate plant, growing spontaneously in the South of Europe, and cultivated in gardens as a culinary herb. It has an aromatic odour and taste, analogous to those of thyme, and was formerly used as a gentle carminative stimulant; but is now employed only to give flavour to food. The *S. montana*, or *winter savory*, which is also cultivated in gardens, has similar properties, and is similarly employed.

SCOLOPENDRIUM OFFICINARUM. Smith. *Asplenium Scolopendrium.* Linn. *Harts-tongue.* A fern indigenous in Europe and America. Its vulgar name was derived from the shape of its leaves, which were the part formerly used in medicine. They have a sweetish, mucilaginous, and slightly astringent taste, and, when rubbed, a disagreeable oily odour. They were used as a deobstruent in visceral affections, as an astringent in hemorrhages and fluxes, and as a demulcent in pectoral complaints; but their properties are feeble, and they have fallen into neglect.

SCROPHULARIA NODOSA. *Figwort.* The root of the *knotty rooted figwort* is perennial, tuberous, and knotty; the stem is herbaceous, erect, quadrangular, smooth, branching, and from two to three feet high; the leaves are opposite, petiolate, ovate-cordate, pointed, sharply toothed, veined, and of a deep-green colour; the flowers are small, dark-purple, slightly drooping, and borne on branching peduncles in erect terminal branches. The plant is a native of Europe, where it grows in shady and moist places, and flowers in July. The leaves, which are the part used, have when fresh a rank fetid odour, and a bitter somewhat acrid taste; but these properties are diminished by drying. Water extracts their virtues, forming a reddish infusion, which is blackened by the sulphate of the sesquioxide of iron. Figwort leaves are said to be anodyne and diuretic, and to have repellent properties when externally applied. They were formerly considered tonic, diaphoretic, discutient, anthelmintic, &c., and were thought to be useful in scrofula. They are at present very little employed, and never in this country. In Europe they are sometimes applied in the form of ointment or fomentation to piles, painful tumours and ulcers, and cutaneous eruptions.

SCUTELLARIA LATERIFLORA. *Scullcap.* This is an indigenous perennial herb, belonging to the Linnæan class and order *Didynamia Gymnospermia*, and to the natural order *Labiatæ*. Its stem is erect, much branched, quadrangular, smooth, and one or two feet high. The leaves are ovate, acute, dentate, subcordate upon the stem, opposite, and supported upon long petioles. The flowers are small, of a pale-blue colour, and disposed in long, lateral, leafy racemes. The calyx has an entire margin, which, after the corolla has fallen, is closed with a helmet-shaped lid. The tube of the corolla is elongated, the upper lip concave and entire, the lower three lobed. The plant grows in moist places, by the sides of ditches and ponds, in all parts of the Union. To the senses it does not indicate, by any peculiar taste or smell, the possession of medicinal virtues. It is even destitute of the aromatic properties which are found in many of the labiate plants. When taken internally, it produces no very obvious effects. Notwithstanding this apparent inertness, it obtained, at one period, extraordinary credit throughout the United States, as a preventive of hydrophobia, and was even thought to be useful in the disease itself. A strong infusion of the plant was given in the dose of a teacupful, repeated several times a day, and continued for three or four months after the bite was received; while the herb itself was applied to the wound. Strong testimony has been adduced in favour of its prophylactic powers; but it has already shared the fate, which in this case is no doubt deserved, of numerous other specifics against hydrophobia, which have been brought into temporary popularity, only to be speedily abandoned. Nevertheless, it is thought by some practitioners to have valuable therapeutic properties; and Drs. Ariel Hunton and C. H. Cleaveland, of Vermont, speak in strong terms of its efficacy as a nervine. They have employed it in neuralgic and convulsive affections, chorea, delirium tremens, and nervous exhaustion from fatigue or over-excitement, and have found it highly advantageous. Dr. Cleaveland says that he prefers it to all other nervines or other antispasmodics, except where an immediate effect is desirable. Dr. Cleaveland prefers the form of infusion, which he prepares by adding half an ounce of the dried leaves to a teacupful of water, and allows the patient to drink *ad libitum.* (*Am. Journ. of Pharm.*, xxiii. 370, from *N. Y. Register of Med. and Pharm.*, also *N. J. Med. Reporter*, v. 13.) The *Scutellaria galericulata*, or common *European scullcap*, which also grows wild in this country, has a feeble, somewhat alliaceous odour, and a bitterish taste. It has been employed in intermittents, and externally in old ulcers, but is now out of use. Dr. R. W. Evans, of Canada West, has found it useful in epilepsy; but to effect a cure it must be continued, he says, for five or six months. He makes an infusion with two ounces of the herb and eight ounces of water, and gives a fluidounce every eight hours, doubling the quantity after a week. (See *Am. Journ. of Med. Sci.*, xvii. 495.) Another indigenous species, the *S. integrifolia*, of which the *S. hyssopifo-*

lia, Linn., is considered by some as a variety, is intensely bitter, and might probably be found useful as a tonic.

SECALE CEREALE. *Rye.* Syria, Armenia, and the southern provinces of Russia have been severally indicated as the native country of rye. The plant is now cultivated in all temperate latitudes. The *grains* consist, according to Einhof, of 24·2 per cent. of envelope, 65·6 of flour, and 10·2 of water. The *flour*, according to the same chemist, consists of 61·07 per cent. of starch, 9·48 of gluten, 3·28 of albumen, 3·28 of uncrystallizable sugar, 11·09 of gum, 6·38 of vegetable fibre, besides 5·62 of loss, comprising an acid, the nature of which was not determined. Rye flour has been much used, in the dry state, as an external application to erysipelatous inflammation, and other eruptive affections, the burning and unpleasant tingling of which it tends to allay, while it absorbs the irritating secretions. In the form of mush it is an excellent laxative article of diet, and, mixed with molasses, may be given with great advantage in hemorrhoids and prolapsus ani, connected with constipation.

SEDUM ACRE. *Biting Stone crop. Small Houseleek.* A small, perennial, succulent European plant, growing on rocks and old walls, with stems about as long as the finger, and numerous very minute leaves. It is inodorous, and has a taste at first cooling and herbaceous, afterwards burning and durably acrid. Taken internally it vomits and purges, and applied to the skin, produces inflammation and vesication. The fresh herb and the expressed juice have been used as an antiscorbutic, emetic, cathartic, and diuretic, and have been applied locally to old ulcers, warts, and other excrescences; but the plant is at present little employed. It has recently been recommended in Germany as a remedy in epilepsy. Other species are less acrid, and are even eaten as salad in some parts of Europe. Such are the *Sedum rupestre* and *S. album*. *S. Telephium* was formerly employed externally to cicatrize wounds, and internally as an astringent in dysentery and hæmoptysis; and is still esteemed by the common people in France as a vulnerary.

SEMPERVIVUM TECTORUM. *Common Houseleek.* A perennial succulent European plant, growing on rocks, old walls, and the roofs of houses, and remarkable for its tenacity of life. It is occasionally cultivated in this country as an ornament to the walls of houses, or as a domestic medicine. The leaves, which are the part used, are oblong, pointed, from half an inch to two inches in length, thick, fleshy, succulent, flat on one side, somewhat convex on the other, smooth, of a light-green colour, inodorous, and of a cooling, slightly saline, astringent, and sourish taste. They are employed, in the recent state and bruised, as a cooling application to burns, stings of bees, hornets, &c., ulcers, and other external affections attended with inflammation. They contain a large proportion of supermalate of lime.

SENECIO VULGARIS. *Common Groundsel.* An annual European plant, introduced into this country, and growing in cultivated grounds. The whole herb is used, and should be gathered while in flower. It has, when rubbed, a peculiar rather unpleasant odour, and a disagreeable, herbaceous, bitterish, and saline taste, followed by a sense of acrimony. It is emetic in large doses, and has been given in convulsive affections, liver complaints, spitting of blood, &c., but is now very little used. The bruised herb is sometimes applied externally to painful swellings and ulcers. The plant is employed also as food for birds, which are fond of it. Other species of Senecio have also been medicinally used; and an indigenous species, the *S. aureus* or *ragwort*, is said by Schoepf to be a favourite vulnerary with the Indians.

SIENNA. *Terra di Sienna.* An argillaceous mineral, compact, of a fine texture, very light, smooth and glossy, of a yellowish-brown or coffee-colour, leaving a dull orange trace when moistened and drawn over paper. By calcination it assumes a reddish-brown colour, and is then called *burnt sienna*. In both the raw and burnt states it is used in painting. The best sienna is brought from Italy, but an inferior kind is found in England.

SILENE VIRGINICA. *Catchfly. Wild Pink.* An indigenous perennial plant, growing in Western Virginia and Carolina, and in the States beyond the Alleghany mountains. Dr. Barton, in his "Collections," states that a decoction of the roots is said to be efficacious as an anthelmintic. We are told that it is considered poisonous by some of the Indians. *S. Pennsylvanica*, which grows in the Eastern section of the Union, from New York to Virginia, probably possesses similar properties.

SISYMBRIUM OFFICINALE. Scopoli. *Erysimum officinale.* Linn. *Hedge Mustard.* A small annual plant, growing in the United States and Europe, along the roadsides, by walls and hedges, and on heaps of rubbish. It has an herbaceous somewhat acrid taste, which is strongest in the tops and flower-spikes, and resembles that of mustard, though much weaker. The seeds have considerable pungency. The herb is said to be diuretic

and expectorant, and has been recommended in chronic coughs, hoarseness, and ulceration of the mouth and fauces. The juice of the plant may be used mixed with honey or sugar, or the seeds may be taken in substance. *Sisymbrium Sophia*, or the *flix weed*, was formerly also officinal. It is of a pungent odour when rubbed, and of an acrid biting taste. The herb has been used externally in indolent ulcers, and the seeds internally in worms, calculous complaints, &c.

SIUM NODIFLORUM. *Water-parsnep.* A perennial, umbelliferous, aquatic European plant, growing also in the Southern section of the United States, where it is supposed to have been introduced. It is commonly considered poisonous; but the expressed juice, given by Withering in the dose of three or four ounces every morning, was not found to affect the head, stomach, or bowels. He found it, in this quantity, very advantageous in obstinate cutaneous diseases; and the plant has been usefully employed by others in similar complaints, and in scrofulous swellings of the lymphatic glands. It is considered diuretic. *Sium latifolium*, which grows in Europe and the United States, and is the *common water parsnep* of this country, is positively asserted to be poisonous; and madness and even death are said to have followed the use of the root. The *S. Sisarum* or *skirret*, a plant of Chinese origin, cultivated in Europe, has a sweetish, somewhat aromatic root, which is employed as food in the form of salad, and is supposed to be a useful diet in complaints of the chest.

SMALT. *Azure.* When the impure oxide of cobalt, obtained by roasting the native arseniuret of that metal, is heated with sand and potassa, the mixture melts, and a beautiful blue glass results, which, when reduced to powder, receives the name of smalt. It is used chiefly in painting.

SOOT. *Fuligo Ligni.* This well known substance has a peculiar smell, and a bitter, empyreumatic, and disagreeable taste. Its composition is very complex. Reduced to powder and treated with water, it affords an infusion of a deep-yellow or brown colour, the colour being deeper if heat be employed. The insoluble portion amounts to about forty-four per cent. The soluble part consists chiefly, according to Berzelius, of a pyrogenous resin united with acetic acid (*acid pyretin*), saturated with potassa, lime, and magnesia. It also contains sulphate of lime, chloride of potassium, acetate of ammonia, and traces of nitric acid. If the solution be evaporated to dryness, it furnishes a black extract. This forms with water a blackish-brown solution, which, when treated with any free acid except the acetic, lets fall the acid pyretin, in the form of a black mass resembling pitch; while the acid employed remains in solution with the bases previously in combination with the pyretin. Braconnot thought he had discovered in the pyretin a peculiar principle, to which he gave the name of *asbolin;* but Berzelius thinks he was mistaken. Besides these substances, Braconnot ascertained the existence in soot of an azotized extractive matter to the amount of twenty per cent. This matter, when submitted to dry distillation, afforded a considerable portion of pyrogenous oil. The soot itself, when subjected to a similar distillation, furnishes one-fifth of its weight of empyreumatic oil. To the above ingredients of soot must be added creasote, to the presence of which it is supposed to owe its medicinal properties.

Soot was formerly officinal with the Edinburgh College, and the Scotch physicians were in the habit of frequently prescribing it as a tonic and antispasmodic in the form of tincture. It went very much out of use in regular practice; and it is only within a few years, that its employment has been revived on account of its containing creasote. At present it is chiefly used as an external remedy in the form of decoction or ointment. In the *Revue Méd.* for June, 1834, M. Blaud details a number of cases of various affections, such as obstinate tetters, porrigo favosa, psora, fistula, cancerous and venereal ulcers, chronic irritations of the lining membrane of the mouth, exudations from the mucous membrane of the nose, herpetic eruptions of the genital organs, and pruritus of the vulva, in which the use of soot effected a cure. The *decoction* is made by adding two handfuls of soot to a pint of water, boiling for half an hour, and filtering. It is applied as a lotion to the affected parts, or injected into the fistulæ several times a day; and, in the intervals, the part, if accessible, is dressed with an *ointment*, made by rubbing up a drachm of finely powdered soot with an ounce of lard. In cases of porrigo, the crusts must be removed by poultices before the soot is applied. In scrofulous ophthalmia, M. Caron Duvillards and M. Baudelocque have found a collyrium, made according to the following formula, very useful. Infuse two ounces of soot in boiling water, filter the solution, and evaporate it to dryness. Dissolve the dry residue, with the assistance of heat, in strong white wine vinegar, and add extract of roses in the proportion of twenty-four grains to twelve fluidounces of the liquid. It is prepared for use by adding a few drops of the liquid to a glass of water. (*Bull. Gén. de Thérapeutique*, March, 1834.) This formula is not very satisfactory; as it does not indicate the proportion of vinegar to be employed. In a case of

severe and extensive burn, in which, after the separation of the sloughs, the patient began to sink from the profuse discharge, Dr. Ebers, of Bordeaux, found advantage from the application, to the granulating surface, of lint soaked in a decoction of soot. It reduced the discharge in a surprising manner, and promoted cicatrization.

The late Dr. Hewson, of this city, found an infusion of soot an efficacious remedy, employed by injection, in cases of ascarides. In one case of long standing in an adult, in which a number of remedies had been tried unsuccessfully, injections of soot daily, persevered in for two weeks, effected a complete cure. The injection was made by adding a cupful of soot to a pint of boiling water, and straining the solution. An *infusion of hickory ashes and soot* is used in this city as a popular remedy for dyspepsia. It is made by infusing a pint of clean hickory ashes and a gill of soot in half a gallon of boiling water, allowing the liquor to stand for twenty-four hours, and then decanting. Of this a small wineglassful is taken three or four times a day. No doubt this infusion has been useful in acidity of stomach; but its indiscriminate use in the various gastric affections popularly confounded under the name of dyspepsia, is calculated to do much harm.

Soot is decidedly antiseptic. A few shovelfuls of it, thrown into privies or drains, effectually destroy their foul exhalations.

SPANISH BROWN. A brownish-red ochre, much used in painting.

SPARTIUM JUNCEUM. *Spanish Broom.* A small shrub, indigenous in the South of Europe, and cultivated in our gardens as an ornamental plant. The flowers are large, yellow, and of an agreeable odour. The seeds are in moderate doses diuretic and tonic, in large doses emetic and cathartic, and have been used advantageously in dropsy. The dose is from ten to fifteen grains three times a day. They may also be given in tincture.

SUCCINIC ACID. *Acidum Succinicum.* This acid is obtained by distilling amber. (See *Succinum.*) The product is an aqueous solution of impure succinic acid, associated with empyreumatic oil. (See *Oleum Succini.*) By filtering the liquor the solution of the impure acid passes through, while the oil is absorbed by the paper. The acid may be purified by boiling the solution with nitric acid, diluted with twice its bulk of water, and then evaporating to crystallize. Should the crystals not be colourless, the treatment with nitric acid must be repeated until they are so. Succinic acid is formed artificially by the action of nitric acid on the fatty acids, and under various other circumstances. M. Desaignes obtained it from malate of lime, subjected to the influence of fermentation excited by casein. The malate was converted into the succinate of lime.

Succinic acid, when pure, is a white, transparent solid, crystallizing in prisms, and having a somewhat acrid taste. It dissolves in five times its weight of cold, and twice its weight of boiling water. It is soluble also in alcohol, but very sparingly so in ether. Nitric acid is without action on it. It melts at 365°, and boils without alteration at 473°. It sublimes, however, at a much lower temperature. According to Wackenroder it is sometimes adulterated with tartaric acid, soaked in oil of amber. Crystallized from its solution in water, its formula is $C_4H_2O_3+HO$. The sublimed acid has the formula $2C_4H_2O_3+HO$. Some chemists double the equivalent of this acid, and make its formula $C_8H_4O_6$.

Succinic acid is at present never used in medicine, and has been very properly omitted in the Dublin Pharmacopœia of 1850. It has lately been ascertained to be a product of vital action, having been detected by M. Heintz in the colourless liquid found in the hydatid cysts of the liver. (*Journ. de Pharm*, Sept, 1850. from *Pogg. Annalen.*) One of its salts, *succinate of ammonia*, has been used with great alleged success in delirium tremens. This salt is occasionally used as a precipitant of sesquioxide of iron.

SULPHATE OF ALUMINA. *Aluminæ Sulphas.* The salts of alumina have been ascertained by M. Gannal to be powerful preservatives of animal matter. Among these the sulphate is to be preferred, on account of its easy preparation and moderate price. It may be made by saturating dilute sulphuric acid with hydrated alumina, and evaporating. It may be prepared also by the process of MM. Huria and Brunel, which consists in exposing in an iron cylinder, sulphate of alumina and ammonia (ammoniacal alum), first dried to separate its water of crystallization, to a cherry-red heat. Sulphate of alumina remains in the cylinder, and the volatilized products are collected in water. The chief of these is sulphite of ammonia, which serves for the preparation of a fresh portion of alum, after having been changed into the sulphate by oxidation in the air. (*Chem. Gaz.*, Sept. 15, 1852, p. 359.) A solution of this salt was found by M. Gannal to be very effectual in preserving bodies for dissection, when injected into the blood-vessels. In the summer season the bodies were preserved fresh for twenty days or more; in the winter, for three months. For use in the winter, a quantity of the solution, sufficient for injecting one body, may be made by adding a pound, avoirdupois, of the salt to a quart of water; for use in warm weather, the solution must be stronger. This salt has been used extensively in the

Philadelphia Hospital, Blockley, at the suggestion of Dr. Dunglison, as an antiseptic and detergent application to ulcers, and with favourable results. Dr. Pennypacker reports several cases in which it proved useful. The strength of the solution employed varied from ʒijss to ʒiij of the salt to fʒvi of water, according to the state of the ulcer. Dr. G. Johnson, of Georgia, found the solution attended with the happiest effects, used as an injection in fetid discharges from the vagina. (*Med. Exam.*, vi. 63 and 112.) *Acetate of alumina* and *chloride of aluminium* (muriate of alumina) also possess antiseptic powers.

SULPHATE OF ALUMINA AND IRON. *Aluminæ et Ferri Sulphas.* This double salt has been brought forward by Sir James Murray, of Dublin, as an astringent, styptic, and vermifuge. The method which he gives for preparing it is not very clearly expressed; but it may be presumed to be formed by dissolving alumina and carbonate of iron, both recently precipitated, in sulphuric acid, and duly evaporating the solution. Sir James recommends it in the treatment of chronic dysentery, diarrhœa, fluor albus, and the colliquative sweats and diarrhœa which attend hectic fever and consumption. Externally he found it a powerful styptic, useful as a gargle in relaxation of the tonsils and uvula, and in salivation, as an injection in hemorrhages, and as a wash for foul and flabby ulcers. The dose for internal exhibition is from five to ten grains, dissolved in some aromatic water. This salt probably consists of tersulphate of alumina, combined with tersulphate of sesquioxide of iron. It is, therefore, not an alum. A true alum, using that term as the designation of a class, has the general formula, $M_2O_3,3SO_3+MO,SO_3+24HO$. In ordinary alum the sesquioxide is alumina, and the protoxide, potassa; but the latter may be replaced by protoxide of iron, so as to give an alum, having the formula, $Al_2O_3,3SO_3+FeO,SO_3+24HO$, which occurs native, forming one variety of *plumose alum*, and may be made artificially. But the alumina may be replaced by certain other sesquioxides, as by those of manganese, chromium, and iron, forming the alums commonly called manganese, chrome, and iron alum. The latter has recently come into notice as a medicine, and deserves a notice in this place; the information respecting it having come too late for insertion under *Alumen*.

Iron Alum. Potassio-sulphate of Sesquioxide of Iron. Double Sulphate of Sesquioxide of Iron and Potassa. ($Fe_2O_3,3SO_3+KO,SO_3+24HO$.) This alum is formed by first converting the sulphate of protoxide of iron by sulphuric acid, assisted by nitric acid, into the tersulphate of the sesquioxide, and then adding an equivalent quantity of sulphate of potassa. (See *page* 1001.) The solution is then treated with an excess of sulphuric acid, and sufficiently evaporated to form crystals on cooling. Iron alum is in the form of octohedral crystals, of a pale-violet colour, more soluble than common alum, and forming a solution having a reddish colour. It was brought to the notice of the Pharmaceutical Society of London, in Dec. 1853, by Mr. Lindsey Blyth, as a new remedy prescribed in St. Mary's Hospital of that city. Dr. Tyler Smith found it to be a more powerful astringent than common alum, but devoid of the stimulating effects of the other salts of iron. The ammonio-sulphate of sesquioxide of iron, in which the potassa is replaced by oxide of ammonium, has identical therapeutic effects. The dose of iron alum is the same as that of ordinary alum. (*Pharm. Journ. and Trans.*, Jan. 1854, p. 306.)

SULPHATE OF CADMIUM. *Cadmii Sulphas.* This salt may be formed by dissolving carbonate of cadmium in dilute sulphuric acid, or metallic cadmium in the same acid, assisted with a little nitric acid. It is a soluble, astringent, efflorescent salt, crystallizing in prisms, which resemble those of sulphate of zinc. It acts on the economy like that salt, but is considered tenfold more powerful. Besides its emetic property, it possesses, according to M. Grimaud, valuable powers as a remedy in syphilis, rheumatism, and gout. As yet it has been used almost exclusively as an astringent and stimulating remedy in diseases of the eyes. In specks and opacities of the cornea, it has been employed successfully by a number of European surgeons. It is used either in solution, in the proportion of from half a grain to four grains to the fluidounce of distilled water, or in the form of ointment, made by mixing two grains with four scruples of fresh lard. M. Fronmüller has employed it, with excellent results, in specks of the cornea, dissolved in rose water in the proportion of three grains to two fluidounces, associated with from half a fluidrachm to a fluidrachm and a half of wine of opium. (*Journ. de Pharm.*, March, 1851.)

SULPHATE OF NICKEL. *Niccoli Sulphas.* This salt is formed by dissolving carbonate of nickel in dilute sulphuric acid, concentrating the solution, and setting it aside to crystallize. The carbonate is procured by dissolving the impure arseniuret of nickel, sold under the name of *speiss*, coarsely powdered and mixed with half its weight of iron filings, in nitromuriatic acid. The solution is evaporated to dryness, and the residue treated with water, which takes up the impure chloride of nickel, and leaves the arsenic in the form of the insoluble arseniate of iron. The liquid is then acidulated with muriatic acid, treated with sulphuretted hydrogen in excess, which precipitates the copper, and,

after filtration, boiled with a little nitric acid, to sesquioxidize any remaining iron. The cold liquid, largely diluted with water, is next treated with a solution of bicarbonate of soda, gradually added, which throws down the iron in the state of sesquioxide. Lastly, the filtered solution, containing the chloride of nickel nearly pure, is boiled with carbonate of soda, which, by double decomposition, throws down a pale-green precipitate of carbonate of nickel. Sulphate of nickel is in the form of emerald-green prismatic crystals, efflorescent in the air, soluble in three parts of cold water, but insoluble in alcohol and in ether. It has a sweet and astringent taste. It consists of one eq. of sulphuric acid 40, one of protoxide of nickel 37·5, and seven of water 63 = 140·5. (NiO,SO_3+7HO.)

Prof. Simpson, of Edinburgh, has made some therapeutic trials with this salt, and found it to act as a gentle metallic tonic, like the preparations of iron, yet somewhat differently. He used it successfully in a case which he relates, of severe and obstinate periodic headache. The dose is from half a grain to a grain three times a day, given in the form of pill, or of simple solution. In large doses it is liable to produce nausea, especially if taken on an empty stomach. (See *Braithwaite's Retrospect*, xxvii. 446.)

SULPHITE OF SODA. *Sodæ Sulphis.* (NaO,SO_2+8HO.) This salt may be prepared by passing sulphurous acid into a solution of carbonate of soda, and evaporating out of contact of the air. It is in the form of transparent crystals, soluble in four parts of cold, and less than their weight of boiling water. Sulphite of soda has been used in cases of yeasty vomiting with remarkable success. The matter vomited in these cases has a yeasty appearance on the surface, and is generally found to contain, when examined by the microscope, two microscopic fungi, called sarcina ventriculi and torula cerevisiæ. The remedy was first used at the suggestion of Prof. Graham, of London, who supposed that the sulphurous acid, necessarily extricated from the salt in the stomach by the acid of the yeasty matter, would destroy the parasites. Dr. Dobie, of Edinburgh, has reported two cases of yeasty vomiting, occurring under his observation, in which the disease was immediately checked by the sulphite. In one of the cases the vomited matter contained an enormous quantity of the torula, without sarcina. (*Ed. Monthly Journ.*, xiv. 574.) The dose of sulphite of soda is a drachm three times a day. (See *Hyposulphite of Soda*, p. 1343.)

SULPHOCYANURET OF POTASSIUM. *Potassii Sulphocyanuretum.* This salt is prepared by fusing in an iron vessel, at a *low* red heat, a mixture of two parts of dried ferrocyanuret of potassium, and one part of flowers of sulphur. The mass, when cold, is dissolved in boiling water, and, to decompose some sulphocyanuret of iron, the solution is treated with carbonate of potassa, which throws down the iron as a carbonate, and gives rise to the formation of a fresh portion of sulphocyanuret of potassium. The whole is then boiled for a quarter of an hour, filtered to separate the precipitated iron, and evaporated that crystals may form. These are purified from carbonate of potassa by being dissolved in alcohol, which takes up the sulphocyanuret and leaves the carbonate. The alcoholic solution is then allowed to crystallize. Sulphocyanuret of potassium is in long, striated, anhydrous prisms, deliquescent in a moist atmosphere, very soluble in alcohol, and having a cooling, somewhat biting taste. It has been proposed as a medicine by Sœmmering, as a substitute for hydrocyanic acid and cyanuret of potassium, on the ground that it possesses the same therapeutic properties, without their inconveniences.

SULPHURET OF CALCIUM. *Calcii Sulphuretum. Hydrosulphate of Lime.* This compound is formed by passing sulphuretted hydrogen, so long as it is absorbed, through water holding lime in suspension. It is in the form of a paste of a greenish-gray colour, and exhaling a strong odour of sulphuretted hydrogen. It is used as a *depilatory*, and is applied in a layer on the part which is to be deprived of hair. At the end of fifteen minutes it is removed with a wet sponge, which at the same time detaches the hairs. On account of this preparation giving out sulphuretted hydrogen, it must not be applied near the mouth or nose.

SUMBUL. *Jatamansi. Musk-root.* Under the name of sumbul or jatamansi, a root has long been used in India, Persia, and other parts of the East, as a perfume, as incense in religious ceremonies, and medicinally. It is the product of an unknown plant, supposed to be umbelliferous, and, from the character of the root, to grow in low wet places. The plant is said to inhabit no part of British India, but the regions to the North and East of it, as Nepaul, Bootan, Bucharia, &c. The root is taken northward to Russia, and reaches the rest of Europe through St. Petersburg. The physicians of Moscow and St. Petersburg were the first to employ it on the Continent of Europe; Dr. Granville first introduced it to the notice of the profession in Great Britain and this country. It has recently also been imported into England from India, whither it was brought from a great distance in the interior.

The medicine comes in transverse sections, from two to four inches in diameter, and from an inch to an inch and a half in length, with a dusky, light-brown wrinkled epidermis,

and an interior porous structure consisting of coarse, irregular, easily separable fibres. The fresh cut surface of a transverse section presents, within the epidermis, an exterior white and spotted layer, and an inner yellow substance which forms the greater part of the root. Examined by means of a microscope it exhibits translucent points which probably represent starch granules. Sumbul has a strong odour, very much resembling that of musk, which it retains even when long kept. The taste, at first feebly sweetish, becomes after a time bitterish and balsamic, but not disagreeable; and a strong aroma is developed under mastication, diffusing itself with a sensation of warmth through the mouth and throat, and rendering the breath fragrant. This effect, however, is much diminished by time. That brought from India differs somewhat from the Russian, being of closer texture, more dense and firm, and of a reddish tint. (*Am. Journ. of Pharm.*, xxiv. 174, from *Pharm. Journ.*)

The root has been analyzed by Reinsch and other German chemists, and found to contain volatile oil, two balsamic resins, one soluble in alcohol, the other in ether, wax, gum, starch, a bitter substance soluble in water and alcohol, a crystallizable acid which Reinsch proposes to call *sumbulic acid*, and saline matter. The musk-like odour seems to be connected with the balsamic resins, and probably depends on some principle associated with them not yet isolated. The volatile oil yielded by distillation has a taste like that of peppermint.

The virtues of the drug appear to be those of a nervous stimulant. It is used by the Russian physicians in low fevers of a typhous character, and in asthenic cases of dysentery and diarrhœa. It has also been employed by them with asserted success in malignant cholera. The authors, on the occasion of a visit in the summer of 1853 to St. Petersburg, were informed by Dr. Thielmann, physician to the Hospital of St. Peter and St. Paul, that he depended mainly on this remedy in the treatment of delirium tremens, having found it superior in its composing influence over that complaint even to opium. Dr. Granville recommends it in gastric spasm, hysteria, chlorosis, amenorrhœa, dysmenorrhœa, palsy of the limbs, epilepsy, and other nervous disorders. Its real value, however, is yet to be ascertained. It is given in substance, infusion, decoction, and alcoholic and ethereal tincture. There seems to be no great precision in relation to the dose; but it is inferrible from the accounts of the drug, that it may be used very much as we use valerian. The facts above stated are taken chiefly from a pamphlet by Dr. A. B. Granville, published in London, A. D. 1850.

SUPPOSITORIES. *Suppositoria.* These are solid bodies intended to be introduced into the rectum, with the view either of evacuating the bowels by irritating the mucous membrane of the rectum, or of producing a specific effect on the neighbouring parts, or on the system at large. They fulfil the same indications as enemata, and are sometimes preferable from the facility of their application, and, when the object is to produce the peculiar effect of a medicine, from the smallness of their bulk, which facilitates retention. Their form may be cylindrical, conical, or spherical; the last being preferable when the bulk is small. They should be of such a consistence as to retain their shape, but so soft as to incur no risk of wounding the rectum. For laxative purposes the suppository may be from one to three inches long, and about as thick as a common candle. Soap is not unfrequently employed for this purpose. A piece of solidified molasses (molasses candy) is sometimes preferred. To increase the purgative effect, and at the same time act on the uterine function, aloes may be added to the soap. Mr. A. B. Taylor, of Philadelphia, recommends *cocoa butter* as the best excipient for solids administered by the rectum, having more exactly the requisite degree of consistence and fusibility than any combination of suet, spermaceti, wax, &c., that could be employed. (*Am. Journ. of Pharm.*, xxiv. 211.) Opium, or some one of its preparations, is very advantageously administered in the form of a suppository, in cases of irritation of the rectum, urinary passages, or genital apparatus. The other narcotics may be used in the same way; and indeed any other medicine, in reference to its effects on the system, provided the quantity be not too large, and the local effects not too irritant. The dose may in general be three times that of the medicine given by the mouth.

SWIETENIA FEBRIFUGA. A large tree growing in the East Indies. The bark is the part employed. It is smooth and red internally, rough and gray on the outer surface, of a feeble aromatic odour, and an astringent bitter taste. Water extracts its virtues by infusion or decoction. It is said to have been much used in India as a substitute for Peruvian bark, to which it is somewhat analogous in medical properties. The dose of the powder is from thirty grains to half a drachm. The watery extract has the virtues of the bark.

The *Swietenia Mahagoni* or *mahogany tree*, which grows in the West Indies and other parts of tropical America, has also a bitter astringent bark, which resembles that of the

S. febrifuga in virtues as well as in sensible properties. The wood of this tree is the mahogany so much used in ornamental wood-work. The bark of *S. Senegalensis* is used on the coast of Africa in the cure of intermittents; and M. Caventou has extracted an alkali from it, which has been suggested as a cheap substitute for quinia. (See *Am. Journ. of Med. Sci.*, N. S., xx. 168.)

SYMPHYTUM OFFICINALE. *Comfrey.* A perennial European plant, cultivated in our gardens for medical use. Its root, which is the part used, is spindle-shaped, branched, often more than an inch thick and a foot long, externally smooth and blackish, internally white, fleshy, and juicy. By drying it becomes wrinkled, of a firm horny consistence, and of a dark colour within. It is almost inodorous, and has a mucilaginous, feebly astringent taste. Among its constituents are mucilage in great abundance, and a small quantity of tannin. It was formerly highly esteemed as a vulnerary, but has lost its credit in this respect. Its virtues are chiefly those of a demulcent, and it may be advantageously used for all the purposes to which the marshmallow is applied. It is a very common ingredient in the domestic cough mixtures, employed in chronic catarrh, consumption, and other pectoral affections. The most convenient form of administration is that of decoction, which may be made either from the fresh or dried root. According to Lewis, comfrey root yields to water a larger proportion of mucilage than the root of Althæa.

SYRINGA VULGARIS. *Common Lilac.* The leaves and fruit of this common garden plant have a bitter and somewhat acrid taste, and have been used as a tonic and febrifuge. In some parts of France, they are said to be employed habitually by the country people in the cure of intermittent fever; and they were recommended by Cruveilhier in the treatment of that complaint. The fruit was examined by MM. Petroz and Robinet, who found a sweet and a bitter principle. The latter was afterwards obtained pure by M. Meillet, who gave it the name of *lilacin*. The green capsules, which yield it in largest proportion, are boiled in water, the decoction is concentrated, subacetate of lead is added, the liquor is evaporated to the consistence of syrup, magnesia is added in excess, and the whole is evaporated to dryness. The residuum is powdered, digested in water at 90° or 100°, and then treated with boiling alcohol and animal charcoal. The alcoholic solution, being filtered and concentrated, yields lilacin upon cooling. This principle, though not alkaline, is thought by M. Meillet to exist in the fruit combined with malic acid. It is crystallizable, bitter, and insoluble in water. (*Am. Journ. of Pharm.*, xiv. 139, from *Journ. de Pharm.*)

TACAMAHAC. *Tacamahaca.* The resinous substance, commonly known by this name, is supposed to be derived from the *Fagara octandra* of Linn. (*Elaphrium tomentosum*, Jacq., *Amyris tomentosum*, Spreng.), a tree of considerable size, growing in the island of Curaçoa, and in Venezuela. The juice exudes spontaneously, and hardens on exposure. As brought into the market, it is in irregularly shaped pieces of various sizes, some not larger than a mustard seed, others as much as an inch or two inches in diameter. The colour is usually light-yellowish or reddish-brown; but in the larger masses is more or less diversified. The pieces are in general translucent, though frequently covered with powder upon their surface, so as to render them apparently opaque. They are heavier than water, brittle, and pulverizable, yielding a pale-yellow powder. Their odour is resinous and agreeable, their taste bitter, balsamic, and somewhat acrid. Exposed to heat they melt and exhale a stronger odour. Tacamahac is partially soluble in alcohol, and completely so in ether and the fixed oils. It consists of resin with a little volatile oil.

Another variety is obtained from the E. Indies, and called *tacamahaca orientale*, or *tacamahaca in testis*. It is supposed to be derived from the *Calophyllum Inophyllum*, and comes into the market in gourd-shells covered with rush leaves. It is of a pale-yellow colour inclining to green, slightly translucent, soft and adhesive, of an agreeable odour, and an aromatic bitterish taste. It is at present very rare in commerce.

Guibourt describes several other varieties of tacamahac, which, however, are little known. Among them is a soft, adhesive, dark-green resin, said to be procured from the *Calophyllum Tacamahaca*, growing in the islands of Bourbon and Madagascar.

Tacamahac was formerly highly esteemed as an internal remedy, but is now employed medicinally only in the composition of ointments and plasters, and little even for this purpose. Its properties are analogous to those of the turpentines. It is sometimes used as incense.

TANNATE OF ALUMINA. *Aluminæ Tannas.* Mr. Rogers Harrison, of London, has employed an aqueous solution of a substance which he calls by this name, as an injection in gonorrhœa, after the acute symptoms have passed. He makes it of such a strength as always to produce smarting. The substance is described to be in crystals, about the size of those of coarse sugar, of a dirty-yellowish colour, and readily soluble in hot water. (*Lond. Med. Gaz.*, xiii. 853.) It is not easy to conjecture what is the substance employed

by Mr. Harrison. Tannate of alumina is nearly insoluble in water. Prof. Procter, of Philadelphia, tried to make a soluble tannate of this earth, but without success; and from the description of the substance used by Mr Harrison, he is inclined to the opinion that it was a mixture of tannic acid and alum. (See *Am. Journ. of Pharm.*, Jan. 1853, p. 25.)

TANNATE OF IRON. *Ferri Tannas.* This salt is prepared by dissolving 44 parts of precipitated subcarbonate of iron, moderately dried, in a boiling solution of 9 parts of pure tannic acid, evaporating the solution at the temperature of 176°, in a porcelain vessel, until it becomes thick, pouring it out on a glass or porcelain plate, and drying it with a gentle heat. As thus obtained, tannate of iron is in flat pieces, of a crimson colour, without taste, and insoluble in water. It acts as an astringent and tonic, and may be given in chlorosis, in the dose of from eight to thirty grains, in the course of a day, made into pills. *Ink* is an aqueous solution of the tanno-gallate of iron and probably possesses similar medical properties. It is a popular and efficacious application to ringworm.

TANNATE OF LEAD. *Plumbi Tannas.* This is obtained by precipitating a concentrated infusion of oak bark with acetate of lead, added drop by drop. It has been used as an external application with success by Dr. Fantonetti in two cases of white swelling of the knee-joint. He employed it at first mixed with a third of its weight of lard, and afterwards pure, the fresh precipitate admitting of application as an ointment. Autenrieth recommends it as a dressing to gangrenous sores. With this intention, the precipitate, either uncombined, or mixed in its dry state with simple ointment in the proportion of two drachms to the ounce, may be spread on linen, and applied to the sore. The preparation here referred to is a bitannate. Other tannates of lead exist.

TARTRATE OF SODA. *Sodæ Tartras.* This salt, in crystals, has been recommended by M. Delioux as an agreeable purgative, almost without taste, and acting with power equal to that of the sulphate of magnesia, in the dose of ten drachms. The *soda powders*, so much used in the United States, form an extemporaneous tartrate of soda, somewhat aërated with carbonic acid. (See *page* 1164.)

TEA. The plant which furnishes tea—*Thea Chinensis*—is an evergreen shrub, belonging to the class and order Monadelphia Polyandria of the sexual system (Polyandria Monogynia, *Linn.*), and to the natural order Ternstromiaceæ. It is usually from four to eight feet high, though capable, in a favourable situation, of attaining the height of thirty feet. It has numerous alternate branches, furnished with elliptical-oblong or lanceolate, pointed leaves, which are serrate, except at the base, smooth on both sides, green, shining, marked with one rib and many transverse veins, and supported alternately upon short footstalks. They are two or three inches long, and from half an inch to an inch in breadth. The flowers are either solitary, or supported two or three together at the axils of the leaves. They are of considerable size, not unlike those of the myrtle in appearance, consisting of a short green calyx with five or six lobes, of a corolla with from four to nine large unequal snow-white petals, of numerous stamens with yellow anthers and connected at their base, and of a pistil with a three-parted style. The fruit is a three-celled and three-seeded capsule. It has not been certainly determined whether more than one species of the tea plant exists. Linnæus admitted two species—*T. Bohea* and *T. viridis*—differing in the number of their petals: but this ground of distinction is untenable, as the petals are known to vary very much in the same plant. Hayne makes three species—*T. stricta*, *T. Bohea*, and *T. viridis*—which are distinguished severally by the shape of their leaves and fruit, and the direction of the footstalk. De Candolle admits but one species, with two varieties—the *viridis* or green tea, with "lanceolate flat leaves, three times as long as they are broad," and the *Bohea*, with "elliptical oblong, subrugose leaves, twice as long as broad." Lindley recognises the two Linnean species, distinguishing them by the leaves, which in *T. viridis* are acuminate and emarginate at the apex, and in *T. Bohea* are smaller, flatter, darker green, with small serratures, and terminate gradually in a point, but are not at all acuminate or emarginate. (*Flora Medica*, 120.)

The tea-plant is a native of China and Japan, and is cultivated in both countries, but most abundantly in the former. In Japan it forms hedgerows around the rice and corn-fields; in China, whence immense quantities of tea are exported, whole fields are devoted to its culture. It is propagated from the seeds, which are planted in holes at certain distances, six or eight seeds being placed in each hole, in order to ensure the growth of one. In three years the plant yields leaves for collection, and in six attains the height of a man. When from seven to ten years old it is cut down, in order that the numerous shoots which issue from the stump may afford a large product of leaves. These are picked separately by the hand. Three harvests, according to Kœmpfer, are usually made during the year; the first at the end of February, the second at the beginning of April, and the third in June. As the youngest leaves are the best, the product of the first collection is most valuable, while that of the third, consisting of the oldest leaves, is comparatively little

esteemed. Sometimes only one or two harvests are made; but care is always taken to assort the leaves according to their age; and thus originate numerous commercial varieties of tea. The character of the plant, dependent upon the soil, situation, climate, and culture, has also a great influence upon the value of the leaves. It is said that the best tea is procured from the shrubs which grow upon the sides of steep hills with a Southern exposure. Though the plant grows both about Pekin in the North and Canton in the South of China, it is said to attain greater perfection in the intermediate country, in the neighbourhood of Nankin, for instance, where the climate is neither so cold as in the first-mentioned vicinity, nor so hot as in the second. Some of the commercial varieties have their origin in this cause; and it is not improbable, though the fact has not been ascertained, that difference in species may be another source of diversity. After having been gathered, the leaves are dried by artificial heat in shallow iron pans, from which they are removed while still hot, and rolled with the fingers, or in the palm of the hand, so as to be brought into the form in which they are found in commerce. It is stated that the odour of the tea leaves themselves is very slight; and that it is customary to mix with them the leaves of certain aromatic plants, such as *Olea fragrans* and *Camellia Sasanqua*, in order to render them pleasant to the smell. The cultivation of tea has been successfully introduced into Brazil. (*Journ. de Pharm. et de Chim.*, xix. 276.)

Tea is brought to this country from Canton and other ports of China. Numerous varieties exist in commerce, differing in the shape communicated by rolling, in colour, in flavour, or in strength; but they may all be arranged in the two divisions of *green* and *black teas*, which, at least in their extremes, differ so much in properties, that it is difficult to conceive that they are derived from the same species.

Properties. *Green tea* is characterized by a dark-green colour, sometimes inclining more or less to blue or brown. It has a peculiar, refreshing, somewhat aromatic odour, and an astringent, slightly pungent, and agreeably bitterish taste. Its infusion has a pale greenish-yellow colour, with the odour and taste of the leaves. According to Mr. Warington, who examined numerous varieties of tea carefully both by the microscope and chemical tests, many of the green teas imported into Great Britain owe their colour to a powdery coating, consisting of sulphate of lime and Prussian blue, others to a mixture of these with a yellowish vegetable substance, and others, again, to sulphate of lime alone. (*Pharm. Journ. and Trans.*, iv. 37.) *Black tea* is distinguished by a dark-brown colour. It is usually less firmly rolled, and lighter than the green, and contains the petioles of the plant mingled with the leaves. Its odour is fainter, and of a somewhat different character, though still fragrant. Its taste, like that of green tea, is astringent and bitterish; but it is less pungent, and to many persons less agreeable. To hot water it imparts a brown colour, with its sensible properties of taste and smell. These vary exceedingly in strength in the different varieties; and some black teas are almost wholly destitute of aromatic or agreeable flavour. According to Mr. Warrington, the difference between green and black tea, so far as concerns their chemical and physical condition, arises from a species of fermentation which the latter is made to undergo, in its preparation, before being roasted. (*Pharm. Journ. and Trans.*, x. 618.) A sophisticated tea is largely exported from China, consisting of powdered tea mixed with sand and other earth, and agglutinated with gum; that which is to pass for black being coloured with plumbago, and the green with the coating above referred to. On analysis, these teas were found to afford from 35 to 45 per cent. of ashes, while the genuine yield only 5 per cent. They may be detected by not unfolding when steeped in boiling water. (*Ibid.*)

Analyzed by G. J. Mulder, 100 parts of green Chinese tea afforded 0·79 of volatile oil, 2·22 of chlorophylle, 0·28 of wax, 2·22 of resin, 8·56 of gum, 17·80 of tannic acid of the variety contained in galls, 0·43 of thein, 22·80 of extractive, traces of apotheme, 23·60 of muriatic extract, 3·00 of albumen, 17·68 of lignin, and 5·56 of salts. The muriatic extract was the matter taken up by diluted muriatic acid from tea, previously exhausted successively by ether, alcohol, and water, and consisted of artificial tannin. The same chemist obtained from 100 parts of black Chinese tea 0·60 of volatile oil, 1·84 of chlorophylle, 3·64 of resin, 7·28 of gum, 12·88 of tannic acid, 0·46 of thein, 19·88 of extractive, 1·48 of apotheme, 19·12 of muriatic extract, 2·80 of albumen, 28·32 of lignin, and 5·24 of salts. (*Annal. der Pharm.*, xxviii. 317.) Dr. Rochleder has found also a peculiar acid, which he calls *boheic acid*. M. Eug. Peligot obtained a much larger proportion of thein than was found by Mulder, the lowest quantity from green tea being 2·4 per cent. and the highest 4·1 per cent.; but even this quantity is too small to represent all the nitrogen contained in tea. (*Journ. de Pharm.*, 3*e sér.*, iv. 224.) The volatile oil is probably one of the principles upon which the effects of tea upon the nervous system depend. Hence old teas are less energetic than those recently imported; and it is said that the fresh leaves have often produced dangerous effects in China. Nevertheless, the tannic acid is not without influence upon the system; and it is not improbable that both the extractive

and thein contribute to the peculiar influence of this valuable product. Of these active ingredients, the volatile oil, tannic acid, and extractive are found most largely, according to the analysis of Mulder, in the green tea. *Thein* is a crystallizable principle discovered by Oudry. It was afterwards proved by Jobst to have the same composition as caffein, and is now generally considered as in all respects identical with that principle. It is also said to exist in the leaves of the Ilex Paraguaiensis or Paraguay tea, and in the seeds of Paullinia sorbilis. (See *Coffee*, *Ilex*, and *Paullinia.*) According to Mulder, thein exists in tea combined with tannic acid. Peligot obtained it by adding to a hot infusion of tea, first subacetate of lead, and then ammonia, filtering the liquid, passing sulphuretted hydrogen through it, again filtering, and evaporating with a moderate heat. On cooling, the liquid deposits thein abundantly, and yields an additional quantity by a careful evaporation. (*Journ. de Pharm.*, 3e *sér.*, iv. 224.) It may be cheaply prepared by putting some old spoiled tea in an iron pot covered with filtering paper, enclosing the whole in a cylindrical paper cap, and cautiously applying heat. Thein rises in vapour and condenses on the paper. (See *Chem. Gaz.*, No. 178, p. 119.) Thein has a feebly bitter taste; in the state of crystals, is dissolved by 93 parts of water, 158 of alcohol, and 298 of ether; melts at about 350° F., and at 723° sublimes in white vapours which condense in minute needles. From its watery solution scarcely any reagent precipitates it. Infusion of galls causes a deposit of tannate of thein, which is again, however, dissolved by heating the water.

Medical Properties and Uses. Tea is astringent and gently excitant, and in its finer varieties exerts a decided influence over the nervous system, evinced by the feelings of comfort and even exhilaration which it produces, and the unnatural wakefulness to which it gives rise, when taken in unusual quantities, or by those unaccustomed to its use. Its properties, however, are not of so decided a character as to render it capable of very extensive application as a medicine; and its almost exclusive use is as a grateful beverage at the evening and morning meals. Taken moderately, and by healthy individuals, it may be considered as perfectly harmless; but long continued in excessive quantity, it is capable of inducing unpleasant nervous and dyspeptic symptoms, the necessary consequences of over-excitement of the brain and stomach. Green tea is decidedly more injurious in these respects than black, and should be avoided by dyspeptic individuals, and by those whose nervous systems are peculiarly excitable. As a medicine, tea may sometimes be given advantageously in diarrhœa; and a strong infusion will often be found to relieve nervous headache. The mode of preparing it for use is too well known to require description. An extract is made from it in China, which is said to be useful in fevers.

TELLURIUM. Several of the combinations of this metal have been tried on the living organism by M. Hansen. Five grains of the *tellurite of potassa*, given to dogs, produced stupefaction and vomiting, and the garlic-like odour of tellurium in the breath. The same salt, tried upon himself for seven successive days, in a dose daily of half a grain, afterwards increased to a grain, caused drowsiness at first, followed, after the seventh day, by a sense of oppression in the cardiac region, nausea, an increased flow of saliva, and loss of appetite. The breath had a garlic-like odour throughout the experiment. (*Chem. Gaz.*, March 1, 1854, p. 90.)

TEUCRIUM CHAMÆDRYS. *Germander. Chamædrys.* A small, didynamous, labiate, perennial European plant, the leaves and tops of which have an agreeable aromatic odour, diminished by drying, and a bitter, somewhat astringent, aromatic, durable taste. They have been employed as a mild corroborant, in uterine, rheumatic, gouty, and scrofulous affections, and intermittent fevers; but are at present little used, and never in this country. Germander was an ingredient in the *Portland powder*, noted as a remedy in gout. This powder, according to the original prescription, consisted of equal parts of the roots of *Aristolochia rotunda* and *Gentiana lutea*, of the tops and leaves of *Teucrium Chamædrys* and *Erythræa Centaurium*, and of the leaves of *Ajuga Chamæpytis*, or *ground pine*. The dose was a drachm taken every morning before breakfast, and continued for three months, then two scruples for three months, afterwards half a drachm for six months, and finally half a drachm every other day for a year. (*Parr.*)

Two other species of Teucrium have been used in medicine—*T. Marum*, *cat thyme*, or *Syrian herb mastich*, which is a native of the South of Europe, and *T. Scordium*, or *water germander*, growing in the higher latitudes of the same continent. The former is a warm, stimulating, aromatic bitter, and has been recommended in hysteria, amenorrhœa, and nervous debility; the latter has the odour of garlic, and a bitter, somewhat pungent taste, and was formerly highly esteemed as a corroborant in low forms of disease; but neither of them is now much employed. *T. Marum* is errhine, and was formerly an ingredient in the *Pulvis Asari Compositus*. The dose of either of the three species is about half a drachm. A plant said to have been used advantageously in cholera in the Levant, a specimen of which was sent to Paris, proved to be *Teucrium Polium*. (*Journ. de Pharm. et de Chim.*, xv. 352.)

THUJA OCCIDENTALIS. *Arbor Vitæ.* An indigenous evergreen tree, growing wild from Canada to Carolina, and cultivated for ornament in gardens. The leaves, or small twigs invested with the leaves, are the part used. They have an agreeable balsamic odour, especially when rubbed, and a strong, balsamic, camphorous, bitter taste. In the state of decoction, they have been used in intermittent fever, and, according to Schoepf, in coughs, fevers, scurvy, and rheumatism. Made into an ointment with lard or other animal fat, they are said to form a useful local application in rheumatic complaints. The distilled water is praised by Boerhaave as a remedy in dropsy. (*Schoepf.*) A yellowish-green volatile oil, which may be obtained from the leaves by distillation, has been used with success in worms.

THYMUS VULGARIS. *Thyme.* A small, well known undershrub, indigenous in the South of Europe, and with us cultivated in gardens. The herbaceous portion, which should be gathered when the plant is in flower, has a peculiar, strong, aromatic, agreeable odour, which is not lost by drying, and a pungent, aromatic, camphorous taste. Its active constituent is a volatile oil, which may be separated by distillation. Oil of thyme (*oleum thymi*) is, when fresh, of a pale-yellow or greenish colour, but as found in the shops is often brown. Its sp. gr. is 0·905. It is said to be commonly sold under the name of oil of origanum. The plant has the aromatic properties of sage, lavender, &c., and may be used for the same purposes. It is, however, more employed in cookery than in medicine. The *T. serpillum*, or *wild thyme* of Europe, is analogous in properties to the garden thyme. Both are occasionally used in baths, fomentations, and poultices, along with other aromatic herbs.

TONKA BEAN. The seed of *Dipterix odorata* of Willd., the *Coumarouna odorata* of Aublet, a large tree growing in Guiana. The fruit is an oblong-ovate pod, enclosing a single seed, from an inch to an inch and a half long, from two to four lines broad, usually somewhat compressed, with a dark-brown, wrinkled, shining, thin, and brittle skin, and a light-brown, oily kernel. The bean has a strong, agreeable, aromatic odour, and a bitterish, aromatic taste. Its active constituent is a crystallizable, odorous substance, analogous to the volatile oils and camphor, and called *coumarin* by Guibourt. This substance is sometimes found in a crystalline state, between the two lobes of the kernel. It has been shown by M. Bleibtreu to be identical with the odorous principle of *Asperula odorata*, *Trifolium melilotus*, and *Anthoxanthum odoratum*. (See *Chem. Gaz.*, Feb. 16, 1852, p. 61.) The tonka bean is used to flavour snuff, being either mixed with it in the state of powder, or put entire into the snuff-box.

TRIGONELLA FŒNUMGRÆCUM. *Fenugreek.* An annual plant growing spontaneously in different parts of the South of Europe, and cultivated in France and Germany for the sake of its seeds. These are one or two lines in length, oblong-cylindrical, somewhat compressed, obliquely truncated at each extremity, brownish-yellow externally, yellow internally, and marked with an oblique furrow running half their length. They have a strong peculiar odour, and an oily, bitterish, farinaceous taste, and contain fixed and volatile oil, mucilage, bitter extractive, and a yellow colouring substance. An ounce of the seeds boiled in a pint of water render it thick and slimy. They yield the whole of their odour and taste to alcohol. Their virtues depend chiefly upon their oil and mucilage. On the continent of Europe they are employed in the preparation of emollient cataplasms and enemata, and enter into the composition of some officinal ointments and plasters. They are never used internally.

TRILLIUM. This is an indigenous genus of pretty little herbaceous plants, growing generally in woods and shady places. The roots are reputed to possess valuable remedial properties. They were employed by the aborigines, have been long used in domestic practice in some parts of the country, and were noticed as medicinal in Henry's Herbal, published in 1812. Dr. S. W. Williams published a paper upon them in the *New England Journ. of Med. and Surg.*, in the year 1820, and has since published another in the *N. Y. Journ. of Med.* (viii. 94). The roots have a somewhat balsamic odour and taste, and produce, when chewed, a sense of heat and irritation, with an increased flow of saliva. They are thought to be astringent; and tonic, expectorant, and alterative properties have been ascribed to them. They have been used by the vulgar to hasten parturition. The complaints in which they are said to have been employed most successfully are the hemorrhages; but they have been used also in cutaneous affections, and externally in obstinate ulcers. Dr. Williams gives a drachm of the powdered root three times a day. Of the different species, the *T. erectum* is generally esteemed most active; though little is known of their relative value.

TRIPOLI. *Terra Tripolitana.* An earthy mineral, of a whitish, yellowish, or pale straw colour, sometimes inclining to red or brown, usually friable, often adhesive to the tongue, and presenting the aspect of argillaceous earth, though differing from clay by the rough-

ness and hardness of its particles, and by not forming a paste with water. The *Venice tripoli* is said to come from Corfu. Tripoli is sometimes artificially prepared by calcining certain argillites. It is used for cleaning and polishing metals.

TRITICUM REPENS. *Couch-grass. Dog-grass. Quickens.* A perennial European plant, very common in gardens, and cultivated grounds, where it is considered a troublesome weed. The root, which is the part medically used, is horizontal, creeping, jointed, about as thick as a straw or thicker, inodorous, and of an agreeable, sweetish, slightly pungent taste. It is used in some parts of Europe, in the form of decoction, as a slightly aperient and nutritive drink. Great quantities of it are said to be consumed in the hospitals of Paris. The decoction, in consequence of the sugar which it contains, is susceptible of the vinous fermentation.

TUSSILAGO FARFARA. *Coltsfoot.* Coltsfoot is a perennial herb, with a creeping root, which early in the spring sends up several leafless, erect, simple, unifloral scapes or flower-stems, five or six inches high, and bearing appressed scale-like bractes of a brownish-pink colour. The flower, which stands singly at the end of the scape, is large, yellow, compound, with hermaphrodite florets in the disk, and female florets in the ray. The latter are numerous, linear, and twice the length of the former. The leaves do not make their appearance until after the flowers have blown. They are radical, petiolate, large, cordate, angular, and toothed at the margin, bright-green upon their upper surface, white and downy beneath. The plant grows spontaneously both in Europe and North America. In this country it is found upon the banks of streams in the Middle and Northern States, and flowers in April. The whole of it is employed, but the leaves most so. They should be gathered after their full expansion, but before they have attained their greatest magnitude. The flowers have an agreeable odour, which they retain after desiccation. The dried root and leaves are inodorous, but have a rough, bitterish, mucilaginous taste. Boiling water extracts all their virtues. Coltsfoot exercises little sensible influence upon the human system. It is, however, demulcent, and is sometimes used in chronic coughs, consumption, and other affections of the lungs. The expectorant properties which it was formerly thought to possess are not obvious. The leaves were smoked by the ancients in pulmonary complaints; and in some parts of Germany they are at the present time said to be substituted for tobacco. Cullen states that he found the expressed juice of the fresh leaves, taken to the extent of some ounces every day, beneficial in several cases of scrofulous sores; and a decoction of the dried leaves, as recommended by Fuller, answered a similar purpose, though it often failed to effect a cure.

The usual form of administration is that of decoction. An ounce or two of the plant may be boiled in two pints of water to a pint, of which a teacupful may be given several times a day.

TUTTY. *Tutia. Impure Oxide of Zinc.* This oxide is formed during the smelting of lead ores containing zinc. It is deposited in the chimneys of the furnaces, in the form of incrustations, moderately hard and heavy, and studded over with small protuberances, of a brownish colour on the outside, and yellowish within. As it occurs in commerce, the pieces occasionally present a bluish cast, from the presence of small particles of metallic zinc. Sometimes a spurious substance is sold for tutty, consisting of a mixture of blue clay and copper filings, made into a paste with water, and dried on an iron rod. It is distinguished from the genuine tutty by its diffusing in water and exhaling an earthy smell, and by its greater friability.

Tutty is used as an external application only, being employed as a desiccant in excoriations. To fit it for medical use it must be reduced to fine powder, which is dusted on the affected part, or applied in the form of ointment. It has been very properly dismissed from the Edinburgh officinal list; its use being superseded by that of the pure oxide.

ULTRAMARINE. This fine blue pigment was formerly obtained from *lapis lazuli* or *lazulite*, a mineral of Siberia. It is now prepared artificially by mixing equal parts of sulphur, carbonate of soda, and silica, adding enough solution of soda to dissolve the silica, and rapidly igniting the mixture. A bluish-green mass results, which becomes blue by ignition in contact with air. It is thought to be a compound of the silicates of alumina and soda with sulphuret of sodium. (*Pharm. Journ. and Trans.*, xi. 230.)

UMBER. *Terra Umbria.* A mineral of a fine compact texture, light, dry to the touch, shining when rubbed by the nail, and of a fine pale-brown colour, which changes to a peculiar beautiful deep-brown by heat. According to Klaproth, it contains 13 parts of silica, 5 of alumina, 48 of oxide of iron, 20 of manganese, and 14 of water in 100. *Burnt umber*, as well as the mineral in its unaltered state, is used in painting. The umber of commerce is said to be brought chiefly from the island of Cyprus.

URATE OF AMMONIA. *Ammoniæ Uras.* ($NH_4O,N_4C_{10}H_2O_4+HO$.) This salt may be formed by digesting uric acid in solution of ammonia. Uric acid is generally obtained from

the dried and powdered excrement of the boa serpent, and of other large snakes, by dissolving it in a solution of potassa with the aid of heat, and precipitating the uric acid from the filtered solution by muriatic acid, added in excess. Urate of ammonia is a white, amorphous, very sparingly soluble salt. It is a constituent of some varieties of guano; and the medicinal properties of that substance are attributed by some to its presence. This salt has been used with good effects by Dr. Bauer, of Germany, as an external application, in the form of ointment, in chronic cutaneous eruptions, and in tubercular diseases of the lungs. The ointment is made of a scruple of the salt to an ounce of lard, and is applied to the eruptions night and morning, and, in the pectoral disease, by friction, night and morning, alternately to the back and front of the chest. (*Medico-Chirurg. Review*, July, 1852, p. 207, from *Buchner's Repert.*)

UREA. ($N_2C_2H_4O_2$.) This substance, the characteristic organic constituent of urine, is identical with the hydrated cyanate of ammonia (NH_3,NC_2O+HO), which salt is the first example of an organic product artificially formed. When obtained from urine, the most convenient process is that proposed by Dr. Gregory, which consists in saturating concentrated urine with oxalic acid, dissolving in water the oxalate of urea formed, decolorizing the solution with animal charcoal, digesting it with carbonate of lime, separating the precipitated oxalate of lime by filtration, and concentrating the filtrate that crystals may form. For the mode of obtaining artificial urea, the reader is referred to chemical treatises.

Urea is in the form of silvery acicular crystals, colourless and free from odour when pure, somewhat resembling nitre in appearance, and having a similar saline, cooling taste. It is soluble in its weight of cold water, and in every proportion in hot water. Though neither acid nor alkaline in its reaction, yet it is capable of uniting with several acids, forming crystallizable compounds like salt. This substance was proposed many years ago by the French physicians as a diuretic; and its use in this way has been revived by Dr. T. H. Tanner, of London. In the few cases in which Dr. Tanner tried the remedy, it acted as a powerful diuretic, without giving rise to any unpleasant symptom whatever. The dose to begin with is ten grains every six hours, dissolved in water, flavoured with syrup; the action of the medicine being aided by the free administration of diluents, and by keeping the skin moderately cool. (See *Braithwaite's Retrospect*, xxv. 161.)

URTICA DIOICA. *Common nettle.* A well known perennial herbaceous plant, growing both in Europe and the United States, by the roadsides, in hedges, and gardens. The leaves, seeds, and roots were formerly officinal. They were deemed diuretic and astringent, and were employed in nephritic complaints, hemorrhages, consumption, jaundice, worms, &c. The young shoots are boiled and eaten by the common people as a remedy in scurvy; and the fresh plant is sometimes used to excite external irritation in cases of torpor and local palsy, the part being beaten with it till the requisite degree of action is produced. The irritant effect of the nettle, applied to the skin, is said to be owing to the presence of free formic acid in the sharp hairs. (See *Am. Journ. of Pharm.*, xxii. 181.) The *U. urens* or *dwarf nettle*, which is an annual plant, and smaller than the former species, has similar properties, and is used for the same purposes. This species also grows wild both in America and Europe. The two plants were formerly distinguished by the names of *urtica major*, applied to *U. dioica*, and of *urtica minor* to *U. urens*. Dr. U. B. Johnson, of Marion, Alabama, has found the U. urens very efficacious in uterine hemorrhage. (*N. Orleans Med. and Surg. Journ.*, vi. 452.)

VALERIANATE OF BISMUTH. *Bismuthi Valerianas.* This salt is formed by double decomposition between solutions of nitrate of bismuth and valerianate of soda. Valerianate of bismuth precipitates as a white powder, which is washed with water, and dried by a gentle heat. It has been recommended by Righini in neuralgia and painful affections of the stomach. The dose is from half a grain to two grains, repeated several times a day, and given in the form of pill.

VANILLA. This has been supposed to be the fruit of *Vanilla aromatica* of Schwartz, the *Epidendrum Vanilla* of Linn., a climbing plant growing in the West Indies, Mexico, and South America. It is said also to be cultivated in the Isle of France and Bourbon. Doubts, however, exist whether the best commercial vanilla is derived from this species, and some ascribe it to the *Vanilla planifolia*. (*Journ. de Pharm. et de Chim.*, xvi. 274.) The pods are collected before they are quite ripe, dried in the shade, covered over with a coat of fixed oil, and then tied in bundles, which are surrounded with sheet lead, or inclosed in small metallic boxes, and sent into the market. Several varieties of vanilla exist in commerce. The most valuable, called *ley* by the Spaniards, consists of cylindrical, somewhat flattened pods, six or eight inches long, three or four lines thick, nearly straight, narrowing towards the extremities, bent at the base, shining and dark-brown externally, wrinkled longitudinally, soft and flexible, and containing within their tough shell, a soft black pulp, in which numerous minute, black, glossy seeds are embedded. It has a peculiar, strong,

agreeable odour, and a warm, aromatic, sweetish taste. The interior pulpy portion is most aromatic. Another variety, called *simarona* by the Spaniards, is smaller, of a lighter colour, and less aromatic. A third variety is the *promprona* of the Spaniards. In this, the pods are from five to seven inches long, from six to nine lines broad, almost always open, brown, soft, viscid, and of a strong odour, but less pleasant than that of the *ley*, to which it is considered inferior. According to Bucholz, vanilla does not yield volatile oil when distilled with water. It is employed to flavour chocolate, ice-cream, &c., and as a perfume. It has been recommended as a remedy in hysteria and low fevers, in the form of an infusion made in the proportion of about half an ounce to a pint of boiling water, and given in tablespoonful doses. Prof. Procter prepares a *fluid extract of vanilla* by the following process. An ounce of vanilla, cut transversely into short pieces, is rubbed with two ounces of granular sugar to coarse powder, and then submitted to percolation with deodorized alcohol, until a pint of tincture is obtained. This is evaporated with a gentle heat to one-half, twelve fluidounces of syrup are added, and the evaporation is continued until the liquid measures a pint, after which it is strained. Thus prepared it has the odour and taste of the vanilla in perfection.

VENETIAN RED. *Bolus Veneta.* A dull red ochrey substance used in painting.

VERBASCUM THAPSUS. *Mullein.* This is a biennial plant, with an erect, round, rigid, hairy stem, which rises from three to six feet in height, and is irregularly beset with large, sessile, oblong or oval, somewhat pointed leaves, indented at the margin, woolly on both sides, and decurrent at the base. The flowers are yellow, and disposed in a long, close, cylindrical, terminal spike.

The mullein is common throughout the United States, growing along the roadsides and in neglected fields, and springing up abundantly in newly cleared places, at the most remote distance from cultivation. It is, however, considered by many botanists as a naturalized plant, introduced originally from Europe, where it is also abundant. It flowers from June to August. The leaves and flowers have been employed. Both have a slight, somewhat narcotic smell, which in the dried flowers becomes agreeable. Their taste is mucilaginous, herbaceous, and bitterish, but very feeble. They impart their virtues to water by infusion. Mullein leaves are demulcent and emollient, and are thought to possess anodyne properties, which render them useful in pectoral complaints. On the Continent of Europe, an infusion of the flowers, strained in order to separate the rough hairs, is considerably used in mild catarrhs. Dr. Home found a decoction of the leaves useful in diarrhœa. The infusion or decoction may be prepared in the proportion of an ounce of the leaves to a pint of water, and given in the quantity of four fluidounces. The leaves are also employed externally, steeped in hot water, as a feebly anodyne emollient. An ointment is prepared from them in the recent state, and used for the same purposes. It may be made in the same manner as ointment of stramonium, by boiling the leaves in lard. It will be found advantageous to moisten them with water previously to the boiling.

VERBENA OFFICINALIS. *Vervain.* This is a common European weed, growing on the roadsides, in the vicinity of towns and villages. Its sensible properties do not indicate the possession of medical virtues; as it is nearly inodorous, and has only a slightly astringent bitterish taste. By the ancients it was highly esteemed both as a medicine, and as a sacred plant employed in certain religious rites. In modern times, superstitious notions in relation to its virtues are still entertained; and the suspension of the root around the neck by a white riband, has been gravely recommended for the cure of scrofula. The leaves, bruised and made into a cataplasm, are used by the vulgar as a remedy in severe headache, and other local pains. The plant, however, is probably inert. An American species, the *V. hastata*, is more bitter than the European, and is said to be emetic. It is not, however, used in regular practice. Schoepf states that the root of the *V. urticifolia*, another indigenous species, has been advantageously used in poisoning from the Rhus Toxicodendron. It is prepared by boiling it in milk and water along with the inner bark of the white oak.

VERDITER. Two preparations of copper, employed as pigments, are known by this name in commerce, and are distinguished by the epithets of blue and green. *Blue verditer* is prepared in London from the solution of nitrate of copper obtained in precipitating silver by copper. According to Gray, this solution is poured hot upon whiting (carbonate of lime), and the mixture stirred every day till the liquor loses its colour, when it is decanted, and fresh portions added till the proper colour is obtained. By a process for procuring this pigment, invented by Pelletier, the solution of nitrate of copper is decomposed by quicklime, and the precipitate, after being washed, is incorporated intimately with another portion of quicklime. By the former process, a carbonate of copper is obtained; by the latter, a mixture of the hydrated oxide of copper and hydrate of lime. *Green verditer* is prepared by precipitating a solution of nitrate of copper by chalk or a

white marl, and consists of carbonate of copper mixed with an excess of the calcareous carbonate.

VERONICA OFFICINALIS. *Speedwell.* Several species of Veronica, common to Europe and this country, have been medicinally employed. Of these the V. officinalis, and *V. Beccabunga* or *brooklime*, are the most conspicuous. *V. officinalis* has a bitterish, warm, and somewhat astringent taste; has been considered diaphoretic, diuretic, expectorant, tonic, &c.; and was formerly employed in pectoral and nephritic complaints, hemorrhages, and diseases of the skin, and in the treatment of wounds. The *beccabunga*, which is very succulent, was used in the fresh state with the view of purifying the blood, and as a remedy in scurvy. Both plants, however, are at present out of use.

VISCUM ALBUM. *Mistletoe.* A European evergreen parasitic shrub, growing on various trees, particularly the apple and other fruit trees, and forming a pendent bush from two to five feet in diameter. The plant is famous in the history of druidical superstition. In the religious rites of the Druids, the mistletoe of the oak was employed, and hence was afterwards preferred when the plant came to be used as a remedy; but it is in fact identical in all respects with those which grow upon other trees. The fresh bark and leaves have a peculiar disagreeable odour, and a nauseous, sweetish, slightly bitter taste. The berries, which are white, and of about the size of a pea, abound in a peculiar viscid principle, and are sometimes used in the preparation of bird-lime, of which this principle is the basis. At one time the mistletoe was highly esteemed as a remedy in epilepsy, palsy, and other nervous diseases; but it is now out of use. The leaves and wood were given in the dose of a drachm in substance, and of an ounce in decoction. Several species of Viscum grow in the United States, but are not used.

WHITING. This is essentially the same as prepared chalk, being made by the pulverization and elutriation of crude chalk. It is used as a coarse paint, and for various purposes in the arts, for which carbonate of lime is requisite. *Paris white* is a variety of the same material.

WOORARI. The name of a powerful poison, prepared by the aborigines in the interior of British Guiana, and used for arming the points of their weapons. Various opinions have been advanced in relation to its source and preparation; but the most probable account is that of Dr. Hancock, who states, from information derived from the natives, that it is a watery extract from the bark of a gourd-like plant. When this poison is inserted in a wound, the animal speedily falls into a state of stupor, and dies in a few minutes, the heart continuing to act for some time after respiration has ceased. If artificial respiration be resorted to before the heart has ceased to act, and be sustained, the animal recovers. Dr. Hancock states that it is swallowed by animals with impunity. It has not been introduced into medicine. For further notice in relation to it, the reader is referred to the *Lond. Pharm. Journ. and Trans.*, iii. 75.

WORMSEED, EUROPEAN. *Santonici Semen. Semen Cynæ. Semen Contra.* This product has been discarded from the Dublin Pharmacopœia of 1850. It was formerly ascribed in that work, in accordance with the general belief at one time, to *Artemisia Santonica* or *Tartarian Southernwood;* but upon insufficient grounds. European wormseed is of two kinds; one called the Aleppo, Alexandria, or Levant wormseed, the other Barbary wormseed. The former is supposed to be the product of *Artemisia Contra*, which grows in Persia, Asia Minor, and other parts of the East. It consists in fact not of the seeds, but of the small globular unexpanded flowers of the plant, mixed with their broken peduncles, and with minute, obtuse, smooth leaves. It has a greenish colour, a very strong aromatic odour increased by friction, and a very bitter disagreeable taste. The Barbary wormseed is thought by some to be derived from *Artemisia Judaica*, by others from the *A. glomerata* of Sieber, both of which grow in Palestine and Arabia. It consists of broken peduncles, having the calyx sometimes attached to their extremity. The calyx is also sometimes separate, consisting of very small linear obtuse leaflets. The flowers are wanting, or in the shape of minute globular buds. All these parts are covered with a whitish down, which serves to distinguish this variety from the wormseed of the Levant. It is, moreover, lighter and more coloured than the latter. Its smell and taste are the same.

These products contain a volatile oil and a resinous extractive matter, to which their virtues have been ascribed. A peculiar principle has also been discovered in them, which has received the name of *santonin*. It is crystallizable, colourless, tasteless, but leaving a slight sense of acrimony in the mouth, inodorous, soluble in ether and alcohol, and nearly insoluble in water. Its alcoholic solution has a decided bitterness. Though neuter in its action upon test-paper, it combines with the alkalies to form soluble and crystallizable salts. It may be obtained by treating wormseed with hydrate of lime and alcohol, evaporating the tincture to one-quarter, filtering the residue to separate the resin, and

treating it while hot with concentrated acetic acid. The santonin is deposited in crystals as the liquor cools. It is a powerful anthelmintic, and, from its want of taste, is much used in Europe in the treatment of worms in children. The dose is from one to four grains twice a day. It has also been employed with considerable asserted success in the treatment of intermittent fever. In over-doses it may prove dangerous. The case of a child of four years old is recorded, in which, after the administration of only three grains, severe abdominal pains came on with vomiting and purging, great prostration, cold sweats, spasms of the extremities, and dilated pupils; though the patient ultimately recovered. (*Ann. de Thérap.*, 1852, p. 218.) For details as to the mode of extracting santonin, the reader is referred to the *American Journal of Pharmacy* (vol. xv. p. 278). We have received a very handsome specimen of it from Messrs. Powers and Weightman, manufacturing chemists of Philadelphia.

The products above described have long been celebrated as a vermifuge, and the title of *semen contra*, by which they are designated in many works on pharmacy, originated in their anthelmintic property. They may be given in powder or infusion. The dose in substance is from ten to thirty grains, which should be repeated morning and evening for several days, and then followed by a brisk cathartic. They are not used in this country, having been superseded by the seeds of *Chenopodium anthelminticum*, which are universally known among us by the name of wormseed.

XANTHORRHŒA RESINS. Two resinous substances, the products of different species of Xanthorrhœa, have recently been introduced into England from New Holland. They are obtained by spontaneous exudation from the stems of the plants, which are usually shrubs. One of the resins is yellow and the other red. The *yellow variety* is in tears, in flattish pieces having on one side the mark of the stem, or in masses of various size and irregular shape. It has a reddish-yellow colour, resembling gamboge when broken, and when heated emits a fragrant odour like that of Tolu balsam. It contains resin, cinnamic and benzoic acids, and a trace of volatile oil, and may therefore be ranked among the balsams. When heated with nitric acid, it yields a large product of carbazotic acid. In medical properties it is said to bear a close resemblance to storax and the balsam of Tolu. A tincture, made in the proportion of two ounces to a pint of alcohol, may be given in the dose of one or two fluidrachms. The *red variety* resembles dragon's blood in colour, and appears to be analogous to the other variety in properties. The above account has been abridged from that of Dr. Pereira in the third edition of his Materia Medica.

ZEA MAYS. *Indian Corn. Maize.* Common Indian corn contains, according to the late Dr. Gorham, of Boston, 77 per cent. of starch, 3 of a principle analogous to gluten, called *zein*, 2·5 of albumen, 1·45 of sugar, 0·8 of extractive, 1·75 of gum, 1·5 of sulphate and phosphate of lime, 3 of lignin, and 9 of water. The meal, in the form of mush, makes an excellent emollient poultice, much used in hospitals; and a gruel may be prepared from it, which is sometimes more grateful to the sick than that made from oat meal.

ZEDOARY. *Radix Zedoariæ.* There are two kinds of zedoary, the long and the round, distinguished by the old officinal titles of *radix zedoariæ longæ*, and *radix zedoariæ rotundæ*; the former produced by the *Curcuma Zedoaria* of Roxburgh, the latter, as some suppose, by the *Kæmpferia rotunda* of Linn., but, according to others, by the *Curcuma Zerumbet* of Roxburgh. Both kinds come from the East Indies. The *long zedoary* is in slices, from an inch and a half to three inches in length, and from half an inch to an inch thick, obtuse at the extremities, and exhibiting the remains of the radical fibres; the *round* is also usually in slices, which are the sections of a roundish root, ending in a point beneath, and divided longitudinally into two parts, each of which is flat on one side, convex on the other, and heart-shaped in its outline. Sometimes the root of the latter variety is entire, and sometimes in quarters instead of halves. It is marked with circular rings on the convex surface, and, like the former, with small projecting points which are the remains of radical fibres. Both are grayish-white on the outside, yellowish-brown within, hard, compact, of an agreeable aromatic odour, and a bitterish, pungent, camphorous taste. The round, however, is less spicy than the long. They yield a volatile oil when distilled with water.

Zedoary is a warm, stimulating aromatic, useful in flatulent colic and debilitated states of the digestive organs. It is not now employed, as it produces no effects which cannot be as well or better obtained from ginger. The dose is from ten grains to half a drachm.

ZERUMBET. *Cassumuniar.* Under these names an East India root was formerly used, having some analogy in sensible and medical properties to ginger, and ascribed to the *Zingiber Zerumbet* of Roscoe. Some consider the cassumuniar as a distinct root, and refer it to the *Zingiber Cassumuniar* of Roxburgh. The difference of opinion is of little importance, as neither of the roots, supposing them not to be the same, is at present to be found in the markets. By some authors the zerumbet has been erroneously confounded with

the round zedoary. Geiger describes it as in pieces of the size of a fig or larger, externally grayish-brown and wrinkled, internally yellowish, hard and tough, of a biting aromatic taste, and a spicy odour.

ZIZYPHUS VULGARIS. Lamarck. *Rhamnus Zizyphus.* Linn. A shrub, or small tree, growing on the shores of the Mediterranean, and cultivated in Italy, Spain, and the South of France. The fruit is the part used. This consists of oval drupes, of the size of a large olive, with a thin, coriaceous, red or reddish-brown skin, a yellowish, sweet, acidulous pulp, and an oblong pointed stone in the centre. These have the officinal name of *jujubæ.* By drying, their pulp becomes softer and sweeter, and acquires a vinous taste, evincing the commencement of fermentation. They are nutritive and demulcent, and are used in the form of decoction in pectoral complaints. *Jujube paste* consists, properly, of gum Arabic and sugar, dissolved in a decoction of this fruit, and evaporated to the proper consistence. As a demulcent, it is in no respect superior to a paste made with gum Arabic and sugar alone; and the preparation commonly sold in this country under the name, contains in fact none of the fruit.

The fruits of two other species of Zizyphus, the *Z. Lotus*, growing in the North of Africa, and the *Z. Jujuba*, a native of the East Indies, possess properties similar to those of the first-mentioned species, and are used as food by the inhabitants of the countries where they grow.

NOTE.—Of the articles included in the foregoing list, those upon *Acetate of Copper, Acetate of Magnesia, Acetic Ether, Albuminate of Iron and Potassa, Ammonio-tartrate of Iron, Anthrakokali, Arseniate of Ammonia, Arseniate of Iron, Benzoate of Ammonia, Benzole, Bisulphuret of Carbon, Bromide of Iron, Bromides of Mercury, Carburet of Iron, Cheltenham Salt, Chloride of Magnesium, Chloride of Mercury and Quinia, Chloride of Potassa, Chloride of Silver, Chlorinated Anæsthetic Compounds, Chromic Acid, Citrate of Iron and Magnesia, Citrate of Iron and Quinia, Citrate of Soda, Crabs' Claws, Crabstones, Crocus of Antimony, Cyanuret of Zinc, Diaphoretic Antimony, Dippel's Animal Oil, Ferrocyanuret of Zinc, Artificial Fruit Essences, Fuligokali, Glass of Antimony, Gold, Guano, Gun Cotton, Hydriodic Acid, Hydriodic Ether, Hydrocyanic Ether, Hyposulphite of Soda, Hyposulphite of Soda and Silver, Indelible Ink, Indian Yellow, Iodide of Ammonium, Iodide of Barium, Iodide of Silver, Iodide of Starch, Iodide of Zinc, Iodides of Calomel, Iodoform, Iodohydrargyrate of Potassium, Lactate of Iron, Lactic Acid, Lithia, Manganese, Meat Biscuit, Muriatic Ether, Artificial Musk, Naphthaline, Nitrate of Copper, Nitrate of Soda, Nitroprusside of Sodium, Nitrosulphate of Ammonia, Nitrous Oxide, Oxalic Acid, Phosphate of Ammonia, Phosphate of Potassa, Platinum, Powder of Algaroth, Pyroacetic Spirit, Soot, Succinic Acid, Sulphate of Alumina, Sulphate of Alumina and Iron, Sulphate of Cadmium, Sulphate of Nickel, Sulphite of Soda, Sulphocyanuret of Potassium, Sulphuret of Calcium, Tannate of Alumina, Tannate of Iron, Tannate of Lead, Tartrate of Soda, Tellurium, Tutty, Urate of Ammonia, Urea, and Valerianate of Bismuth,* were written by Dr. Bache; the remainder by Dr. Wood.

II. ART OF PRESCRIBING MEDICINES.

THE physician should be acquainted not only with the properties of medicines, and the diseases to which they are respectively applicable, but also with the art of prescribing them, so that they may be adapted to the peculiarities of individual patients, and, by the mode in which they are administered, may produce the greatest curative effect with the least possible inconvenience. In relation to these points, a few general rules will be useful for the guidance of the young practitioner, although much must be left to his own judgment and discretion. We shall compress the remarks which we have to offer, under the two heads of the quantity or dose in which medicines may be given, and the mode of their exhibition.

1. DOSE OF MEDICINES.—In the body of the work, the quantity has been stated in which each medicine must ordinarily be given to produce its peculiar effects in the adult patient. But there are various circumstances which modify the dose, and demand attention on the part of the practitioner.

The *age* of the patient is the most important of these circumstances. The young require a smaller dose than those of maturity, to produce an equal effect; and the old, though their systems are, perhaps, less susceptible to the action of medicines than those of the middle-aged, cannot bear an equally forcible impression. The following table of Gaubius, exhibiting the doses proportioned to the age, is frequently referred to.

The dose for a person of middle age being		1 or 1 drachm,
That of a person from 14 to 21 years will be		$\frac{2}{3}$ or 2 scruples,
7 to 14	" "	$\frac{1}{2}$ or $\frac{1}{2}$ a drachm,
4 to 7	" "	$\frac{1}{3}$ or 1 scruple,
of 4 years	"	$\frac{1}{4}$ or 15 grains,
3 "	"	$\frac{1}{6}$ or 10 grains,
2 "	"	$\frac{1}{8}$ or 8 grains,
1 year	"	$\frac{1}{12}$ or 5 grains.

We prefer the following simple scheme of Dr. Young, which we extract from Paris's Pharmacologia.

"For children under twelve years, the doses of most medicines must be diminished in the proportion of the age to the age increased by 12; thus at two years to $\frac{1}{7}$—viz., $\frac{2}{2+12}=\frac{1}{7}$. At twenty-one the full dose may be given."

To the above rule some exceptions are offered in particular medicines, which require to be given to children in much larger proportional doses than those above stated. Such are castor oil and calomel, a certain quantity of which will in general not produce a greater effect in a child two or three years old than double the quantity in an adult.

Sex, *temperament*, and *idiosyncrasy* have also an influence upon the dose, and should be kept in view in prescribing. Females usually require somewhat smaller doses than males, and persons of sanguine temperament than the phlegmatic. Constitutional peculiarities, called idiosyncrasies, often exist in individuals, rendering them more than usually susceptible or insusceptible to the action of certain remedies, the dose of which must be modified accordingly. Thus in some per-

sons a grain or two of calomel will excite salivation, while in others scarcely any quantity which can be safely administered will produce this effect. Sometimes, moreover, a medicine operates on an individual in a manner wholly different from its ordinary mode. In all such cases experience is the only sure guide; but the occasional existence of these peculiarities indicates the propriety of making particular inquiries in relation to the idiosyncrasies of those patients, for whom we may be called for the first time to prescribe.

Habit is another important circumstance which modifies the dose of medicines. Generally speaking, the susceptibility to the action of medicines is diminished by their frequent and continued use; and, in order to maintain a given impression, the quantity must be regularly increased. This is especially true in regard to the narcotics, which are sometimes borne in enormous doses by those habituated to their use. It is a good practical rule in prescribing, when circumstances demand the continuance, for a considerable length of time, of some particular effect, to vary the medicine, and employ successively several with the same general powers, so as not too rapidly to exhaust the susceptibility to the action of any individual remedy. Another important practical rule connected with the influence of habit is, when any medicine, which from its nature is of variable strength, has been employed for some time in increasing doses, to reduce the dose upon resorting to a new parcel, until its relative strength has been ascertained. A neglect of this precaution, in cases where the last parcel happened to be more powerful than that previously employed, has sometimes been followed by very serious consequences.

2. Mode of Administering Medicines.—This has reference both to the combination of medicines with one another, and the form in which they are exhibited.

Simplicity in prescription is always desirable, when no object is to be gained by deviating from it. Remedies should never be mixed together without a definite purpose, nor with the vague hope that, out of the number prescribed, some one may perchance produce a salutary impression. Those exceedingly complex prescriptions, formerly so much in vogue, of which the ingredients were so numerous as to render altogether impossible a reasonable estimate of their bearing on each other, or their effects on disease, have been generally abandoned by modern practitioners. The only ground upon which any of them can be justifiably retained is that, by very frequent trials, through a long course of years, and in various states of disease, their influence on the system may have been fully ascertained, so that they may be considered rather in the light of a single remedy than a compound of many. Upon this ground, however, no prudent physician would attempt to originate such combinations. In mixing medicines, we ought to proceed no further than we should be justified in doing by a clear knowledge of the properties and mutual relations of the several ingredients, and their fitness to answer some particular indication in the treatment of disease. There are certain principles upon which medicines may be advantageously combined, and which it may not be amiss to mention for the benefit of the young practitioner.

Remedies of the same general character may be given in connexion, in order to increase their energy, or to render their action more certain. It has been well ascertained that substances thus combined will often act vigorously, when, severally, they would produce comparatively little effect; and it sometimes happens that, while their activity is augmented, they are at the same time rendered less irritating, as in the case of the drastic cathartics. (See *Pilulæ Catharticæ Compositæ.*)

Different medicines are very often mixed together, in order to meet different and co-existing indications, without any reference to the influence which they

may reciprocally exert on each other. Thus in the same patient we not unfrequently meet with debility of stomach and constipation of the bowels, connected with derangement of the hepatic function. To answer the indications presented by these morbid conditions, we may properly combine in the same dose, a tonic, cathartic, and mercurial alterative. For similar reasons we often unite tonics, purgatives, and emmenagogues, anodynes and diaphoretics, emetics and cathartics, antacids, astringents, and tonics; and scarcely two medicines can be mentioned, not absolutely incompatible with each other, which may not occasionally be combined with advantage to counteract co-existing morbid conditions.

Another very important object of combination, is the modification which is thereby effected in the actions of medicines differing from each other in properties. In this way new powers are sometimes developed, and those previously existing are greatly increased. Examples of such a result are afforded in the officinal powder of ipecacuanha and opium, and in the combination of squill and calomel; the former operating as a diaphoretic, the latter as a diuretic beyond the capabilities of either of their constituents. The effects of one medicine are, in numerous instances, increased by the influence of another in augmenting the natural susceptibility of the system to its action. Thus bitters enable cathartics to operate in smaller doses; purgatives awaken the dormant susceptibility to the action of mercury; and stimulants excite the torpid stomach, so that it will receive impressions from various medicines before inoperative. In some instances, the action of one medicine is promoted by that of another apparently of a nature wholly opposite. Thus, when calomel and opium are given in colic, the purgative operation of the former is facilitated by the relaxation of intestinal spasm produced by the latter. Medicines, in addition to the effects for which they are administered, very frequently produce disagreeable symptoms, which may be moderated or altogether prevented by combination with other medicines; and this object may usually be accomplished, without in the least degree interfering with the remediate influence desired. Thus the griping produced by cathartics, and the nausea by these and various other medicines, may often be corrected by the simultaneous use of aromatics. To cover the disagreeable taste or odour of certain medicines, and to afford a convenient vehicle for their administration, are also important objects of combination; as upon these circumstances often depend the acceptability of the medicine to the stomach, and even the possibility of inducing the patient to swallow it. Substances should be preferred as vehicles which are calculated to render the medicine acceptable to the palate and stomach, and in other ways to correct its disagreeable effects; as syrups for powders, the aromatic waters for medicines given in the form of mixture, and carbonic acid water for the neutral salts.

But, in the mixing of medicines, care should be taken that they are neither chemically nor physiologically incompatible; in other words, that they are not such as will react on each other so as to produce new and unexpected combinations, nor such as will exert contrary and opposite effects upon the system. Thus when the operation of an acid is desired, an alkali should not be given at the same time, as they unite to form a third substance entirely different from either; nor should a soluble salt of lime, baryta, or lead be given with sulphuric acid or a soluble sulphate, as decomposition would ensue, with the production of an inert compound. So, also, in relation to physiological incompatibility, diaphoretics and diuretics should not, as a general rule, be united with a view to their respective effects; as these are to a certain extent incompatible, one being diminished by whatever has a tendency to increase the other. There are cases, however, in which we may advantageously combine medicines with a view to their chemical reaction, as in the instance of the effervescing draught; and circumstances sometimes call for the union of remedies apparently opposite, as

in the case of colic before alluded to, in which opium may be advantageously combined with purgatives. Still, such combinations should never be formed, unless with a full understanding of their effects, and a special reference to them.

The *form in which medicines are exhibited*, is often an object of considerable importance. By variation in this respect, according to the nature of the medicine, the taste of the patient, or the condition of the stomach, we are frequently enabled to secure the favourable operation of remedies, which, without such attention, might prove useless or injurious. Medicines may be given in the solid state, as in the form of powder, pill, troche, or electuary; in the state of mixture, in which a solid is suspended in a liquid, or one liquid is mechanically mixed with another in which it is insoluble; or in the state of solution, under which may be included the various forms of infusion, decoction, tincture, wine, vinegar, syrup, honey, and oxymel. Of these different forms we have already treated sufficiently at large, under their respective heads, in the second part of this work.

In writing extemporaneous prescriptions, neatness, order, and precision, should always be observed; as, independently of the pleasing moral effect inseparable from these principles in all things, a positive practical advantage results, in the greater accuracy which the habit of attending to them gives to the prescriber, and the comparative certainty which they afford that his directions will be strictly complied with. As a general rule, when medicines are combined in prescription, that should come first in order which is considered as the most prominent and important, next the adjuvant or corrigent, and lastly the vehicle. Sometimes, however, it is important to indicate to the apothecary the succession in which the substances should be combined in reference to the perfection of the mixture, and this may render convenient a deviation from the order above mentioned. The physician should always be careful either to write out the full name of the medicine, or to employ such abbreviations as are not likely, by the misunderstanding of an ill-formed letter, to lead into error. Very serious and even fatal mistakes have been occasioned by a neglect of this precaution. The formulæ of the several Pharmacopœias which are detailed in this work, will serve as good examples for the guidance of the young practitioner. The following table explains the signs and abbreviations habitually used in prescriptions. The formulæ afterwards given will serve to illustrate the ordinary mode of prescribing, while they exhibit combinations of medicines frequently employed in practice.

W.

Table of Signs and Abbreviations.

℞	Recipe.	Take.	Collyr.	Collyrium.	An eye-water.
āā	Ana.	Of each.	Cong.	Congius vel Congii.	A gallon or gallons.
℔	Libra vel libræ.	A pound or pounds.	Decoct.	Decoctum.	A decoction.
℥	Uncia vel unciæ.	An ounce or ounces.	Ft.	Fiat.	Make.
ʒ	Drachma vel drachmæ.	A drachm or drachms.	Garg.	Gargarysma.	A gargle.
℈	Scrupulus vel scrupuli.	A scruple or scruples.	Gr.	Granum vel grana.	A grain or grains.
O	Octarius vel octarii.	A pint or pints.	Gtt.	Gutta vel guttæ.	A drop or drops.
f℥	Fluiduncia vel fluiduncia.	A fluidounce or fluidounces.	Haust.	Haustus.	A draught.
fʒ	Fluidrachma vel fluidrachmæ.	A fluidrachm or fluidrachms.	Infus.	Infusum.	An infusion.
♏	Minimum vel minima.	A minim or minims.	M.	Misce.	Mix.
Chart.	Chartula vel chartulæ.	A small paper or papers.	Mass.	Massa.	A mass.
Coch.	Cochlear vel cochlearia.	A spoonful or spoonfuls.	Mist.	Mistura.	A mixture.
			Pil.	Pilula vel pilulæ.	A pill or pills.
			Pulv.	Pulvis vel pulveres.	A powder or powders.
			Q. S.	Quantum sufficit.	A sufficient quantity.
			S.	Signa.	Write.
			Ss.	Semis.	A half.

Examples of Common Extemporaneous Prescriptions.

POWDERS.

℞ Antimonii et Potassæ Tartratis gr.i.
Pulveris Ipecacuanhæ ℈i.
Fiat pulvis.
S. To be taken in a wineglassful of sweetened water.
An active emetic.

℞ Hydrargyri Chloridi Mitis,
Pulveris Jalapæ, āā gr.x.
Misce.
S. To be taken in syrup or molasses.
An excellent cathartic in the commencement of bilious fevers, and in hepatic congestion.

℞ Pulveris Jalapæ gr.x.
Potassæ Bitartratis ʒii.
Misce.
S. To be taken in syrup or molasses.
A hydragogue cathartic, used in dropsy, and in scrofulous inflammation of the joints.

℞ Sulphuris ʒi.
Potassæ Bitartratis ʒii.
Misce.
S. To be taken in syrup or molasses.
A laxative used in piles and cutaneous diseases.

℞ Pulveris Rhei gr.x.
Magnesiæ ʒss.
Fiat pulvis.
S. To be taken in syrup or molasses.
A laxative and antacid, used in diarrhœa, dyspepsia, &c.

℞ Pulveris Scillæ gr.xii.
Potassæ Nitratis ʒi.
Fiat pulvis, in chartulas sex dividendus.
S. One to be taken twice or three times a day in syrup or molasses.
A diuretic employed in dropsy.

℞ Potassæ Nitratis ʒi.
Antimonii et Potassæ Tartratis gr.i.
Hydrarg. Chlorid. Mitis gr.vi.
Fiat pulvis, in chartulas sex dividendus.
S. One to be taken every two hours in syrup or molasses.
A refrigerant, diaphoretic, and alterative, used in bilious fevers; usually called *nitrous powders*.

℞ Pulveris Guaiaci Resinæ,
Potassæ Nitratis, āā ʒi.
Pulveris Ipecacuanhæ gr.iii.
Opii gr.ii.
Fiat pulvis, in chartulas sex dividendus.
S. One to be taken every three hours in syrup or molasses.
A stimulant diaphoretic, used in rheumatism and gout after sufficient depletion.

℞ Ferri Subcarbonatis,
Pulveris Colombæ,
Pulveris Zingiberis, āā ʒi.
Fiat pulvis, in chartulas sex dividendus.

S. One to be taken three times a day in syrup or molasses.

A tonic, used in dyspepsia and general debility.

Pills.

℞ Pulveris Aloës,
Pulveris Rhei, āā ʒss.
Saponis ℈i.
Misce, et cum aquâ fiat massa in pilulas viginti dividenda.

S. Two or three to be taken daily, at bed-time, or before a meal.

An excellent laxative in habitual constipation.

℞ Massæ Pilularum Hydrargyri,
Pulveris Aloës,
Pulveris Rhei, āā ℈i.
Misce, et cum aquâ fiat massa in pilulas viginti dividenda.

S. Three to be taken at bed-time.

An alterative and laxative, useful in constipation with deranged or deficient hepatic secretion.

℞ Pulveris Aloës,
Extracti Quassiæ, āā ʒi.
Olei Anisi ♏x.
Syrupi q. s.
Misce, et fiat massa in pilulas triginta dividenda.

S. Two to be taken once, twice, or three times a day.

A laxative, tonic, and carminative, useful in dyspepsia.

℞ Pulveris Scillæ ℈i.
Hydrargyri Chloridi Mitis gr.x.
Pulveris Acaciæ,
Syrupi, āā q. s.
Misce, et fiat massa in pilulas decem dividenda.

S. One to be taken two or three times a day.

A diuretic and alterative, much used in dropsy, especially when complicated with organic visceral disease.

℞ Pulveris Opii gr.iv.
Pulveris Ipecacuanhæ gr.xviii.
Pulveris Acaciæ,
Syrupi, āā q. s.
Misce, et fiat massa in pilulas duodecim dividenda.

S. One to be taken after each stool.

An anodyne diaphoretic, useful in dysentery and diarrhœa after the use of laxatives.

℞ Pulveris Opii,
Pulveris Ipecacuanhæ, āā gr.iii.
Hydrargyri Chloridi Mitis gr.vi.
Pulveris Acaciæ,
Syrupi, āā q. s.
Misce, et fiat massa in pilulas tres dividenda.

S. One or more to be taken at bed-time, or according to circumstances.

An anodyne, diaphoretic, and alterative, very useful in diarrhœa, dysentery, typhoid pneumonia, and various other diseases.

℞ Plumbi Acetatis, in pulv. triti, gr.xii.
Pulveris Opii gr.i.
Pulv. Acaciæ,
Syrupi, āā q. s. ut fiat massa in pilulas sex dividenda.

S. One every two, three, or four hours.

An astringent much employed in hæmoptysis and uterine hemorrhage.

Mixtures.

℞ Magnesiæ ʒi.
Syrupi f℥i.
Tere simul, et affunde
Aquæ Acidi Carbonici f℥iv.
Fiat haustus.

S. To be taken at a draught, the mixture being well shaken.

An agreeable mode of administering magnesia.

℞ Mannæ ℥i.
Fœniculi contusi ʒi.
Aquæ bullientis f℥iv.
Fiat infusum et cola; dein adjice
Magnesiæ Carbonatis ʒii.
Ft. mist.

S. One-third to be taken every three or four hours till it operates, the mixture being shaken.

An excellent carminative and mild laxative in flatulence and pain in the bowels.

℞ Olei Ricini f℥i.
Pulveris Acaciæ,
Sacchari, āā ʒii.
Aquæ Menthæ Piperitæ f℥iii.
Acaciam et saccharum cum fluidunciâ dimidiâ aquæ menthæ tere; dein oleum adjice, et contere; denique aquam reliquam paulatim infunde, et omnia misce.

S. To be taken at a draught, the mixture being well shaken.

℞ Olei Ricini f℥i.
Vitellum ovi unius.
Tere simul, et adde
Syrupi f℥ss.
Aquæ Menthæ Piperitæ f℥ii.
Ft. haust.

S. To be taken at a draught, the mixture being well shaken.

This and the preceding formula afford convenient modes of administering castor oil, when the stomach is irritable. Any other fixed oil may be given in the same way. Half the quantity will often answer.

℞ Olei Ricini f℥iss.
Tincturæ Opii ♏xxx.
Pulv. Acaciæ,
Sacchari, āā ℥ii.
Aquæ Menthæ Viridis f℥iv.

Acaciam et saccharum cum paululo aquæ menthæ tere; dein oleum adjice, et iterum tere; denique aquam reliquam paulatim infunde, et omnia misce.

S. A tablespoonful to be taken every hour or two hours till it operates, the mixture being each time well shaken.

Used as a gentle laxative in dysentery and diarrhœa. It is usually known by the name of *oleaginous mixture.*

℞ Elaterii gr.i.
Spiritûs Ætheris Nitrici f℥ii.
Tincturæ Scillæ,
Vini Colchici Rad., āā f℥ss.
Syrupi f℥i.
Ft. mist.

S. A tablespoonful to be taken three or four times a day in a little water.

Diuretic, used by Ferriar in dropsy.

℞ Copaibæ,
Spiritûs Lavandulæ Comp., āā f℥ii.
Mucilaginis Acaciæ f℥ss.
Syrupi f℥iii.
Simul tere; dein paulatim affunde
Aquæ f℥iv.
Misce.

S. A tablespoonful to be taken four times a day, or more frequently.

Given in chronic catarrh, and chronic nephritic affections. The dose must be larger in gonorrhœa.

Neutral Mixture.

℞ Acidi Citrici ℥ii.
Olei Limonis ♏i.
Simul tere, et adde
Aquæ f℥iv.
Liqua, et adde
Potassæ Carbonatis q. s. ad saturand.
Misce, et per linteum cola.

Or,

℞ Succi Limonis recentis f℥iv.
Potassæ Carbonatis q. s. ad saturandum.
Misce et cola.

S. A tablespoonful to be given with an equal quantity of water, every hour or two hours.

An excellent diaphoretic in fever.

Effervescing Draught.

℞ Potassæ Carbonatis ℥ii.
Aquæ f℥iv.
Liqua.

Or,

℞ Potassæ Bicarbonatis ℥iii.
Aquæ f℥iv.
Liqua.

S. Add a tablespoonful of the solution to the same quantity of lemon or lime-juice, previously mixed with a tablespoonful of water; and give the mixture, in the state of effervescence, every hour or two hours.

An excellent diaphoretic and anti-emetic in fever with nausea or vomiting.

Brown Mixture.

℞ Pulv. Extract. Glycyrrhizæ,
Pulv. Acaciæ, āā ℥ii.
Aquæ ferventis f℥iv.
Liqua, et adde
Vini Antimonii f℥ii.
Tincturæ Opii ♏xx.
Ft. mist.

S. A tablespoonful to be taken occasionally.

Expectorant, demulcent, and anodyne, useful in catarrhal affections.

℞ Antimonii et Potassæ Tartratis gr.i.
Syrupi Scillæ,
Liquoris Morphiæ Sulphatis, āā f℥ss.
Pulveris Acaciæ ℥ii.
Syrupi f℥ss.
Aquæ f℥iv.
Ft. mist.

S. A tablespoonful to be taken occasionally.

An expectorant and anodyne cough mixture.

℞ Acidi Nitrosi f℥i.
Tincturæ Opii gtt.xl.
Aquæ Camphoræ f℥viii.
Misce.

S. One-fourth to be taken every three or four hours.

Hope's mixture, used in dysentery, diarrhœa, and cholera.

℞ Camphoræ ℥i.
Myrrhæ ℥ss.
Pulv. Acaciæ,
Sacchari, āā ℥ii.
Aquæ f℥vi.

Camphoram cum alcoholis paululo in pulverem tere; dein cum myrrhâ, acaciâ, et saccharo contere; denique cum aquâ paulatim instillatâ misce.

S. A tablespoonful to be taken for a dose, the mixture being well shaken.

A convenient form for administering camphor.

℞ Cretæ Præparatæ ℈iv.
Massæ Pil. Hydrarg. gr.viii.
Tincturæ Opii gtt.viii.
Pulveris Acaciæ,
Sacchari, āā ʒi.
Aquæ Cinnamomi,
Aquæ, āā fʒi.
Solida simul tere, dein liquida paulatim inter terendum adjice, et omnia misce.

S. A teaspoonful to be taken for a dose, the mixture being well shaken.

An antacid and alterative mixture, well adapted to infantile diarrhœa with white stools. The dose mentioned is for a child a year or two old, and may be repeated four or six times in twenty-four hours.

℞ Pulveris Kino ʒii.
Aquæ bullientis fʒvi.
Fiat infusum et cola; dein secundum artem admisce,
Cretæ Præparatæ ʒiii.
Tincturæ Opii fʒss.
Spiritûs Lavandulæ Compositi fʒss.
Pulveris Acaciæ,
Sacchari, āā ʒii.
S. A tablespoonful to be taken for a dose, the mixture being well shaken.

Astringent and antacid, useful in diarrhœa.

Solutions.

℞ Magnesiæ Sulphatis ʒi.
Syrupi Limonis fʒi.
Aquæ Acidi Carbonici fʒvi.
Misce.
S. To be taken at a draught.

An agreeable mode of administering sulphate of magnesia.

℞ Magnesiæ Sulphatis ʒi.
Antimonii et Potassæ Tartratis gr.i.
Succi Limonis recentis fʒi.
Aquæ fʒiii.
Misce.
S. A tablespoonful to be taken every two hours till it operates upon the bowels.

Useful in fevers.

℞ Potassæ Nitratis ʒi.
Antimonii et Potassæ Tartratis gr.i.
Aquæ fʒiv.
Liqua.
S. A tablespoonful to be taken every two hours.

A refrigerant diaphoretic, used in fevers.

℞ Quiniæ Sulphatis gr.xii.
Acidi Sulphurici Aromatici gtt.xxiv.
Syrupi fʒss.
Aquæ Menthæ Piperitæ fʒi.
Misce.
S. A teaspoonful to be taken every hour or two hours.

A good mode of administering sulphate of quinia in solution.

Infusions.

℞ Sennæ ʒiii.
Magnesiæ Sulphatis,
Mannæ, āā ʒss.
Fœniculi ʒi.
Aquæ bullientis Oss.
Macera per horam in vase leviter clauso, et cola.

S. A teacupful to be taken every four or five hours till it operates.

An excellent purgative in febrile complaints.

℞ Spigeliæ ʒss.
Sennæ ʒii.
Mannæ ʒi.
Fœniculi ʒii.
Aquæ bullientis Oi.
Macera per horam in vase leviter clauso, et cola.

S. A wineglassful to be given to a child from two to four years old, three or four times a day.

A powerful anthelmintic.

℞ Colombæ contusæ,
Zingiberis contusi, āā ʒss.
Sennæ ʒii.
Aquæ bullientis Oi.
Macera per horam in vase leviter clauso, et cola.

S. A wineglassful to be taken morning, noon, and evening, or less frequently if it operate too much.

An excellent remedy in dyspepsia with constipation and flatulence.

℞ Pulveris Cinchonæ Rubræ ʒi.
Acidi Sulphurici Aromatici fʒi.
Aquæ Oi.
Macera per horas duodecim, subinde agitans.

S. A wineglassful of the clear liquid to be taken for a dose.

A good method of administering Peruvian bark in cold infusion.

III. TABLES OF WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT. *U. S., Lond., Ed.*

Pound.		Ounces.		Drachms.		Scruples.		Grains.
℔ 1	=	12	=	96	=	288	=	5760
		℥ 1	=	8	=	24	=	480
				ʒ 1	=	3	=	60
						℈ 1	=	gr. 20

The Imperial Standard Troy weight, at present recognised by the British laws, corresponds with the Apothecaries' weight in pounds, ounces, and grains, but differs from it in the division of the ounce, which, according to the former scale, contains twenty pennyweights, each weighing twenty-four grains.

AVOIRDUPOIS WEIGHT.

Pound.		Ounces.		Drachms.		Troy Grains.
℔ 1	=	16	=	256	=	7000
		oz. 1	=	16	=	437·5
				dr. 1	=	gr. 27·34375

Relative Value of Troy and Avoirdupois Weights.

Pound.		Pounds.		Pound.	Oz.	Grains.
1 Troy	=	0·822857	Avoirdupois	= 0	13	72·5
1 Avoirdupois	=	1·215277	Troy	= 1	2	280

DUBLIN WEIGHTS.*

Pound.		Ounces.		Drachms.		Scruples.		Grains.
℔ 1	=	16	=	128	=	384	=	7000
		℥ 1	=	8	=	24	=	437·5
				ʒ 1	=	3	=	54·68
						℈ 1	=	18·22

APOTHECARIES' OR WINE MEASURE. *U. S.*

Gallon.		Pints.		Fluidounces.		Fluidrachms.		Minims.		Cubic Inches.
Cong. 1	=	8	=	128	=	1024	=	61440	=	231
		O 1	=	16	=	128	=	7680	=	28·875
				f℥ 1	=	8	=	480	=	1·8047
						fʒ 1	=	♏ 60	=	·2256

IMPERIAL MEASURE.

Adopted by all the British Colleges.

Gallon.		Pints.		Fluidounces.		Fluidrachms.		Minims.
1	=	8	=	160	=	1280	=	76800
		1	=	20	=	160	=	9600
				1	=	8	=	480
						1	=	60

* By this term is meant the division of weights adopted by the Dublin College in their Pharmacopœia of 1850. The division of the drachm and scruple is not the nearest approximation to accuracy. The precise number for the drachm is 54·6875, which would give as the nearest to the precise number, with two decimals, for the drachm 54·69, and for the scruple 18·23.

Relative Value of Apothecaries' and Imperial Measure.

APOTHECARIES' MEASURE.		IMPERIAL MEASURE.			
		Pints.	Fluidounces.	Fluidrachms.	Minims.
1 gallon	=	6	13	2	23
1 pint	=		16	5	18
1 fluidounce	=		1	0	20
1 fluidrachm	=			1	2.5
1 minim	=				1·04

IMPERIAL MEASURE.		APOTHECARIES' MEASURE.				
		Gallon.	Pints.	Fluidoz.	Fluidr.	Minims.
1 gallon	=	1	1	9	5	8
1 pint	=		1	3	1	38
1 fluidounce	=				7	41
1 fluidrachm	=					58
1 minim	=					0·96

Relative Value of Weights and Measures in Distilled Water at 60° Fahrenheit.

1. Value of Apothecaries' Weight in Apothecaries' Measure.

				Pints.	Fluidoz.	Fluidr.	Minims.
1 pound	=	0·7900031 pints	=	0	12	5	7·2238
1 ounce	=	1·0533376 fluidounces	=	0	1	0	25·6020
1 drachm	=	1·0533376 fluidrachms	=	0	0	1	3·2002
1 scruple	=		=	0	0	0	21·0667
1 grain	=		=	0	0	0	1·0533

2. Value of Apothecaries' Measure in Apothecaries' Weight.

			Pounds.	Oz.	Dr.	Sc.	Gr.	Grains.
1 gallon	= 10·12654270 pounds	=	10	1	4	0	8·88	= 58328·886
1 pint	= 1·26581783 pounds	=	1	3	1	1	11·11	= 7291·1107
1 fluidounce	= 0·94936332 ounces	=	0	0	7	1	15·69	= 455·6944
1 fluidrachm	= 0·94936332 drachms	=	0	0	0	2	16·96	= 56·9618
1 minim	= 0·94936332 grains	=						·9493

3. Value of Avoirdupois Weight in Apothecaries' Measure.

		Pints.	Fluidounces.	Fluidrachms.	Minims.
1 pound	= 0·9600732 pints	= 0	15	2	53·3622
1 ounce	= 0·9600732 fluidounces	= 0	0	7	40·8351

4. Value of Apothecaries' Measure in Avoirdupois Weight.

1 gallon = 8·33269800 pounds.
1 pint = 1·04158725 pounds.
1 fluidounce = 1·04158725 ounces.

5. Value of Imperial Measure in Apothecaries' and Avoirdupois Weights.

Imperial Measure.		Apothecaries' Weight.					Avoirdupois Weight.			Grains.	Cubic Inches.
1 gallon	=	12 ℔	1 ℥	6 ʒ	2 ℈	0 gr.	= 10 ℔	0 ℥	=	70,000	= 277·27384
1 pint	=	1	6	1	2	10	= 1	4	=	8,750	= 34·65923
1 fluidounce	=			7	0	17·5	=	1	=	437·5	= 1·73296
1 fluidrachm	=				2	14·69	=			54·69	= 0·21662
1 minim	=									·91	= 0·00361

In converting the weights of liquids heavier or lighter than water into measures, or conversely, a correction must be made for specific gravity. In converting weights into measures, the calculator may proceed as if the liquid was water, and the obtained measure will be to the true measure *inversely* as the specific gravity. In the converse operation, of turning measures into weights, the same assumption may be made, and the obtained weight will be to the true weight *directly* as the specific gravity.

FORMER FRENCH WEIGHTS.

Pound.		Marc.		Onces.		Gros.		Deniers.		Grains.		Troy Grains.		Grammes.
1 Poids de Marc	=	2	=	16	=	128	=	384	=	9216	=	7561	=	489·5058
1 Apothecary	=	1·5	=	12	=	96	=	288	=	6912	=	5670·5	=	367·1294
		1	=	8	=	64	=	192	=	4608	=	3780·5	=	244·7529
				1	=	8	=	24	=	576	=	472·5	=	30·5941
						1	=	3	=	72	=	59·1	=	3·8242
								1	=	24	=	19·7	=	1·2747
										1	=	0·8	=	·0530

Relative Value of old French and English Weights.

Poids de Marc.		Troy Weight.		Avoirdupois.		Troy Grains.
1 pound	=	1·312680 ℔	=	1·080143 ℔	=	7561
1 once (ounce)	=	·984504 oz.	=	1·080143 oz.	=	472·5625
1 gros (drachm)	=	·954504 dr.	=			59·0703125
1 grain	=					·820421

Troy.		Poids de Marc.		French Grains.
1 pound	=	0·76180 ℔	=	7561
1 ounce	=	1·01574 onces	=	585·083
1 drachm	=	1·01574 gros	=	73·135
1 grain	=			1·219

Avoirdupois.		Poids de Marc.		French Grains.
1 pound	=	0·925803 ℔	=	8532·3
1 ounce	=	0·925803 once	=	533·27

To convert French grains into Troy grains, divide by	1·2189
——— Troy grains into French grains, multiply by	
——— French ounces into Troy ounces, divide by	1·015734
——— Troy ounces into French ounces, multiply by	
——— French pounds (poids de marc) into Troy pounds, multiply by	1·31268
——— Troy pounds into French pounds, divide by	

FRENCH DECIMAL WEIGHTS AND MEASURES.

The French *metrical* system is based upon the idea of employing, as the unity of all measures, whether of length, capacity, or weight, a uniform unchangeable standard, adopted from nature, the multiples and subdivisions of which should follow in decimal progression. To obtain such a standard, the length of one-fourth part of the terrestrial meridian, extending from the equator to the pole, was ascertained. The ten millionth part of this arc was chosen as the unity of measures of length, and was denominated *metre*. The cube of the tenth part of the metre was taken as the unity of measures of capacity, and denominated *litre*. The weight of distilled water, at its greatest density, which this cube is capable of containing, was called *kilogramme*, of which the thousandth part was adopted as the unity of weight, under the name of *gramme*. The multiples of these measures, proceeding in the decimal progression, are

distinguished by employing the prefixes, *deca*, *hecto*, *kilo*, and *myria*, taken from the Greek numerals; and the subdivisions, following the same order, by *deci*, *centi*, *mili*, from the Latin numerals.

The *metre*, or unity of length, at 32°	= 39·371	English inches at 62°.
The *litre*, or unity of capacity	= 61·028	English cubic inches.
The *gramme*, or unity of weight	= 15·434	Troy grains.

Upon this basis the following tables, taken with some slight alterations from the Edinburgh New Dispensatory, have been constructed. It was ascertained by accurate examination at the London Mint, that the gramme is only 15·434 Troy grains, though sometimes stated at 15·444 grains.

MEASURES OF LENGTH.

The metre being at 32°, and the foot at 62°.

		English Inches.		Miles.	Fur.	Yards.	Feet.	Inches.
Millimetre	=	·03937						
Centimetre	=	·39371						
Decimetre	=	3·93710						
Metre	=	39·37100	=	0	0	1	0	3·371
Decametre	=	393·71000	=	0	0	10	2	9·710
Hectometre	=	3937·10000	=	0	0	109	1	1·100
Kilometre	=	39371·00000	=	0	4	213	1	11·000
Myriametre	=	393710·00000	=	6	1	156	1	2·000

MEASURES OF CAPACITY.

		English Cubic Inches.		Apothecaries' Measure.
Millilitre	=	·061028	=	16·2318 minims.
Centilitre	=	·610280	=	2·7053 fluidrachms.
Decilitre	=	6·102800	=	3·3816 fluidounces.
Litre	=	61·028000	=	2·1135 pints.
Decalitre	=	610·280000	=	2·6419 gallons.
Hectolitre	=	6102·800000		
Kilolitre	=	61028·000000		
Myrialitre	=	610280·000000		

MEASURES OF WEIGHT.

		Troy Grains.		lb.	oz.	dr.	gr.
Milligramme	=	·0154					
Centigramme	=	·1543					
Decigramme	=	1·5434					
Gramme	=	15·4340					
Decagramme	=	154·3402	=	0	0	2	34·3
Hectogramme	=	1543·4023	=	0	3	1	43·4
Kilogramme	=	15434·0234	=	2	8	1	14
Myriagramme	=	154340·2344	=	26	9	4	20

Though the decimal system of weights and measures was established by law in France, it was found impossible to procure its general adoption by the people, who obstinately adhered to the old *poids de marc* and its divisions; or, if they adopted the new weights, gave them the names of the old weights to which they most nearly approached. Thus the *kilogramme*, which is equal to 18,827 $\frac{15}{100}$ French grains, or 2 pounds 5 gros 35 $\frac{15}{100}$ grains *poids de marc*, was divided into two parts, and the half of it called a pound. One reason for this adherence

to the old weights was the convenience of division into halves, quarters, &c., of which the new were not susceptible. To obviate this difficulty the Imperial government legalized the employment of the half kilogramme as the unity of weight, under the name of pound, and allowed this to be divided into half pounds, quarters, eighths, ounces, &c., as in the old *poids de marc*. The new pound is distinguished by the name of *metrical pound*, and has been adopted to a considerable extent; while the old weights are retained by some, particularly by the apothecaries and goldsmiths; so that three systems are now more or less in use in France—the original *poids de marc*, the decimal system, and the metrical pound with its divisions. The following table represents the relative value of these different weights.

Decimal System.		Poids de Marc. lb	oz.	dr.	gr.		Metrical Pound. lb	oz.	dr.	gr.
1 centigramme	=	0	0	0	0·19	=	0	0	0	0·18
1 decigramme	=	0	0	0	1·88	=	0	0	0	1·84
1 gramme	=	0	0	0	18·83	=	0	0	0	18·43
1 decagramme	=	0	0	2	44·27	=	0	0	2	40·32
1 hectogramme	=	0	3	2	10·71	=	0	3	1	43·2
1 kilogramme	=	2	0	5	35·15	=	2	0	0	0

Poids de Marc.		Grammes.	Metrical Pound.		Grammes.
1 grain	=	0·0531	1 grain	=	0·054
24 grains or ℈i	=	1·2747	24 grains or ℈i	=	1·302
72 grains or ʒi	=	3·8242	72 grains or ʒi	=	3·906
1 ounce	=	30·5941	1 ounce	=	31·25
1 pound	=	489·5058	1 pound	=	500

The following table is taken from Christison's Dispensatory, and was calculated chiefly from data contained in Soubeiran's Traité de Pharmacie.

Table of certain foreign Apothecaries' Weights, exhibiting the Value of their different Denominations in Troy Grains.

	Pound.	Ounce.	Drachm.	Scruple.	Grain.
French (old) - -	5670·5	472·50	59·10	19·70	0·820
Spanish - - -	5320·4	443·49	55·44	18·47	0·769
Tuscan - - -	5240·3	436·67	54·58	18·19	0·758
Roman - - -	5235·0	436·25	54·53	18·17	0·757
Austrian - -	6495·1	541·25	67·65	22·55	1·127
German or Nuremberg Russian - -	5524·8	460·40	57·55	19·18	0·960
Prussian - -	5415·1	451·26	56·40	18·80	0·940
Dutch Belgian - -	5695·8	474·64	59·33	19·78	0·988
Swedish - -	5500·2	458·34	57·29	19·09	0·954
Piedmontese - -	4744·7	395·39	49·45	16·48	0·824
Venetian - -	4661·4	388·45	48·55	16·18	0·809

Of these weights, all, except the French, Spanish, Tuscan, and Roman (first named in the table), are divided into parts corresponding with those of the English Apothecaries' weight. In these four, the drachm contains 72 instead of 60 grains, and the scruple 24 instead of 20 grains; but, as in the English, there are 3 scruples in the drachm, 8 drachms in the ounce, and 12 ounces in the pound.

APPROXIMATE MEASUREMENT.

For the sake of convenience, in the absence of proper instruments, we often make use of means of measurement, which, though not precise nor uniform, afford results sufficiently accurate for ordinary purposes. Of this kind are certain household implements, of a capacity approaching to uniformity, and corresponding to a certain extent with the regular standard measures. Custom has attached a fixed value to these implements, with which it is proper that the practitioner should be familiar; although their capacity, as they are now made, with the exception of the wineglass, generally somewhat exceeds that at which they were originally and still continue to be estimated.

A *tea-cup* is estimated to contain about four fluidounces, or a gill.
A *wineglass* - - - - - two fluidounces.
A *tablespoon* (cochlear magnum) - half a fluidounce.
A *teaspoon* (cochlear parvum) - a fluidrachm.

Small quantities of liquid medicines are often estimated by *drops*, each of which is usually considered equivalent to a minim, or the sixtieth part of a fluidrachm. The drop of water and of watery fluids is, on an average, about this size; but the same is by no means the case with all medicinal liquids, and the drop even of the same liquid varies much in bulk, according to the circumstances under which it is formed. This is, therefore, an uncertain mode of estimating the quantity of liquids, and should be superseded where minim measures can be had.

The results stated in the following table were obtained by Mr. E. Durand, of Philadelphia. (See *Journ. of the Philadelphia College of Pharmacy*, i. 169.) They may be relied on as accurate, but should be considered as indicating only the relative number of drops afforded by the several liquids mentioned; for, under other circumstances than those of Mr. Durand's experiments, entirely different results might be obtained as relates to each liquid. The preparations experimented with were those of the first edition of the U. S. Pharmacopœia.

Table, exhibiting the Number of Drops of different Liquids equivalent to a Fluidrachm.

	Drops.		Drops.
Acid, acetic (crystallizable)	120	Tincture of assafetida, of foxglove, of guaiac, of opium	120
Acid, hydrocyanic (medicinal)	45	Tincture of chloride of iron	132
Acid, muriatic	54	Vinegar, distilled	78
Acid, nitric	84	Vinegar of colchicum	78
Acid, nitric, diluted (1 to 7)	51	Vinegar of opium (black drop)	78
Acid, sulphuric	90	Vinegar of squill	78
Acid, sulphuric, aromatic	120	Water, distilled	45
Acid, sulphuric, diluted (1 to 7)	51	Water of ammonia (strong)	54
Alcohol (rectified spirit)	138	Water of ammonia (weak)	45
Alcohol, diluted (proof spirit)	120	Wine (Teneriffe)	78
Arsenite of potassa, solution of	57	Wine, antimonial	72
Ether, sulphuric	150	Wine of colchicum	75
Oil of aniseed, of cinnamon, of cloves, of peppermint, of sweet almonds, of olives	120*	Wine of opium	78

* See *page* 1098 for the results obtained by Professor Procter with the volatile oils, which give a considerably smaller number of drops to the fluidrachm than here stated, showing how different may be the results obtained under different circumstances.

IV. ALPHABETICAL TABLE OF PHARMACEUTICAL EQUIVALENTS.*

Name.	*Symbol or Formula.†*	*Equivalent.*
Acid, acetic	$C_4H_3O_3$	51
crystallized	$C_4H_3O_3+HO$	60
amylic. See Acid, valerianic.		
antimonic	SbO_5	169
antimonious	SbO_4	161
arsenic	AsO_5	115
arsenious	AsO_3	99
benzoic	$C_{14}H_5O_3$	113
crystallized	$C_{14}H_5O_3+HO$	122
boracic	BO_3	34·9
camphoric (monohydrated)	$C_{10}H_7O_3+HO$	100
carbonic	CO_2	22
chloric	ClO_5	75·42
chlorous	ClO_4	67·42
chromic	CrO_3	50·27
citric	$C_{12}H_5O_{11}$	165
crystallized	$C_{12}H_5O_{11}+4HO$	201
gallic (dried at 212°)	$C_7H_3O_5$	85
hydriodic	HI	127·3
hydrocyanic (prussic acid)	HCy	27
hydrosulphuric (sulphuretted hydrogen)	HS	17
hypochlorous	ClO	43·42
hyponitrous	NO_3	38
hypophosphorous	PO	40
hyposulphuric	S_2O_5	72
hyposulphurous	S_2O_2	48
iodic	IO_5	166·3
kinic (crystallized)	$C_7H_6O_6$	96
lactic (monohydrated)	$C_6H_5O_5+HO$	90
meconic (dried at 212°)	$C_{14}H_4O_{14}$	200
muriatic (hydrochloric acid)	HCl	36·42
nitric	NO_5	54
quadrihydrated (sp. gr. 1·42)	NO_5+4HO	90

* This table includes all the elements, although many of them are not used in medicine. It also embraces a few compounds which are not used in pharmacy, but which are inserted on account of their general importance. Including aridium and donarium, the present number of the elements is 65.

† By modern chemists the elements are designated by letters, called *symbols*. The initial letter of the name is the symbol, whenever it is distinctive; but, when several elements have names beginning with the same letter, the plan adopted is to represent one of them by the initial letter, and the rest by the initial letter with some other associated with it. Thus C stands for carbon, Ca for calcium, Cd for cadmium, Ce for cerium, Cl for chlorine, Co for cobalt, Cr for chromium, Cu for copper, &c. The use of these symbols saves time and space in designating the composition of compounds. Where a single equivalent is intended to be designated, the symbol of the element is simply given; but where several equivalents are to be represented, the symbol is preceded by a figure indicating the number. Thus C means one equivalent of carbon, 2C two equivalents, and so on. Sometimes the number of equivalents is denoted by a small depressed figure following the symbol; and this plan has been adopted, in most instances, in the above table. The group of letters and figures, thus used to denote the composition of any compound, is called the *formula* of such compound. The symbols given are those of Berzelius, and should not be varied from, for fear of destroying their usefulness by creating confusion.

Name.	*Symbol or Formula.*	*Equivalent.*
Acid, nitrous	NO_4	46
oxalic	C_2O_3	36
crystallized	C_2O_3+3HO	63
sublimed	C_2O_3+HO	45
phosphoric	PO_5	72
monohydrated (glacial acid)	PO_5+HO	81
phosphorous	PO_3	56
prussic. See Acid, hydrocyanic.		
succinic	$C_4H_2O_3$	50
sulphuric	SO_3	40
monohydrated (sp. gr. 1·845)	SO_3+HO	49
(Nordhausen acid)	$2SO_3+HO$	89
sulphurous	SO_2	32
tannic (tannin from galls)	$C_{18}H_8O_{12}$	212
tartaric	$C_4H_2O_5$	66
crystallized	$C_4H_2O_5+HO$	75
uric (lithic acid)	$N_4C_{10}H_2O_4$	150
hydrated	$N_4C_{10}H_2O_4+2HO$	168
valerianic (amylic acid)	$C_{10}H_9O_3$	93
hydrated	$C_{10}H_9O_3+HO$	102
Aconitia	$NC_{60}H_{47}O_{14}$	533
Alcohol	C_4H_5O+HO	46
amylic	$C_{10}H_{11}O+HO$	88
methylic	C_2H_3O+HO	32
Aldehyd	$C_4H_4O_2$	44
Alum. See Sulphate of alumina and potassa.		
Alumina	Al_2O_3	51·4
tersulphate (salt in alum)	$Al_2O_3,3SO_3$	171·4
ALUMINIUM	Al	13·7
Amide (amidogen)	NH_2	16
Ammonia	NH_3	17
acetate	$NH_3,C_4H_3O_3$	68
crystallized	$NH_3,C_4H_3O_3+7HO$	131
bicarbonate	$NH_3,2CO_2$	61
bihydrosulphate	$NH_3,2HS$	51
carbonate	NH_3,CO_2	39
hydrosulphate (hydrosulphuret)	NH_3,HS	34
muriate (sal ammoniac)	NH_3,HCl	53·42
nitrate	NH_3,NO_5	71
sesquicarbonate	$2NH_3,3CO_2$	100
hydrated (medicinal carbonate)	$2NH_3,3CO_2+2HO$	118
sulphate	NH_3,SO_3+HO	66
urate	$NH_3,N_4C_{10}H_2O_4+2HO$	185
Ammonium	NH_4	18
Amyle	$C_{10}H_{11}$	71
acetate of oxide (acetate of amylic ether)	$C_{10}H_{11}O,C_4H_3O_3$	130
oxide (amylic ether)	$C_{10}H_{11}O$	79
ANTIMONY or STIBIUM	Sb	129
oxychloride (powder of Algaroth)	$9SbO_3+2SbCl_3$	1847·52
oxysulphuret	SbO_3+5SbS_3+16HO	1182
tartrate of teroxide	$SbO_3,C_4H_2O_5$	219
terchloride (butter of antimony)	$SbCl_3$	235·26
teroxide (medicinal oxide)	SbO_3	153
tersulphuret (medicinal sulphuret)	SbS_3	177

Name.	*Symbol or Formula.*	*Equivalent.*
ARIDIUM?*		
ARSENIC	As	75
bisulphuret (realgar)	AsS_2	107
terchloride	$AsCl_3$	181·26
teriodide	AsI_3	453·9
tersulphuret (orpiment)	AsS_3	123
Atropia	$NC_{34}H_{23}O_6$	289
sulphate	$NC_{34}H_{23}O_6,SO_3$?	329
BARIUM	Ba	68·7
chloride	BaCl	104·12
crystallized	BaCl+2HO	122·12
Baryta	BaO	76·7
carbonate	BaO,CO_2	98·7
hydrate	BaO,HO	85·7
muriate. See Barium, chloride.		
nitrate	BaO,NO_5	130·7
sulphate	BaO,SO_3	116·7
Benzole	$C_{12}H_6$	78
Benzyle	$C_{14}H_5O_2$	105
BISMUTH	Bi	213
nitrate of teroxide	BiO_3,NO_5	291
teroxide	BiO_3	237
Black oxide of manganese. See Manganese, deutoxide.		
oxide of mercury. See Mercury, protoxide.		
Blue vitriol. See Copper, sulphate of protoxide.		
Borax. See Soda, biborate.		
BORON	B	10·9
BROMINE	Br	78·4
Brucia	$N_2C_{44}H_{25}O_7$	373
CADMIUM	Cd	55·8
protoxide	CdO	63·8
sulphate of protoxide	CdO,SO_3	103·8
Caffein (also theïn and guaranin)	$N_4C_{16}H_{10}O_4$	194
CALCIUM	Ca	20·5
chloride	CaCl	55·92
crystallized	CaCl+6HO	109·92
Calomel. See Mercury, protochloride.		
Camphene	$C_{10}H_8$	68
Camphor	$C_{10}H_8O$	76
CARBON	C	6
bisulphuret	CS_2	38
Caustic potassa. See Potassa, hydrate.		
soda. See Soda, hydrate.		
CERIUM	Ce	46
Ceruse. See Lead, carbonate of protoxide.		
Cetin	$C_{32}H_{33}O$	233
Chalk. See Lime, carbonate.		
CHLORINE	Cl	35·42
Chloroform	C_2HCl_3	119·26

* This was announced, some years ago, as a new metal by M. Ullgren. M. Bahr has repeated M. Ullgren's experiments, and has arrived at the conclusion that the so-called aridium consists of iron, containing phosphorus and probably chromium.

Name.	*Symbol or Formula.*	*Equivalent.*
CHROMIUM	Cr	26·27
Cinchonia	$NC_{20}H_{12}O$	154
disulphate	$2NC_{20}H_{12}O,SO_3$	348
crystallized	$2NC_{20}H_{12}O,SO_3+2HO$	366
sulphate	$NC_{20}H_{12}O,SO_3$	194
Cinnabar. See Mercury, bisulphuret.		
COBALT	Co	29·5
Codeia	$NC_{35}H_{20}O_5$	284
COLUMBIUM or TANTALUM*	Ta	185
Common salt. See Sodium, chloride.		
COPPER or CUPRUM	Cu	31·6
acetate of protoxide	$CuO,C_4H_3O_3$	90·6
black or protoxide	CuO	39·6
diacetate of protoxide (verdigris)	$2CuO,C_4H_3O_3$	130·2
nitrate of protoxide	CuO,NO_5	93·6
crystallized	CuO,NO_5+3HO	120·6
red or dioxide	Cu_2O	71·2
sulphate of protoxide (blue vitriol)	CuO,SO_3	79·6
crystallized	CuO,SO_3+5HO	124·6
Corrosive sublimate. See Mercury, bichloride.		
Cream of tartar. See Potassa, bitartrate.		
Creasote	$C_{28}H_{16}O_4$	216
Cyanogen	NC_2 or Cy	26
DIDYMIUM	Di	48
DONARIUM?†		
Epsom salt. See Magnesia, sulphate.		
ERBIUM	E	?
Ethal	$C_{32}H_{33}O+HO$	242
Ether	C_4H_5O	37
acetic	$C_4H_5O,C_4H_3O_3$	88
hydriodic	C_4H_5I	155·3
hyponitrous	C_4H_5O,NO_3	75
muriatic	C_4H_5Cl	64·42
sulphuric. See Ether.		
Ethereal oil. See Sulphate of ether and etherine.		
Etherine	C_4H_4	28
Ethyle	C_4H_5	29
Ferrocyanogen	$FeCy_3$	106
Flowers of zinc. See Zinc, protoxide.		
FLUORINE	F	18·68
Formyle	C_2H	13
Fusel oil. See Alcohol, amylic.		
Glauber's salt. See Soda, sulphate.		
Glucina	G_2O_3	37·92
GLUCINIUM	G	6·96
Glycerin	$C_6H_7O_5+HO$	92
Glyceryle	C_6H_7	43

* According to M. H. Rose the columbium of Hatchett, and the tantalum of Ekeberg are distinct metals.

† This is the name given by M. Bergemann to a metal assumed to be present in an oxide, supposed to be new, found by him in a Norwegian mineral, called orangite. The oxide in question is now stated to be impure thorina; and, should this statement be confirmed, donarium must be struck from the list of metals.

Name.	*Symbol or Formula.*	*Equivalent.*
GOLD or AURUM	Au	199
Goulard's extract of lead. See Lead, diacetate of protoxide.		
Green vitriol. See Iron, sulphate of protoxide.		
Heavy oil of wine. See Sulphate of ether and etherine.		
HYDROGEN	H	1
protoxide (water)	HO	9
ILMENIUM	Il	60·24
IODINE	I	126·3
IODOFORM	C_2HI_3	391·9
IRIDIUM	Ir	98·8
IRON or FERRUM	Fe	28
bitartrate of sesquioxide	$Fe_2O_3,2C_4H_2O_5$	212
bromide	FeBr	106·4
carbonate of protoxide	FeO,CO_2	58
citrate of sesquioxide	$Fe_2O_3,C_{12}H_5O_{11}$	245
ferrocyanuret (pure Prussian blue)	Fe_7Cy_9	430
iodide	FeI	154·3
crystallized	FeI+5HO	199·3
medicinal black oxide	Fe_2O_3+2FeO	152
native black oxide	Fe_2O_3+FeO	116
protocyanuret	FeCy	54
protoxide	FeO	36
red or sesquioxide	Fe_2O_3	80
hydrated	Fe_2O_3+2HO	98
sesquichloride	Fe_2Cl_3	162·26
subarseniate of protoxide	$4FeO,AsO_5$	259
sulphate of protoxide (green vitriol)	FeO,SO_3	76
crystallized	FeO,SO_3+7HO	139
tartrate of protoxide	$FeO,C_4H_2O_5$	102
tartrate of sesquioxide	$Fe_2O_3,C_4H_2O_5$	146
teracetate of sesquioxide	$Fe_2O_3,3C_4H_3O_3$	233
ternitrate of sesquioxide	$Fe_2O_3,3NO_5$	242
tersulphate of sesquioxide	$Fe_2O_3,3SO_3$	200
tervalerianate of sesquioxide	$Fe_2O_3,3C_{10}H_9O_3$	359
tribasic phosphate of protoxide	$2FeO,HO,PO_5$	153
LANTANIUM	La	44·15
LEAD or PLUMBUM	Pb	103·6
acetate of protoxide (sugar of lead)	$PbO,C_4H_3O_3$	162·6
crystallized	$PbO,C_4H_3O_3+3HO$	189·6
carbonate of protoxide (white lead)	$2(PbO,CO_2)+PbO,HO$	387·8
chloride	PbCl	139·02
deutoxide (puce oxide)	PbO_2	119·6
diacetate of protoxide (Goulard's extract)	$2PbO,C_4H_3O_3$	274·2
iodide	PbI	229·9
nitrate of protoxide	PbO,NO_5	165·6
protoxide (massicot)	PbO	111·6
red oxide (red lead or minium)	Pb_3O_4	342·8
Lime	CaO	28·5
bone-phosphate	$3CaO,PO_5$	157·5
carbonate (chalk)	CaO,CO_2	50·5
chlorinated	CaO,Cl	63·92
hydrate (slaked lime)	CaO,HO	37·5
muriate. See Calcium, chloride.		

Name.	*Symbol or Formula.*	*Equivalent.*
Lime, oxalate	CaO,C_2O_3	64·5
tartrate	$CaO,C_4H_2O_5$	94·5
Lithia	LO	14
carbonate	LO,CO_2	36
LITHIUM	L	6
Magnesia	MgO	20
carbonate (magnesia alba)	$3(MgO,CO_2+HO)+MgO,HO$	182
citrate	$3MgO,C_{12}H_5O_{11}$	225
sulphate (Epsom salt)	MgO,SO_3	60
crystallized	MgO,SO_3+7HO	123
MAGNESIUM	Mg	12
hydrated chloride	MgCl,6HO	101·42
MANGANESE	Mn	27·7
deutoxide (black oxide)	MnO_2	43·7
Mannite	$C_6H_7O_6$	91
Massicot. See Lead, protoxide.		
MERCURY or HYDRARGYRUM	Hg	202
acetate of protoxide	$HgO,C_4H_3O_3$	261
ammoniated (white precipitate)	$HgCl,NH_2$	253·42
bichloride (corrosive sublimate)	$HgCl_2$	272·84
bicyanuret (prussiate)	$HgCy_2$	254
biniodide	HgI_2	454·6
binitrate of deutoxide	$HgO_2,2NO_5$	326
bisulphate of deutoxide	$HgO_2,2SO_3$	298
bisulphuret (cinnabar)	HgS_2	234
deutoxide (red precipitate)	HgO_2	218
nitrate of protoxide	HgO,NO_5	264
protiodide	HgI	328·3
protochloride (calomel)	HgCl	237·42
protosulphuret	HgS	218
protoxide (black oxide)	HgO	210
sesquiodide	Hg_2I_3	782·9
subsulphate of deutoxide (turpeth mineral)	$3HgO_2,2SO_3$	734
sulphate of protoxide	HgO,SO_3	250
Methyle	C_2H_3	15
Minium. See Lead, red oxide.		
MOLYBDENUM	Mo	47·7
Morphia	$NC_{35}H_{20}O_6$	292
acetate	$NC_{35}H_{20}O_6,C_4H_3O_3$	343
muriate	$NC_{35}H_{20}O_6,HCl$	328·42
sulphate	$NC_{35}H_{20}O_6,SO_3$	332
Narcein	$NC_{28}H_{20}O_{12}$	298
NICKEL	Ni	29·5
protoxide	NiO	37·5
sulphate of protoxide	NiO,SO_3	77·5
crystallized	NiO,SO_3+7HO	140·5
NIOBIUM*	Nb	?

* Niobium and pelopium were alleged to exist in the Bavarian and North American columbites. Recently, however, M. H. Rose has announced that they are the same, and proposes to retain the name niobium. It is not contended that the peculiar metal of the columbites is different from that discovered in 1801 by Hatchett; and, therefore, as justly remarked by Prof. A. Connell, of St. Andrews, it should be called columbium, the name given to it by its discoverer, and the name niobium should be abandoned. (*Philos. Mag.*, June, 1854, p. 461.)

Name.	*Symbol or Formula.*	*Equivalent.*
Nitre. See Potassa, nitrate.		
NITROGEN	N	14
NORIUM	No	?
Olefiant gas	C_2H_2	14
Orpiment. See Arsenic, tersulphuret.		
OSMIUM	Os	99·7
OXYGEN	O	8
PALLADIUM	Pd	53·3
PELOPIUM.		
PHOSPHORUS	P	32
PLATINUM	Pt	98·9
Potassa	KO	47·2
acetate	$KO,C_4H_3O_3$	98·2
crystallized	$KO,C_4H_3O_3+2HO$	116·2
arsenite	KO,AsO_3	146·2
bicarbonate	$KO,2CO_2$	91·2
crystallized	$KO,2CO_2+HO$	100·2
bichromate	$KO,2CrO_3$	147·74
binoxalate (salt of sorrel)	$KO,2C_2O_3$	119·2
crystallized	$KO,2C_2O_3+3HO$	146·2
bisulphate	$KO,2SO_3$	127·2
crystallized	$KO,2SO_3+2HO$	145·2
bitartrate (cream of tartar)	$KO,2C_4H_2O_5$	179·2
crystallized	$KO,2C_4H_2O_5+HO$	188·2
carbonate (salt of tartar)	KO,CO_2	69·2
chlorate	KO,ClO_5	122·62
chromate	KO,CrO_3	97·47
citrate	$3KO,C_{12}H_5O_{11}$	306·6
ferrocyanate. See Potassium, ferrocyanuret.		
hydrate (caustic potassa)	KO,HO	56·2
hydriodate. See Potassium, iodide.		
nitrate (nitre or saltpetre)	KO,NO_5	101·2
oxalate	KO,C_2O_3	83·2
sesquicarbonate	$2KO,3CO_2$	160·4
sulphate (vitriolated tartar)	KO,SO_3	87·2
tartrate (soluble tartar)	$KO,C_4H_2O_5$	113·2
tribasic phosphate	$2KO,HO,PO_5$	175·4
POTASSIUM or KALIUM	K	39·2
bromide	KBr	117·6
chloride	KCl	74·62
cyanuret	KCy	65·2
ferrocyanuret	2KCy,FeCy	184·4
crystallized	2KCy,FeCy+3HO	211·4
iodide	KI	165·5
iodohydrargyrate	$2KI,HgI_2$	785·6
teroxide	KO_3	63·2
tersulphuret	KS_3	87·2
Prussian blue. See Iron, ferrocyanuret.		
Prussiate of mercury. See Mercury, bicyanuret.		
Prussic acid. See Acid, hydrocyanic.		
Puce oxide of lead. See Lead, deutoxide.		
Pyroxylic spirit. See Alcohol, methylic.		

Name.	*Symbol or Formula.*	*Equivalent.*
Quinia	$NC_{20}H_{12}O_2$	162
disulphate (medicinal sulphate)	$2NC_{20}H_{12}O_2,SO_3$	364
crystallized	$2NC_{20}H_{12}O_2,SO_3+8HO$	436
muriate	$NC_{20}H_{12}O_2,HCl$	198·42
sulphate	$NC_{20}H_{12}O_2,SO_3$	202
valerianate	$NC_{20}H_{12}O_2,C_{10}H_9O_3$	255
Quinidia	$NC_{18}H_{11}O$	141
disulphate	$2NC_{18}H_{11}O,SO_3$	322
crystallized	$2NC_{18}H_{11}O,SO_3+HO$	331
Realgar. See Arsenic, bisulphuret.		
Red lead. See Lead, red oxide.		
precipitate. See Mercury, deutoxide.		
RHODIUM	R	52·2
Rochelle salt. See Tartrate of potassa and soda.		
RUTHENIUM	Ru	52·2
Sal ammoniac. See Ammonia, muriate.		
Salicin	$C_{26}H_{18}O_{14}$	286
Salt of sorrel. See Potassa, binoxalate.		
of tartar. See Potassa, carbonate.		
Saltpetre. See Potassa, nitrate.		
SELENIUM	Se	39·6
Silica	SiO_3	45·3
SILICON	Si	21·3
SILVER or ARGENTUM	Ag	108
chloride	AgCl	143·42
cyanuret	AgCy	134
nitrate of protoxide	AgO,NO_5	170
protoxide	AgO	116
Slaked lime. See Lime, hydrate.		
Soda	NaO	31·3
acetate	$NaO,C_4H_3O_3$	82·3
crystallized	$NaO,C_4H_3O_3+6HO$	136·3
biborate (borax)	$NaO,2BO_3$	101·1
octohedral	$NaO,2BO_3+5HO$	146·1
prismatic	$NaO,2BO_3+10HO$	191·1
bicarbonate	$NaO,2CO_2$	75·3
crystallized	$NaO,2CO_2+HO$	84·3
carbonate	NaO,CO_2	53·3
crystallized	NaO,CO_2+10HO	143·3
hydrate (caustic soda)	NaO,HO	40·3
muriate. See Sodium, chloride.		
nitrate	NaO,NO_5	85·3
sesquicarbonate	$2NaO,3CO_2$	128·6
hydrated	$2NaO,3CO_2+4HO$	164·6
sulphate (Glauber's salt)	NaO,SO_3	71·3
crystallized	NaO,SO_3+10HO	161·3
sulphite	NaO,SO_2	63·3
crystallized	NaO,SO_2+8HO	135·3
tartrate	$NaO,C_4H_2O_5$	97·3
crystallized	$NaO,C_4H_2O_5+2HO$	115·3
tribasic phosphate (medicinal phosphate)	$2NaO,HO,PO_5$	143·6
crystallized	$2NaO,HO,PO_5+24HO$	359·6
valerianate	$NaO,C_{10}H_9O_3$	124·3

Name.	*Symbol or Formula.*	*Equivalent.*
SODIUM or NATRIUM	Na	23·3
chloride (common salt)	NaCl	58·72
iodide	NaI	149·6
sesquioxide	Na_2O_3	70·6
Soluble tartar. See Potassa, tartrate.		
Starch	$C_{12}H_{10}O_{10}$	162
Strontia	SrO	51·8
STRONTIUM	Sr	43·8
Strychnia	$N_2C_{44}H_{23}O_4$	347
muriate	$N_2C_{44}H_{23}O_4,HCl$	383·42
Sugar, cane	$C_{12}H_{11}O_{11}$	171
of lead. See Lead, acetate of protoxide.		
of milk	$C_{24}H_{19}O_{19}$	315
crystallized	$C_{24}H_{19}O_{19}+5HO$	360
Sulphate of alumina and potassa (alum)	$Al_2O_3,3SO_3+KO,SO_3$	258·6
crystallized	$Al_2O_3,3SO_3+KO,SO_3+24HO$	474·6
Sulphate of ether and etherine	$C_4H_5O,SO_3+C_4H_4,SO_3$	145
SULPHUR	S	16
iodide (bisulphuret of iodine)	IS_2	158·3
Sulphuretted hydrogen. See Acid, hydrosulphuric.		
Tartar emetic. See Tartrate of antimony and potassa.		
Tartrate of antimony and potassa	$SbO_3,C_4H_2O_5+KO,C_4H_2O_5$	332·2
Tartrate of iron and potassa	$Fe_2O_3,C_4H_2O_5+KO,C_4H_2O_5$	259·2
Tartrate of potassa and soda	$KO,C_4H_2O_5+NaO,C_4H_2O_5$	210·5
TELLURIUM	Te	64·2
TERBIUM	Tb	?
Thebaina	$NC_{25}H_{14}O_3$	202
Thorina	ThO	67·6
THORIUM	Th	59·6
TIN or STANNUM	Sn	58·9
protochloride	SnCl	94·32
TITANIUM	Ti	25
TUNGSTEN or WOLFRAM	W	92
Turpeth mineral. See Mercury, subsulphate of deutoxide.		
URANIUM	U	60
Urea	$N_2C_2H_4O_2$	60
VANADIUM	V	68·5
Veratria	$NC_{34}H_{22}O_6$	288
Verdigris. See Copper, diacetate of protoxide.		
Vitriolated tartar. See Potassa, sulphate.		
Water. See Hydrogen, protoxide.		
White precipitate. See Mercury, ammoniated.		
vitriol. See Zinc, sulphate of protoxide.		
Yttria	YO	40·2
YTTRIUM	Y	32·2
ZINC	Zn	32·3
acetate of protoxide	$ZnO,C_4H_3O_3$	91·3
crystallized	$ZnO,C_4H_3O_3+7HO$	154·3
carbonate of protoxide (precipitated carbonate)	$8ZnO,3CO_2+6HO$	442·4
chloride	ZnCl	67·72
cyanuret	ZnCy	58·3
iodide	ZnI	158·6

Name.	*Symbol or Formula.*	*Equivalent.*
Zinc, protoxide (flowers of zinc) -	ZnO	40·3
sulphate of protoxide (white vitriol)	ZnO,SO_3	80·3
crystallized - - -	ZnO,SO_3+7HO	143·3
sulphuret (blende) - - -	ZnS	48·3
valerianate of protoxide - -	$ZnO,C_{10}H_9O_3$	133·3
Zirconia - - - - -	Zr_2O_3	91·2
ZIRCONIUM - - - - -	Zr	33·6

B.

V. CORRESPONDENCE BETWEEN DIFFERENT THERMOMETERS.

In *Fahrenheit's* thermometer, which is universally employed in this country and Great Britain, the freezing point of water is placed at 32°, and the boiling point at 212°, and the number of intervening degrees is 180.

The *Centigrade* thermometer, which has long been used in Sweden under the name of Celsius's thermometer, and is now most generally employed on the continent of Europe, marks the freezing point *zero*, and the boiling point 100°.

In *Reaumur's* thermometer, used in France before the revolution, the freezing point is at zero, and the boiling point at 80°.

In *De Lisle's* thermometer used in Russia, the graduation begins at the boiling point, which is marked *zero*, while the freezing point is placed at 150°.

From the above statement, it is evident that 180 degrees of Fahrenheit are equal to 100° of the centigrade, 80° of Reaumur, and 150° of De Lisle; or 1 degree of the first is equal to $\frac{5}{9}$ of a degree of the second, $\frac{4}{9}$ of a degree of the third, and $\frac{5}{6}$ of a degree of the last. It is easy, therefore, to convert the degrees of one into the equivalent number of degrees of the other; but, in ascertaining the corresponding points upon the different scales, it is necessary to take into consideration their different modes of graduation. Thus, as the zero of Fahrenheit is 32° below the point at which that of the centigrade and of Reaumur is placed, this number must be taken into account in the calculation. The following propositions will embrace all the cases which can arise in relation to the three last-mentioned thermometers. That of De Lisle is seldom or never referred to in works which are read in this country.

1. If any degree on the *centigrade* scale, either above or below zero, be multiplied by 9 and divided by 5, or if any degree of *Reaumur* above or below zero be multiplied by 9 and divided by 4, the quotient will, in either case, be the number of degrees above or below 32°, or the freezing point of *Fahrenheit.*

2. The number of degrees between any point of *Fahrenheit's* scale and 32°, if multiplied by 5 and divided by 9, will give the corresponding point on the *centigrade;* if multiplied by 4 and divided by 9, will give the corresponding point on the scale of *Reaumur.*

3. Any degree of the *centigrade* multiplied by 4 and divided by 5, will give the corresponding degree of *Reaumur;* and conversely, any degree of *Reaumur* multiplied by 5 and divided by 4, will give the corresponding degree of the *centigrade.*

VI. TABLES,

SHOWING THE SPECIFIC GRAVITY CORRESPONDING WITH THE SEVERAL DEGREES OF HYDROMETERS IN USE.

Baumé's hydrometer is usually employed in France. In this instrument, the sp. gr. of distilled water is assumed as the zero of the descending scale, in relation to fluids heavier than itself, while it is assumed as 10 on the ascending scale, in relation to lighter fluids. In the Pharmacopœia Batava, a modification of the instrument has been adopted, in which the sp. gr. of distilled water has been assumed as the zero of both scales. In the following tables, the specific gravity of liquids is given, corresponding with the several degrees of these two hydrometers. The first column of specific gravities, corresponding with Baumé's scale, is taken from the Paris Codex, and is, therefore, of high authority; the second is that which has been given in previous editions of this work, taken from Duncan's Edinburgh Dispensatory (A. D. 1830), and based on the calculations of Huss.

For Liquids lighter than Water.

Degree of hydrometer.	Specific Gravity.			Degree of hydrometer.	Specific Gravity.		
	By Baumé.		In Pharm. Batava.		By Baumé.		In Pharm. Batava.
0			1000	32	0·867	0·8638	819
1			993	33	0·862	0·8584	814
2			987	34	0·857	0·8531	810
3			980	35	0·852	0·8479	805
4			974	36	0·847	0·8428	800
5			967	37	0·842	0·8378	796
6			961	38	0·837	0·8329	792
7			954	39	0·832	0·8281	787
8			948	40	0·827	0·8233	782
9			941	41	0·823	0·8186	778
10	1·000	1·0000	935	42	0·818	0·8139	774
11	0·993	0·9930	929	43	0·813	0·8093	770
12	0·986	0·9861	923	44	0·809	0·8047	766
13	0·979	0·9792	917	45	0·804	0·8001	762
14	0·973	0·9724	911	46	0·800	0·7956	758
15	0·966	0·9657	906	47	0·795	0·7911	754
16	0·960	0·9591	900	48	0·791	0·7866	750
17	0·953	0·9526	895	49		0·7821	746
18	0·947	0·9462	889	50		0·7777	742
19	0·941	0·9399	884	51		0·7733	
20	0·935	0·9336	878	52		0·7689	
21	0·929	0·9274	873	53		0·7646	
22	0·923	0·9212	868	54		0·7603	
23	0·917	0·9151	863	55		0·7560	
24	0·911	0·9091	858	56		0·7518	
25	0·905	0·9032	852	57		0·7476	
26	0·800	0·8974	847	58		0·7435	
27	0·894	0·8917	842	59		0·7394	
28	0·889	0·8860	837	60		0·7354	
29	0·883	0·8804	832	61		0·7314	
30	0·878	0·8748	828	62		0·7251	
31	0·872	0·8693	823				

For Liquids heavier than Water.

Degree of hydrometer.	Specific Gravity.			Degree of hydrometer.	Specific Gravity.		
	By Baumé.		In Pharm. Batava.		By Baumé.		In Pharm. Batava.
0	1000	1·0000	1000	41	1398	1·3947	1398
1	1007	1·0070	1007	42	1412	1·4082	1412
2	1014	1·0141	1014	43	1426	1·4219	1426
3	1022	1·0213	1022	44	1440	1·4359	1440
4	1029	1·0286	1029	45	1454	1·4501	1454
5	1036	1·0360	1036	46	1470	1·4645	1470
6	1044	1·0435	1044	47	1485	1·4792	1485
7	1052	1·0511	1052	48	1501	1·4942	1501
8	1060	1·0588	1060	49	1516	1·5096	1516
9	1067	1·0666	1067	50	1532	1·5253	1532
10	1075	1·0745	1075	51	1549	1·5413	1549
11	1083	1·0825	1083	52	1566	1·5576	1566
12	1091	1·0906	1091	53	1583	1·5742	1583
13	1100	1·0988	1100	54	1601	1·5912	1601
14	1108	1·1071	1108	55	1618	1·6086	1618
15	1116	1·1155	1116	56	1637	1·6264	1637
16	1125	1·1240	1125	57	1656	1·6446	1656
17	1134	1·1326	1134	58	1676	1·6632	1676
18	1143	1·1414	1143	59	1695	1·6823	1695
19	1152	1·1504	1152	60	1715	1·7019	1714
20	1161	1·1596	1161	61	1736	1·7220	1736
21	1171	1·1690	1171	62	1758	1·7427	1758
22	1180	1·1785	1180	63	1779	1·7640	1779
23	1190	1·1882	1190	64	1801	1·7858	1801
24	1199	1·1981	1199	65	1823	1·8082	1823
25	1210	1·2082	1210	66	1847	1·8312	1847
26	1221	1·2184	1221	67	1872	1·8548	1872
27	1231	1·2288	1231	68	1897	1·8790	1897
28	1242	1·2394	1242	69	1921	1·9038	1921
29	1252	1·2502	1252	70	1946	1·9291	1946
30	1261	1·2612	1261	71	1974	1·9548	1974
31	1275	1·2724	1275	72	2002	1·9809	2002
32	1286	1·2838	1286	73	2031	2·0073	2031
33	1298	1·2954	1298	74	2059	2·0340	2059
34	1309	1·3072	1309	75	2087	2·0610	2087
35	1321	1·3190	1321	76	2116		2116
36	1334	1·3311	1334				
37	1346	1·3434	1346				
38	1359	1·3559	1359				
39	1372	1·3686	1372				
40	1384	1·3815	1384				

The French Codex employs Baumé's hydrometer to indicate the density of iquids heavier than water; but for those lighter than water, it has recourse to the instrument of *Cartier*, as the one most diffused in commerce. This differs from Baumé's only in a slight modification of the scale. In both, the lowest point is 10°; but 30° of Cartier correspond with 32° of Baumé, so that 20 degrees of the former are equivalent to 22 of the latter. Such, at least, was the original relation of the two instruments; but that of Cartier has subsequently undergone some slight modifications. The following table, extracted from the Codex, shows the value of the several degrees of Baumé's scale in those of Cartier's. The *centesimal alcoholmeter* of Gay-Lussac is applicable only to alcohol. The scale of this instrument is divided into 100 unequal degrees, the zero corresponding to pure water, and 100° to absolute alcohol; and every intermediate degree expresses the per centage of pure alcohol, by measure, contained in the liquors examined. Thus, when the instrument stands at 40° in any alcoholic liquid, it indicates that 100 parts of the liquid contain 40 of pure alcohol and 60 of water. But, as it was graduated for the temperature of 59° of Fahrenheit, the liquors to be tested should be brought to that temperature. In *page* 62 of this Dispensatory is a table indicating the specific gravity corresponding with each per centage of alcohol by weight; and as, in the table given in the next page, the value of Cartier's degrees in those of the alcoholmeter is stated, there can be no difficulty in converting the degrees of any one of these instruments into those of another, or of ascertaining the specific gravity, or the per centage of alcohol whether by measure or weight, to which they respectively correspond.

Table showing the Value of the Degrees of Baumé's Hydrometer in those of Cartier's.

Baumé.	Cartier.	Baumé.	Cartier.	Baumé.	Cartier.
10	10	23	21·94	36	33·88
11	10·92	24	22·85	37	34·80
12	11·84	25	23·77	38	35·72
13	12·76	26	24·69	39	36·63
14	13·67	27	25·61	40	37·55
15	14·59	28	26·53	41	38·46
16	15·51	29	27·44	42	39·40
17	16·43	30	28·38	43	40·31
18	17·35	31	29·29	44	41·22
19	18·26	32	30·31	45	42·14
20	19·18	33	31·13	46	43·06
21	20·10	34	32·04	47	43·98
22	21·02	35	32·96	48	44·90

Table showing the Value of the Degrees of Cartier's Hydrometer in those of Gay-Lussac's Centesimal Alcoholmeter.

Cartier.	Centesimal Alcoholmeter.	Cartier.	Centesimal Alcoholmeter.	Cartier.	Centesimal Alcoholmeter.
10	0·2	22	58·7	34	86·2
11	5·1	23	61·5	35	88
12	11·2	24	64·2	36	89·6
13	18·2	25	66·9	37	91·2
14	25·2	26	69·4	38	92·7
15	31·6	27	71·8	39	94·1
16	36·9	28	74	40	95·4
17	41·5	29	76·3	41	96·6
18	45·5	30	78·4	42	97·7
19	49·1	31	80·5	43	98·8
20	52·5	32	82·6	44	99·8
21	55·6	33	84·4		

INDEX.

A

Abbreviations, table of 1411
Abelmoschus esculentus 1340
Abelmoschus moschatus 1340
Abies balsamea 729
Abies Canadensis 564
Abies communis 563
Abies excelsa 563
Abies larix 730
Abies nigra 729
Abies pectinata 729
Abies picea 563, 729
Abies taxifolia 729
Absinthic acid 5
Absinthin 5
Absinthium 4
Absolute alcohol 852
Abuta 551
Acacia 5
Acacia Adansonii 6
Acacia Arabica 6
Acacia catechu 198
Acacia decurrens 7
Acacia Ehrenbergiana 6
Acacia floribunda 7
Acacia gummifera 6
Acacia karroo 6
Acacia Nilotica 6
Acacia nostras 7
Acacia Senegal 6
Acacia seyal 6
Acacia tortilis 7
Acacia vera 6
Acaciæ veræ succus 7
Acer saccharinum 632
Aceta 793
Acetate of alumina 1393
Acetate of ammonia, solution of 861
Acetate of amylic ether 1329
Acetate of copper 1289
Acetate of iron, tincture of 995
Acetate of lead 569
Acetate of magnesia 1289
Acetate of morphia 1087
Acetate of morphia, solution of 1088
Acetate of potassa 1133
Acetate of quinia 251
Acetate of soda 686
Acetate of zinc 1276
Acetated tincture of opium 1242
Acetic acid 15
Acetic acid, aromatic 799
Acetic acid, camphorated 798
Acetic acid, diluted 800
Acetic acid, glacial 16, 19
Acetic acid of commerce 15, 20
Acetic acid, strong 16
Acetic ether 1289
Acetic extract of colchicum 973
Acetification 13
Acetone 1385
Acetosella 1376
Acetum 12
Acetum Britannicum 14
Acetum cantharidis 795
Acetum colchici 796
Acetum destillatum 794
Acetum Gallicum 14
Acetum opii 796
Acetum scillæ 798
Achillea millefolium 1289
Achilleic acid 1289
Acid, acetic 15
Acid, aromatic sulphuric 816
Acid, arsenious 21
Acid, benzoic 800
Acid binitrate of deutoxide of mercury 1042
Acid, chlorohydric 35
Acid, citric 32
Acid, diluted acetic 800
Acid, diluted hydrocyanic 805
Acid, diluted muriatic 812
Acid, diluted nitric 812
Acid, diluted phosphoric 815
Acid, diluted sulphuric 816
Acid, gallic 803
Acid, hydrochloric 35
Acid, hydrocyanic 806
Acid, medicinal hydrocyanic 808
Acid, muriatic 35
Acid nitrate of mercury 1042
Acid, nitric 40
Acid, nitromuriatic 813
Acid, prussic 805
Acid, pure arsenious 903
Acid, pure nitric 813
Acid, pure sulphuric 818
Acid pyretin 1391
Acid, pyroligneous 15
Acid, sulphuric 45
Acid, tannic 819
Acid, tartaric 51
Acid, valerianic 745
Acida 799
Acids 799
Acidum aceticum 15, 17
Acidum aceticum camphoratum 798
Acidum aceticum dilutum 800
Acidum aceticum e ligno venale 15, 17
Acidum aceticum forte 16, 17
Acidum aceticum glaciale 16
Acidum arseniosum 21
Acidum, arseniosum purum 903
Acidum benzoicum 800
Acidum chromicum 1314
Acidum citricum 32
Acidum gallicum 803
Acidum hydriodicum 1341
Acidum hydrochloricum 35
Acidum hydrochloricum dilutum 812
Acidum hydrocyanicum 805
Acidum hydrocyanicum dilutum 805
Acidum lacticum 1354
Acidum muriaticum 35
Acidum muriaticum dilutum 812
Acidum muriaticum purum 35
Acidum muriaticum venale 35
Acidum nitricum 40
Acidum nitricum dilutum 812
Acidum nitricum purum 813
Acidum nitricum venale 40
Acidum nitromuriaticum 813
Acidum oxalicum 1373

Acidum phosphoricum dilutum 815
Acidum pyroligneum 15, 17
Acidum succinicum 1392
Acidum sulphuricum 45
Acidum sulphuricum aromaticum 816
Acidum sulphuricum dilutum 816
Acidum sulphuricum purum 818
Acidum sulphuricum venale 45
Acidum tannicum 819
Acidum tartaricum 51
Acipenser huso 403
Acipenser ruthenus 403
Acipenser stellatus 403
Acipenser sturio 403
Aconite leaves 54
Aconite root 54
Aconiti folia 54
Aconiti radix 54
Aconitia 56, 822
Aconitic acid 56
Aconitin 56
Aconitum anthora 54
Aconitum cammarum 54
Aconitum ferox 54
Aconitum lycoctonum 54
Aconitum napellus 55
Aconitum neomontanum 54
Aconitum Neubergense 55
Aconitum paniculatum 54
Aconitum Sinense 54
Aconitum Tauricum 54
Aconitum uncinatum 54
Acorus calamus 151
Acrid lettuce 442
Actæa alba 1290
Actæa Americana 1290
Actæa racemosa 217
Actæa rubra 1290
Actæa spicata 1290
Adansonia digitata 1290
Adeps 57
Adeps suillus 57
Adeps suillus præparatus 1253
Adhesive plaster 956, 957
Adiantum capillus veneris 1290
Adiantum pedatum 1290
Administering medicines, mode of 1408
Ærugo 305
Æsculus hippocastanum 1290
Æther 825
Æther aceticus 1289
Æther hydriodicus 1342
Æther hydrocyanicus 1342
Æther muriaticus 1363
Æther sulphuricus 825
Ætherea 825
Æthiops vegetabilis 1330
Æthylamine 534
African kino 433
Agar agar 1330
Agaric 1291
Agaric of the oak 1291
Agaric, purging 1291
Agaric, white 1291
Agathis Damarra 733
Agathosmas 148
Agathotes chirayta 215
Agave Americana 1292
Agave Virginica 1292
Agedoite 370
Agrimonia eupatoria 1292
Agrimony, common 1292
Aix la Chapelle water 112
Ajuga chamæpitys 1292
Ajuga pyramidalis 1292
Ajuga reptans 1292
Alantin 405
Albumen as an antidote for corrosive sublimate 1029
Albumen ovi 548
Albumen, vegetable 343
Albuminate of iron 1292–3
Albuminate of iron and potassa, syrup of 1292
Alceæ Ægyptiacæ 1340
Alchemilla vulgaris 1293
Alcohol, *Ed., Dub.* 852
Alcohol, *U. S.* 59
Alcohol, absolute 62, 852
Alcohol, ammoniated 864
Alcohol, amylic 851
Alcohol amylicum 851
Alcohol as a poison 63
Alcohol, diluted 854
Alcohol dilutum 854
Alcohol, methylic 701
Alcohol, preparations of 851
Alcohol, table of the sp. gr. of 62
Alcoholic extract of aconite 969
Alcoholic extract of belladonna 972
Alcoholic extract of hemlock 976
Alcoholic extract of henbane 979
Alcoholic fermentation 60
Alcoholic muriatic ether 1364
Alcoholic potassa 1132
Alcoholic solution of chloroform 849
Alcoholmeter, Gay-Lussac's centesimal 1433, 1434
Alcornoque 1293
Aldehyd 14, 838
Aldehyd resin 14, 838
Alder, American 1294
Alder, black 595
Alder, common European 1294
Ale 755
Alembic 778
Aleppo scammony 661
Aletris 64
Aletris farinosa 64
Alexandria senna 672
Alhagi Maurorum 464
Alisma plantago 1293
Alizarin 623
Alkalimetry 584
Alkanet 1293
Alkekengi 1381
Alliaria officinalis 1293
Allium 65
Allium Canadense 65
Allium cepa 1372
Allium porrum 1355
Allium sativum 65
Allspice 559
Allyle 66, 684
Almond confection 928
Almond emulsion 1076
Almond mixture 1076
Almond oil soap 650
Almonds, bitter 90, 91
Almonds, sweet 90, 91
Alnus glutinosa 1294
Alnus serrulata 1294
Aloe 67
Aloe Africana 69
Aloe arborescens 67, 72
Aloe Barbadensis 67
Aloe commelyni 67
Aloe ferox 69
Aloe hepatica 67
Aloe Indica 67, 71
Aloe multiformis 67
Aloe plicatilis 69
Aloe purpurascens 67, 72
Aloe Socotrina 68
Aloe spicata 67
Aloe vera 68
Aloe vulgaris 68
Aloes 67
Aloes, Barbadoes 71
Aloes, Bethelsdorp 69
Aloes, caballine 72
Aloes, Cape 69
Aloes, fetid 72
Aloes, hepatic 71
Aloes, horse 72
Aloes, Mocha 72
Aloes, shining 69
Aloes, Socotrine 69
Aloesin 73
Aloetic pills 1110
Aloin 73
Alpinia cardamomum 183
Alpinia galanga 1331
Alsop's infusion jar 1050
Alteratives 3
Althæa 76
Althæa officinalis 76
Althæa rosea 77
Althææ flores 76

Althææ folia 76
Althææ radix 76
Alum 77
Alum, dried 855
Alum, preparations of 855
Alum-root 385
Alum slate 77
Alum spring, Rockbridge 112
Alum stone 77
Alumen 77
Alumen exsiccatum 855
Alumen siccatum 855
Alumen ustum 855
Alumina 79
Alumina, acetate of 1393
Alumina and iron, sulphate of 1393
Alumina, sulphate of 1392
Alumina, tannate of 1396
Aluminæ et ferri sulphas 1393
Aluminæ sulphas 1392
Aluminæ tannas 1396
Aluminium 80
Aluminous schist 77
Alyon's ointment 1263
Amadou 1291
Amalgamation 117
Amber 713
Amber eupione 1365
Ambergris 1294
Ambra grisea 1294
Ambrein 1294
American agave 1292
American aloe 1292
American centaury 629
American columbo 354
American gentian 354
American hellebore 748
American ipecacuanha 336, 368
American sanicle 385
American senna 193
American silver fir 729
American spikenard 116
Amide 1047
Amidin 94
Amidogen 1047
Ammonia 81
Ammonia, aromatic spirit of 864
Ammonia, arseniate of 1298
Ammonia, benzoate of 1302
Ammonia, bicarbonate of 858
Ammonia, carbonate of 855
Ammonia, fetid spirit of 865
Ammonia, hydriodate of 1347
Ammonia, hydrochlorate of 85
Ammonia, hydrosulphuret of 858
Ammonia, muriate of 85
Ammonia, nitrosulphate of 1368
Ammonia, phosphate of 1380
Ammonia, preparations of 855
Ammonia, sesquicarbonate of 855
Ammonia, solution of 859
Ammonia, spirit of 863
Ammonia, stronger solution of 83
Ammonia, succinate of 1392
Ammonia, urate of 1401
Ammonia, water of 859
Ammoniac 88
Ammoniac mixture 1076
Ammoniac plaster 947
Ammoniacal alum 78
Ammoniacal ointment, vesicating 85
Ammoniacum 88
Ammoniacum præparatum 1023
Ammoniæ acetatis aqua 861
Ammoniæ aqua 859
Ammoniæ aqua fortior 83
Ammoniæ arsenias 1298
Ammoniæ benzoas 1302
Ammoniæ bicarbonas 858
Ammoniæ carbonas 855
Ammoniæ carbonatis aqua 858
Ammoniæ citratis liquor 863
Ammoniæ hydrochloras 85
Ammoniæ hydrosulphuretum 858
Ammoniæ liquor 859
Ammoniæ liquor fortior 83
Ammoniæ murias 85
Ammoniæ phosphas 1380
Ammoniæ sesquicarbonas 855
Ammoniæ uras 1401
Ammonia-meter 84
Ammoniated alcohol 864
Ammoniated copper 933
Ammoniated copper, solution of 935
Ammoniated iron 1019
Ammoniated mercury 1047
Ammoniated tincture of castor 1225
Ammoniated tincture of guaiac 1233
Ammoniated tincture of opium 1243
Ammoniated tincture of valerian 1249
Ammonii iodidum 1347
Ammonio-chloride of iron 1019
Ammonio-chloride of iron, tincture of 1019
Ammonio-chloride of silver 1313
Ammonio-citrate of iron 999
Ammonio-tartrate of iron 1294
Ammonium 81
Ammonium, chloride of 87
Ammonium, iodide of 1347
Ammonium, oxide of 82
Amomum angustifolium 182
Amomum cardamomum 181, 182
Amomum grana paradisi 182
Amomum maximum 181
Amomum melegueta 182
Amomum racemosum 181
Amomum repens 183
Amomum zingiber 762
Amorphous quinia 1171
Amygdala amara 90, 91
Amygdala dulcis 90, 91
Amygdalæ oleum 498
Amygdalic acid 92
Amygdalin 91
Amygdaline soap 650
Amygdalus communis 90
Amygdalus Persica 1379
Amylaceous ipecacuanha 418
Amyle, hydrated oxide of 851
Amylic acid 851
Amylic alcohol 851
Amylic ether, acetate of 1329
Amylic ether, valerianate of 1329
Amylum 93
Amyris caranna 1309
Amyris commiphora 1301
Amyris elemifera 324
Amyris Gileadensis 1299
Amyris kataf 488
Amyris tomentosum 1396
Anacardic acid 1295
Anacardium occidentale 1294
Anacyclus officinarum 599
Anacyclus pyrethrum 599
Anæsthetic compounds, chlorinated 1313
Anagallis arvensis 1295
Anagallis cærulea 1295
Anamirta cocculus 267
Anchusa Italica 1295
Anchusa officinalis 1295
Anchusa tinctoria 1293
Anchusic acid 1293
Anda Brasiliensis 1370
Anda Gomesii 1370
Anda, oil of 1370
Anderson's pills 1111
Andira inermis 1306
Andira retusa 1306
Andromeda arborea 1295
Andromeda mariana 1295
Andromeda speciosa 1295
Anemone, meadow 1295
Anemone nemorosa 1295
Anemone pratensis 1295
Anemone pulsatilla 1295
Anemonic acid 1296
Anemonin 1296
Anethum 96

Anethum fœniculum 352
Anethum graveolens 96
Angelica 97
Angelica archangelica 97
Angelica atropurpurea 97
Angelica-tree bark 116
Angelicic acid 98
Angola weed 437
Angustura 98
Angustura bark 98
Angustura, false 100
Anhydrous alcohol 62
Animal charcoal 177
Animal charcoal as an agent for procuring vegetable active principles 918
Animal charcoal, purified 917
Animal oil 86
Animé 1296
Anise 101
Anise water 890
Aniseed, star 101
Anise-tree, Florida 1344
Anisum 101
Annotta 1296
Anodyne enema 959
Anodyne liniment 1067
Anodynes 3
Antacids 3
Anthelmintics 3
Anthemis 102
Anthemis arvensis 102
Anthemis cotula 295
Anthemis nobilis 102
Anthemis pyrethrum 599
Anthemis tinctoria 102
Anthoxanthum odoratum 1400
Anthracite 176
Anthrakokali 1296
Anthrenus 168
Anthriscus cerefolium 1296
Antilithics 2
Antimonial ointment 1254
Antimonial powder 882
Antimonial wine 876
Antimonic acid 105
Antimonii et potassæ tartras 867
Antimonii oxidum 866
Antimonii oxysulphuretum 878
Antimonii potassio-tartras 867
Antimonii sulphuretum 106
Antimonii sulphuretum aureum 878
Antimonii sulphuretum præcipitatum 878
Antimonii sulphuretum præparatum 877
Antimonii tartarizati liquor 876
Antimonii terchloridi liquor 865
Antimonii tersulphuretum 106
Antimonious acid 105
Antimonium 104
Antimonium diaphoreticum 1325
Antimonium tartarizatum 867
Antimony 104
Antimony and potassa, tartrate of 867
Antimony ash 104
Antimony, crocus of 1322
Antimony, glass of 1333
Antimony, oxide of 866
Antimony, oxychloride of 1384
Antimony, oxysulphuret of 878
Antimony, precipitated sulphuret of 878
Antimony, preparations of 865
Antimony, prepared sulphuret of 877
Antimony, suboxide of 105
Antimony, sulphuret of 106
Antimony, tartarized 867
Antimony, teroxide of 866
Antirrhinic acid 313
Antirrhinum linaria 1297
Antispasmodics 2
Apiin 554
Apis mellifica 203, 473
Apium petroselinum 554
Apocynin 107
Apocynum androsæmifolium 106
Apocynum cannabinum 107
Aporetin 616
Apothecaries' measure 1415
Apothecaries' weight 1415
Apotheme 961
Appert's process 988
Apple essence 1329
Application of heat 775
Approximate measurement 1420
Aqua 108
Aqua acidi carbonici 887
Aqua aluminosa Bateana 855
Aqua ammoniæ 859
Aqua amygdalæ amaræ 889
Aqua anethi 890
Aqua anisi 890
Aqua Binelli 1297
Aqua calcis 911
Aqua camphoræ 890
Aqua carui 891
Aqua cassiæ 891
Aqua cinnamomi 891
Aqua destillata 884
Aqua fluvialis 110
Aqua fœniculi 891
Aqua fontana 110
Aqua fortis 40
Aqua lauro-cerasi 891
Aqua luciæ 650
Aqua menthæ piperitæ 892
Aqua menthæ pulegii 893
Aqua menthæ viridis 892
Aqua phagedænica 1027
Aqua picis liquidæ 566
Aqua pimentæ 892
Aqua pulegii 893
Aqua regia 813
Aqua rosæ 893
Aqua sambuci 893
Aqua sapphirina 307
Aquæ 885
Aquæ medicatæ 885
Aquilegia vulgaris 1297
Arabin 9
Aralia hispida 116
Aralia nudicaulis 115
Aralia racemosa 116
Aralia spinosa 116
Araucaria Dombeyi 733
Arbor vitæ 1400
Arbutus uva ursi 743
Arcanum duplicatum 592
Archangelica officinalis 97
Archil 438
Arctium lappa 443
Arctostaphylos uva ursi 743
Ardent spirits of commerce 61
Areca catechu 201, 1297
Areca nut 1297
Argel 672
Argemone Mexicana 1297
Argenti chloridum 1313
Argenti cyanuretum 895
Argenti iodidum 1347
Argenti nitras 896, 899
Argenti nitras fusus 899
Argenti oxidum 901
Argentine flowers of Antimony 105
Argentum 117
Argentum purificatum 117
Argol 580
Arica bark 237
Aricina 249
Aristolochia clematitis 676
Aristolochia hastata 677
Aristolochia hirsuta 677
Aristolochia Indica 676
Aristolochia longa 676
Aristolochia pistolochia 676
Aristolochia reticulata 677
Aristolochia rotunda 676
Aristolochia sagittata 677
Aristolochia semper virens 676
Aristolochia serpentaria 676
Aristolochia tomentosa 677
Armoracia 118

Arnica 119
Arnica montana 119
Arnicina 120
Arnotta 1296
Aromatic acetic acid 799
Aromatic confection 929
Aromatic mixture of iron 1078
Aromatic powder 1162
Aromatic spirit of ammonia 864
Aromatic spirit of vinegar 799
Aromatic sulphuric acid 816
Aromatic syrup of rhubarb 1209
Aromatic vinegar 799
Arrow-root 467
Arseniate of ammonia 1298
Arseniate of iron 1298
Arsenic 121
Arsenic acid 121
Arsenic, bisulphuret of 1385
Arsenic, iodide of 904
Arsenic, preparations of 903
Arsenic, teriodide of 904
Arsenic, tersulphuret of 1373
Arsenical paste 24
Arsenical solution 905
Arsenical solution of Pearson 23
Arsenici et hydrargyri hydriodatis liquor 904
Arsenici iodidum 904
Arsenici oxydum album venale 21
Arsenicum 121
Arsenicum album 21
Arsenicum purum 121
Arsenious acid 21
Arsenious acid as a poison 25
Arsenious acid, pure 903
Arsenious acid, tests for 29
Arsenite of potassa, solution of 905
Arsenite of quinia 251
Art of prescribing medicines 1407
Artanthe elongata 471
Artemisia abrotanum 4
Artemisia absinthium 4
Artemisia Chinensis, 4, 1362
Artemisia contra 1404
Artemisia glomerata 1404
Artemisia Indica 4, 1362
Artemisia Judaica 1404
Artemisia moxa 1362
Artemisia Pontica 4
Artemisia santonica 4, 1404
Artemisia vulgaris 4
Arterial stimulants 2
Artesian wells 110
Artichoke, garden 1324
Artificial camphor 519
Artificial gum 95
Artificial musk 1365
Artificial oil of bitter almonds 499, 1303
Artificial Seltzer water 887
Arum 122
Arum maculatum 122
Arum triphyllum 122
Asagræa officinalis 628
Asarabacca 1298
Asarin 1298
Asarone 1298
Asarum 122
Asarum camphor 1298
Asarum Canadense 123
Asarum Europæum 1298
Asbolin 1391
Asclepias curassavica 1298
Asclepias, flesh-coloured 124
Asclepias, gigantea 1308
Asclepias incarnata 124
Asclepias Syriaca 124
Asclepias tuberosa 125
Asclepias vincetoxicum 1324
Ash-bark 231
Ash-coloured cantharis 172
Asiatic pills 25
Asparagin 77
Asparagus 1298
Asparagus officinalis 1298
Asparamide 77
Asparmic acid 77
Aspartic acid 77
Aspen 1383
Asperula odorata 1400
Asphaltum 553
Aspidium filix fœmina 1299
Aspidium filix mas 350
Asplenium adiantum-nigrum 1299
Asplenium filix fœmina 1299
Asplenium scolopendrium 1389
Asplenium trichomanes 1299
Assacou 1340
Assafetida 126
Assafetida mixture 1077
Assafetida pills 1112
Assafetida plaster 948
Assafœtida 126
Assafœtida præparata 1023
Astragalus aristatus 738
Astragalus Creticus 737
Astragalus gummifer 737
Astragalus massiliensis 737
Astragalus strobiliferus 738
Astragalus tragacantha 737
Astragalus verus 738
Astringents 2
Athyrium filix fœmina 1299
Atkinson's depilatory 1373
Atropa belladonna 140
Atropa mandragora 1357
Atropia 141
Atropiæ sulphas 907
Attaleh 8
Attar of roses 517
Aurantii aqua 131
Aurantii cortex 129
Aurantii floris aqua 131
Aurantii oleum 131
Aurantium 129
Aurum 1334
Australian gum 9
Ava 472
Avena 132
Avena sativa 132
Avenæ farina 132
Avens 367
Avens, purple 367
Avens, water 366
Avoirdupois weight 1415
Axungia 57
Aya-pana 333
Aydendron laurel 1381
Azedarach 133
Azure 1391

B

Bacher, tonic pills of 978
Balaustines 373
Balm 474
Balm of Gilead 732, 1299
Balm of Gilead tree 729
Balsam apple 1361
Balsam, Canada 731
Balsam, Carpathian 729
Balsam, Hungarian 1386
Balsam of copaiva 286
Balsam of fir 731
Balsam of Gilead 1299
Balsam of Peru 134
Balsam of sulphur 496, 1299
Balsam of Tolu 137
Balsam, Riga 1386
Balsam weed 1345
Balsam, white 135
Balsamina 1361
Balsamito 136
Balsamodendron Gileadense 1299
Balsamodendron myrrha 488
Balsamum Canadense 727
Balsamum Carpaticum 1386
Balsamum Gileadense 1299
Balsamum Libani 1386
Balsamum Peruvianum 134
Balsamum Tolutanum 137
Balsamum tranquilans 1299
Balsamum traumaticum 1222
Balston Spa water 113
Banana essence 1329
Bancksia Abyssinica 1351
Baneberry 1290
Bang 338
Baobab 1290
Baphia nitida 1308
Baptisia tinctoria 1300
Barbadoes aloes 71
Barbadoes nuts 1300

Barbadoes petroleum 553
Barbadoes tar 552
Barbary gum 8
Barberry 1303
Barii chloridi liquor 909
Barii chloridum 908
Barii iodidum 1347
Barilla 691, 692
Barium 138
Barium, chloride of 908
Barium, iodide of 1347
Bark, Arica 237
Bark, ash 231
Bark, Bogota 245
Bark, Calisaya 233
Bark, Carabaya 236
Bark, Caribæn 247
Bark, coquetta 245
Bark, crown 229
Bark, Cusco 236, 237
Bark, Fusagasuga 245
Bark, gray 230
Bark, Huamilies 232
Bark, Huanuco 230
Bark, Jaen 231
Bark, light Calisaya 236
Bark, Lima 230
Bark, Loxa 229
Bark, Maracaybo 241
Bark, new 247
Bark of St. Ann 236
Bark, pale 228
Bark, Peruvian 218
Bark, Peruvian Calisaya 237
Bark, Pitaya 245
Bark, red 239
Bark, St. Lucia 247
Bark, Santa Martha 242
Bark, silver 230
Bark, yellow 233
Barks, Carthagena 241
Barks, false 246
Barks, non-officinal 241
Barley 389
Barley sugar 636
Barley water 940
Baroselenite 139
Barosma crenata 149
Barosma crenulata 148
Barosma serratifolia 148
Barras 731
Baryta 138
Baryta, carbonate of 139
Baryta, muriate of 908
Baryta, preparations of 908
Baryta, sulphate of 139
Baryta water 138
Barytæ carbonas 139
Barytæ murias 908
Barytæ sulphas 139
Barytina 747
Basil 1369
Basilicon ointment 925
Bassora gum 1300
Bassorin 1300
Bastard dittany 1326
Bastard ipecacuanha 1298
Bateman's drops 1244
Bates's alum water 855
Bath water 113
Baths 114
Baume de commandeur 1222
Baume tranquille 1299
Baumé's hydrometer 768
Baumé's hydrometer, table of the value of the degrees of, in sp. gr. 1431, 1432
Bay salt 696
Bay berries 444
Bay leaves 445
Bdellium 1301
Bead tree, common 134
Beaked hazel 1321
Bean of St. Ignatius 1301
Bearberry 743
Bear's-foot 1339
Beaver tree 460
Bebeerin 1301
Bebeeru bark 1301
Beccabunga 1404
Bedeguar 1302
Bedford spring water 112
Beech-drops 1372
Beef's marrow soap 650
Beer 755
Beet sugar 632
Belladonna 140
Belladonnin 140
Bendee 1340
Bengal cardamom 182
Bengal opium 530
Benjamin tree 144
Benne leaves 679
Benne oil 679
Benzene 1302
Benzine 1302
Benzoate of ammonia 1302
Benzoë amygdaloides 144
Benzoë in sortis 144
Benzoic acid 800
Benzoin 144
Benzoin, flowers of 801
Benzoin odoriferum 1302
Benzoïne 499
Benzoinum 144
Benzole 1302
Benzyle 499, 802
Berberin 279, 1303
Berberis Canadensis 1303
Berberis vulgaris 1303
Bergamot pear essence 1329
Bergamotæ oleum 500
Bestucheff's tincture of iron 998
Betel 1297
Betel-nut 1297
Bethelsdorp aloes 69
Betonica officinalis 1303
Betony, wood 1303
Betula alba 1303
Betula lenta 1303
Betula papyracea 1303
Betulin 1303
Bevilacqua 1342
Bezoar 1303
Bibasic phosphate of soda 1187
Biborate of soda 689
Bicarbonate of ammonia 858
Bicarbonate of potassa 1139
Bicarbonate of soda 1178
Bichloride of mercury 1025
Bichromate of potassa 579
Bicolorata (cinchona) 247
Bicyanuret of mercury 1035
Biferrocyanuret of potassium 806
Bignonia catalpa 1310
Bignonia sempervirens 1332
Bilate of soda 1377
Bilifulvin 1377
Bilin 1376
Biliverdin 1377
Biniodide of mercury 1037
Binoxalate of potassa 1376
Binoxide of mercury 1042
Birch, European 1303
Birch, sweet 1303
Bird-lime 1303
Bird-manure 1336
Bismuth 145
Bismuth, magistery of 911
Bismuth, nitrate of 910
Bismuth, subnitrate of 910
Bismuth, teroxide of 146
Bismuth, trisnitrate of 910
Bismuth, valerianate of 1402
Bismuth, white oxide of 910
Bismuthi nitras 910
Bismuthi subnitras 910
Bismuthi valerianas 1402
Bismuthum 145
Bismuthum album 910
Bistort 1304
Bisulphate of potassa 1146
Bisulphuret of carbon 1304
Bisulphuret of iodine 1198
Bisulphuret of mercury 1045
Bitartrate of potassa 580
Biting stone-crop 1390
Bitter almond water 889
Bitter almonds 90, 91
Bitter candytuft 1344
Bitter cucumber 275
Bitter polygala 578
Bittersweet 317
Bitumens 552
Bituminous coal 176
Bixa orellana 1296
Bixin 1296
Black alder 595
Black ash 691
Black birch 1383
Black cantharis 172

Black cyanuret of potassium 1151
Black draught 1061
Black drink 1344
Black drop 796, 797
Black flux 582
Black hellebore 381
Black ipecacuanha 418
Black lead 1309
Black mustard seeds 683
Black nightshade 318
Black oxide of iron 1010
Black oxide of manganese 462
Black oxide of mercury 1038
Black pepper 560
Black pitch 562
Black poplar 1383
Black poppy 525
Black salts 583
Black snakeroot 217, 1387
Black spruce 729
Black sulphuret of mercury 1044
Black wash 1033
Blackberry-root 623
Black-oak bark 602, 603
Bladder-senna 1320
Bladder-wrack 1329
Blazing star 64
Bleaching powder 155
Blende 760, 1284
Blessed thistle 1311
Blistering cloth 923
Blistering paper 923
Blistering plaster 921
Blisters, use of 170
Block-tin 704
Blood weed 1298
Bloodroot 645
Blooming spurge 335
Blue flag 421
Blue gentian 365
Blue mass 1119
Blue pills 1119
Blue stone 306
Blue vitriol 306
Blunt-leaved dock 625
Bog-bean 476
Bogota bark 243, 245
Boheic acid 1398
Bole Armenian 1305
Boles 1305
Boletus fomentarius 1292
Boletus igniarius 1291
Boletus laricis 1291
Boletus ribis 1292
Boletus ungulatus 1292
Bolus Veneta 1403
Bone 546
Bone-ash 547
Bone-black 177
Bone-earth 547
Bone-oil 1326
Bone-phosphate of lime 547
Boneset 333
Bone-spirit 85, 177
Bonplandia trifoliata 99
Boracic acid 689
Boracic acid, native 688
Borage 1305
Borago officinalis 1305
Borate of soda 687
Borax 687
Borax, octohedral 689
Borax, prismatic 689
Bordeaux turpentine 731
Borneo camphor 162
Boswellia serrata 1371
Botany Bay kino 433
Boullay's filter 782
Bouncing bet 1387
Brake, common 1299
Bran 342, 344
Brandy 702
Brandy mixture 1080
Brasiletto 1305
Brass 761
Brayera anthelmintica 1351
Brazil wood 1305
Brazilian sarsaparilla 655
Bread 343
Breselin 1305
Briançon manna 464
Brighton water 112
Brimstone 714
British barilla 692
British gum 94
British oil 521
British vinegar 12
Bromide of carbon 147
Bromide of iron 1305
Bromide of potassium 1149
Bromides of mercury 1305
Bromine 146
Brominium 146
Brooklime 1404
Broom 666
Broom, Spanish 1392
Broom-rape 1373
Broussonnetia tinctoria 1330
Brown mixture 1080
Brown sugar 631, 637
Brucea antidysenterica 100
Brucia 491
Bryonia alba 1306
Bryonia dioica 1306
Bryonin 1306
Bryony 1306
Bubon galbanum 355
Bucharian rhubarb 613, 615
Buchu 148
Buckbean 476
Buckthorn berries 607
Buckthorn juice 607
Bucku 148
Buckwheat 1304
Buena 219
Bugle, common 1292
Bugle-weed 455
Bugloss 1295
Burdock 442
Burgundy pitch 562
Burgundy pitch plaster 953
Burnett's disinfecting fluid 1282
Burning bush 1327
Burnt alum 855
Burnt hartshorn 292
Burnt sienna 1390
Burnt sponge 1192
Burnt umber 1401
Bursera gummifera 1309
Butea frondosa 433
Butea gum 433
Butter of antimony 866
Butter of zinc 1278
Buttercup 604
Butterfly-weed 125
Butternut 426
Button snakeroot 331, 1355
Butyrate of ethylic ether 1328
Butyric acid 1328
Butyric ether 1328

C

Caballine aloes 72
Cabbage-tree bark 1306
Cacao 1316
Cadmii sulphas 1393
Cadmium, sulphate of 1393
Cænotus 330
Cæsalpina Brasiliensis 1305
Cæsalpina crista 1305
Cæsalpina echinata 1305
Cæsalpina sappan 1305
Caffea Arabica 1317
Caffeic acid 1318
Caffein 1318
Caffein, citrate of 1319
Caffeo-tannic acid 1318
Cahinca 1306
Cahincic acid 1307
Cajeput oil 501
Cajuputi 501
Calamina 149
Calamina præparata 1277
Calamine 149
Calamine cerate 920
Calamine, prepared 1277
Calamus 151
Calamus aromaticus 151
Calamus draco 1326
Calamus rotang 1326
Calcii chloridum 152
Calcii sulphuretum 1394
Calcination 784
Calcined magnesia 1071
Calcined mercury 1041
Calcis carbonas præcipitatus 913
Calcis chlorinatæ liquor 916

Calcis murias 152
Calcis muriatis solutio 915
Calcis phosphas præcipitatum 916
Calcium 152
Calendula officinalis 1307
Calendulin 1307
Calico bush 1350
Calisaya bark 233, 234
Calisaya barks, false 235
Callicocca ipecacuanha 416
Calomel 1031
Calomel, iodides of 1349
Calomel pills 1121
Calomel pills, compound 1112
Calomelas 1031
Calophyllum inophyllum 1396
Calophyllum tacamahaca 1396
Calotropis gigantea 1308
Calotropis madarii Indico-orientalis 1308
Calumba 277
Calx 153
Calx chlorinata 154
Cam wood 1308
Cambogia 359
Camellia sasanqua 1398
Camphene 162
Camphor 159
Camphor, artificial 519
Camphor liniment 1066
Camphor liniment, compound 1066
Camphor tea 164
Camphor water 890
Camphora 159
Camphora officinarum 159
Camphorated acetic acid 798
Camphorated soap liniment 1067
Camphorated tincture of opium 1243
Camphorated tincture of soap 1246
Camphoric acid 161
Canada balsam 731
Canada fleabane 330
Canada pitch 564
Canada snakeroot 123
Canada turpentine 727, 731
Canarium commune 324
Canary seed 1308
Canary weed 437
Cancer-root 1372
Candytuft, bitter 1344
Cane brimstone 715
Cane sugar 632
Canella 165
Canella alba 165
Canna 166
Canna coccinea 166
Canna edulis 166
Canna starch 166
Cannabin 339
Cannabis Indica 338
Cannabis sativa 338
Cantharidal collodion 924
Cantharides 167
Cantharidin 168
Cantharis 166
Cantharis æneas 173
Cantharis albida 173
Cantharis aszelianus 173
Cantharis atrata 172
Cantharis cinerea 172
Cantharis marginata 172
Cantharis Nuttalli 173
Cantharis politus 173
Cantharis vesicatoria 167
Cantharis vittata 171
Caoutchouc 1308
Caoutchouc, vulcanized 1308
Cap cement 780
Cape aloes 69
Cape gum 9
Caper plant 1370
Caper-bush 1809
Caphopicrite 616
Capnomor 296
Capparis spinosa 1309
Caprification 349
Capsicin 174
Capsicum 173
Capsicum annuum 173
Capsicum baccatum 173
Capsicum frutescens 173
Capsules of gelatin 1333
Carabaya bark 236
Caracas kino 432
Caracas sarsaparilla 655
Caramel 636
Caranna 1309
Caraway 187
Caraway water 891
Carbo 175
Carbo animalis 177
Carbo animalis purificatus 917
Carbo ligni 179
Carbohydrogens 176
Carbolic acid 196
Carbon 175
Carbonate of ammonia 855
Carbonate of baryta 139
Carbonate of iron and manganese, saccharine 1360
Carbonate of iron, pills of 1116
Carbonate of iron, precipitated 1013
Carbonate of iron, saccharine 995
Carbonate of iron with sugar 995
Carbonate of lead 571
Carbonate of lime 299
Carbonate of lime, precipitated 913
Carbonate of lithia 1356
Carbonate of magnesia 455
Carbonate of manganese 1359
Carbonate of potassa 1136
Carbonate of potassa from pearlash 1136
Carbonate of potassa, impure 582
Carbonate of potassa, pure 1138
Carbonate of potassa, solution of 1139
Carbonate of soda 690
Carbonate of soda, dried 1178
Carbonate of soda, solution of 1178
Carbonate of zinc 1277
Carbonate of zinc, precipitated 1277
Carbonated waters 111, 112
Carbonic acid 889
Carbonic acid water 887
Carburet of iron 1309
Carburet of sulphur 1304
Cardamine pratensis 1309
Cardamom 181
Cardamomum 181
Cardamomum longum 181
Cardamomum majus 181, 182
Cardamomum medium 181
Cardamomum minus 181
Cardinal flower 454
Cardol 1295
Carduus benedictus 1311
Caribæan bark 247
Carminative, Dalby's 458
Carminatives 3
Carmine 270
Carnation 1325
Carolina jasmine 1332
Carolina pink 698
Carota 184
Carotin 185
Carpathian balsam 729
Carpobalsamum 1299
Carrageen 216
Carrageenin 216
Carrara marble 469
Carron oil 1066
Carrot ointment 186
Carrot root 184, 185
Carrot seed 184, 185
Carthagena barks 241
Carthagena ipecacuanha 417
Carthamic acid 186
Carthamine 186
Carthamus 186
Carthamus tinctorius 186
Cartier's hydrometer 1433
Carui 187
Carum 187
Carum carui 187
Carvacrol 1099

Carvene 310
Carvole 310
Caryophyllic acid 1100
Caryophyllin 189
Caryophyllus 188
Caryophyllus aromaticus 188
Cascarilla 190, 219
Cascarillin 191
Casein 343
Cashew nut 1294
Cassava 725
Cassia 192, 266
Cassia acutifolia 670
Cassia Æthiopica 671, 672
Cassia Brasiliana 193
Cassia buds 267
Cassia caryophyllata 1321
Cassia elongata 671
Cassia fistula 192
Cassia lanceolata 671, 672
Cassia lignea 265
Cassia Marilandica 193
Cassia obovata 671
Cassia obtusata 671
Cassia ovata 671
Cassia præparata 1160
Cassia, purging 192
Cassia senna 670
Cassiæ cortex 262
Cassiæ fistulæ pulpa 1160
Cassiæ oleum 503
Cassiæ pulpa 1160
Cassina 1344
Cassumuniar 1405
Cassuvium pomiferum 1294
Cast iron 344
Castanea 194
Castanea pumila 194
Castile soap 651
Castillon's powders 915
Castor 195
Castor fiber 195
Castor oil 513
Castoreum 195
Castorin 196
Cat thyme 1399
Catalpa cordifolia 1310
Catalpa tree 1310
Cataplasm of chlorinated soda 920
Cataplasma carbonis 919
Cataplasma conii 919
Cataplasma fermenti 919
Cataplasma lini 919
Cataplasma sinapis 919
Cataplasma sodæ chlorinatæ 920
Cataplasmata 918
Cataplasms 918
Cataria 197
Catawba tree 1310
Catch-fly 1390
Catechu 198
Catechuic acid 201
Catechuin 201
Catechus, non-officinal 200
Cathartic clyster 959
Cathartics 2
Cathartin 608, 675
Cathartocarpus fistula 192
Catmint 197
Catnep 197
Caustic potassa 1131
Caustics 2
Causticum commune acerrimum 1132
Causticum commune mitius 1133
Cayenne cinnamon 266
Cayenne pepper 173
Ceanothus Americanus 1310
Cedar apples 429
Cedar oil 430
Cedar, red 429
Cedrin 1310
Cedron 1310
Celandine 1311
Celastrus scandens 1311
Cements 780
Centaurea benedicta 1311
Centaurin 203
Centaurium 203
Centaury, American 629
Centaury, European 203
Centesimal alcoholmeter 769, 1433
Cepa 1372
Cephaëlis ipecacuanha 416
Cera 203
Cera alba 204
Cera flava 204
Cerain 205
Cerasin 9
Cerasus lauro-cerasus 443
Cerasus serotina 597
Cerasus Virginiana 597
Cerata 920
Cerate of carbonate of zinc 927
Cerate of mercury, compound 925
Cerate of Spanish flies 921
Cerate of subacetate of lead 925
Cerate, simple 927
Cerated glass of antimony 1333
Cerates 920
Ceratum 927
Ceratum calaminæ 920
Ceratum cantharidis, *Lond.* 1255
Ceratum cantharidis, *U. S.* 921
Ceratum cetacei 924
Ceratum hydrargyri compositum 925
Ceratum plumbi acetatis 1265
Ceratum plumbi compositum 925
Ceratum plumbi subacetatis 925
Ceratum resinæ 925
Ceratum resinæ compositum 926
Ceratum sabinæ 926
Ceratum saponis 926
Ceratum saponis compositum 926
Ceratum simplex, *Ed.* 924
Ceratum simplex, *U. S.* 927
Ceratum zinci carbonatis 927
Cerevisiæ fermentum 207
Cerin 205
Cerotic acid 205
Cerotine 205
Ceroxylon Andicola 206
Ceruse 571
Cerussa acetata 569
Cervus elaphus 292
Cervus Virginianus 292
Cetaceum 209
Cetic acid 209
Cetin 209
Cetraria 210
Cetraria Islandica 210
Cetraric acid 211
Cetrarin 210
Cevadic acid 628
Cevadilla 627
Ceylon cardamom 181
Ceylon cinnamon 266
Ceylon gamboge 360
Ceylon moss 1330
Chærophyllum sativum 1296
Chalk 299
Chalk mixture 1078
Chalk, prepared 914
Chalybeate bread 1354
Chalybeate waters 111, 112
Chamædrys 1399
Chamæpitys 1292
Chamomile 102
Chamomile, German 472
Chamomile, wild 295
Charcoal 179
Charcoal, animal 177
Charcoal cataplasm 919
Charcoal, pure 175
Cheese rennet 1331
Chelæ cancrorum 1322
Chelerythrin 1312
Chelidonic acid 1311
Chelidonin 1312
Chelidonium majus 1311
Chelidoxanthin 1312
Cheltenham salt, artificial 1312
Cheltenham water 112, 113
Chemical operations 780
Chenopodium 212
Chenopodium ambrosioides 213
Chenopodium anthelminticum 212

Chenopodium botrys 213
Cherry birch 1303
Cherry-laurel 443
Cherry-laurel water 891
Chervil 1296
Chian turpentine 728, 732
Chicory 1314
Chillies 174
Chimaphila 213
Chimaphila maculata 214
Chimaphila umbellata 213
China root 653
China wax 206
Chinese camphor 160
Chinese cinnamon 266
Chinese galls 357
Chinese rhubarb 612
Chinoidine 1171
Chinquapin 194
Chiococca anguifuga 1306
Chiococca densifolia 1306
Chiococca racemosa 1306
Chirayta 215
Chiretta 215
Chironia angularis 629
Chironia centaurium 203
Chlorate of potassa 585
Chloric ether, strong 849
Chloride of aluminium 1393
Chloride of ammonium 87
Chloride of arsenic, solution of 903
Chloride of barium 908
Chloride of barium, solution of 909
Chloride of calcium 152
Chloride of calcium, solution of 915
Chloride of ethyle 1363
Chloride of gold 1334
Chloride of gold and sodium 1335
Chloride of iron, tincture of 996
Chloride of lime 155
Chloride of magnesium 1312
Chloride of mercury and quinia 1312
Chloride of olefiant gas 1313
Chloride of potassa, solution of 1312
Chloride of silver 1313
Chloride of soda, solution of 1181
Chloride of sodium 695
Chloride of sodium, pure 1185
Chloride of zinc 1278
Chloride of zinc, solution of 1281
Chlorinated anæsthetic compounds 1313
Chlorinated chlorohydric ether 1313
Chlorinated lime 154
Chlorinated lime, solution of 916
Chlorinated muriatic ether 1314
Chlorinated soda, solution of 1181
Chlorine 895
Chlorine water 894
Chlorinii liquor 894
Chloroaurate of ammonia 1335
Chloroform 840
Chloroform, methylic 842
Chloroformum 840
Chloroformyl 840
Chlorogenic acid 1318
Chlorohydric acid 35
Chlorophylle 323
Chocolate 1317
Chocolate nuts 1316
Choke cherry 597
Cholepyrrhin 1377
Cholesterin 1376
Cholic acid 1377
Cholinic acid 1377
Chondrus 216
Chondrus crispus 216
Christmas rose 381
Chrome green 1314
Chrome yellow 1314
Chromic acid 1314
Chrysanthemum parthenium 1385
Chrysene 713
Chrysophanic acid 616
Chrysophyllum glycyphlæum 1361
Chrysoretin 675
Chulariose 631
Churrus 339
Cicer arietinum 1373
Cichorium endivia 1314
Cichorium intybus 1314
Cicindela 166
Cicuta 281
Cicuta maculata 1315
Cicuta virosa 1314
Cider 755
Cimicifuga 217
Cimicifuga racemosa 217
Cimicifuga serpentaria 217
Cincholin 253
Cinchona 218
Cinchona acutifolia 219
Cinchona amygdalifolia 224
Cinchona asperifolia 224
Cinchona australis 224
Cinchona Boliviana 223
Cinchona caduciflora 224
Cinchona Calisaya 221
Cinchona Carabayensis 224
Cinchona cava 219
Cinchona Chomeliana 224
Cinchona cinerea 218, 230
Cinchona Condaminea 221
Cinchona cordifolia 222
Cinchona coronæ 218
Cinchona crassifolia 224
Cinchona dichotoma 224
Cinchona flava 218, 233
Cinchona glandulifera 224
Cinchona hirsuta 223
Cinchona Humboldtiana 223
Cinchona Josephiana 221
Cinchona lanceolata 223
Cinchona lancifolia 222
Cinchona lucumæfolia 223
Cinchona macrocalyx 224
Cinchona macrocarpa 219
Cinchona magnifolia 219
Cinchona micrantha 222
Cinchona Mutisii 224
Cinchona Muzonensis 224
Cinchona nitida 223
Cinchona oblongifolia 219
Cinchona officinalis 219
Cinchona ovalifolia 223
Cinchona ovata 223
Cinchona pallida 218, 228
Cinchona pelalba 224
Cinchona Pitayensis 222, 246
Cinchona pubescens 223
Cinchona purpurascens 224
Cinchona purpurea 223
Cinchona rotundifolia 224
Cinchona rubra 219, 239
Cinchona scrobiculata 222
Cinchona stenocarpa 219
Cinchona, testing of 257
Cinchona villosa 224
Cinchonia 252, 1170
Cinchonia, kinate of 255
Cinchonia, sulphate of 252, 1170
Cinchonic acid 255
Cinchonic red 250
Cinchonicine 254
Cinchonidia 254
Cinchonidine 254
Cinchotannic acid 250
Cinchovatin 249
Cinnabar 1045
Cinnabaris 1045
Cinnameine 136
Cinnamic acid 503
Cinnamomi oleum 502
Cinnamomum 262
Cinnamomum aromaticum 264
Cinnamomum cassia 264
Cinnamomum culilawan 264, 1324
Cinnamomum Loureirii 264
Cinnamomum nitidum 264
Cinnamomum rubrum 264
Cinnamomum sintoc 264
Cinnamomum tamala 264
Cinnamomum Zeylanicum 263
Cinnamon 262

Cinnamon water 891
Cinnamyle 504
Cinquefoil 1384
Cissampelina 552
Cissampelos glaberrima 551
Cissampelos pareira 551
Cistus Canadensis 380
Cistus Creticus 1352
Cistus ladaniferus 1352
Cistus laurifolius 1352
Citrate of ammonia, solution of 863
Citrate of caffein 1319
Citrate of iron 998
Citrate of iron and magnesia 1315
Citrate of iron and quinia 1315
Citrate of magnesia, solution of 1071
Citrate of potassa 1142
Citrate of potassa, solution of 1143
Citrate of quinia 251
Citrate of soda 1315
Citrated effervescing powders 1164
Citric acid 32
Citrine ointment 1260
Citron 447
Citrullus colocynthis 275
Citrus acris 447
Citrus aurantium 130
Citrus bigaradia 130
Citrus decumana 130
Citrus limetta 500
Citrus limonium 447
Citrus medica 446
Citrus vulgaris 130
Civet 1315
Claret 752
Clarification 774
Clarified honey 1073
Clarry 644
Cleansing of vessels 787
Cleavers 1331
Clematis crispa 1316
Clematis erecta 1315
Clematis flammula 1316
Clematis viorna 1316
Clematis Virginica 1316
Clematis vitalba 1316
Climbing staff-tree 1311
Cloud berry 623
Clove bark 1321
Clove pink 1325
Cloves 188
Club-moss 1357
Clyster, cathartic 959
Clyster of aloes 958
Clyster of assafetida 958
Clyster of colocynth 959
Clyster of opium 959
Clyster of turpentine 960
Clysters 958
Cnicin 1311
Cnicus benedictus 1311
Coal-fish 506
Coal-gas liquor 856
Cobalt blue 1316
Cobweb 1316
Coccoloba uvifera 432
Cocculus 267
Cocculus Indicus 267
Cocculus lacunosus 268
Cocculus Levanticus 268
Cocculus palmatus 278
Cocculus Plukenetii 268
Cocculus suberosus 267
Coccus 269
Coccus cacti 269
Coccus Ilicis 269
Coccus lacca 1352
Cochineal 269
Cochinilin 270
Cochlearia armoracia 118
Cochlearia officinalis 1316
Cocin 1317
Cocinic acid 1317
Cocoa 1316
Cocoa butter 1317
Cod, common 506
Codeia 535
Cod-liver oil 506
Coffee 1317
Cohobation 778, 1097
Cohosh 217
Cohosh, red 1290
Cohosh, white 1290
Coke 176
Colchici cormus 271
Colchici radix 271, 272
Colchici semen 271, 275
Colchicia 273
Colchicum autumnale 271
Colchicum root 271
Colchicum seed 271
Colchicum variegatum 1340
Colcothar 47
Cold bath 115
Cold cream 1254
Cold seeds, greater 1323
Collecting of plants 765
Collinsonia Canadensis 1320
Collodion 849
Collodion, cantharidal 924
Collodium 849
Colocynth 275
Colocynthin 276
Colocynthis 275
Colomba 277
Colombin 279
Colophonic acid 606
Colophony 605, 731
Coloquintida 275
Colouring principles of plants 1346
Coltsfoot 1401
Columbic acid 279
Columbine 1297
Columbo 277
Columbo, American 354
Columbo, false 280
Columbo wood 280
Colutea arborescens 1320
Comfrey 1396
Commercial muriatic acid 35
Commercial nitric acid 41
Commercial sulphate of iron 348
Commercial sulphuric acid 45
Common caustic, milder 1133
Common caustic, strongest 1132
Common salt 695
Common silkweed 124
Common water 109
Compound calomel pills 1112
Compound camphor liniment 1066
Compound cathartic pills 1113
Compound cerate of mercury 925
Compound confection of catechu 929
Compound decoction of aloes 936
Compound decoction of barley 941
Compound decoction of broom 944
Compound decoction of flaxseed 941
Compound decoction of sarsaparilla 943
Compound extract of colocynth 975
Compound galbanum plaster 950
Compound honey of squill 1213
Compound infusion of catechu 1053
Compound infusion of flaxseed 1058
Compound infusion of gentian 1056
Compound infusion of orange peel 1052
Compound infusion of Peruvian bark 1053
Compound infusion of roses 1059
Compound infusion of senna 1061
Compound liniment of ammonia 1065
Compound mixture of gentian 1079
Compound mixture of iron 1079

Compound mixture of liquorice 1080
Compound ointment of galls 1257
Compound ointment of iodine 1264
Compound ointment of lead 1265
Compound pill of chloride of mercury 1112
Compound pill of colocynth 1114
Compound pill of gamboge 1113
Compound pill of hemlock 1115
Compound pill of storax 1124
Compound pills of aloes 1111
Compound pills of galbanum 1118
Compound pills of iron 1117
Compound pills of rhubarb 1123
Compound pills of soap 1123
Compound pills of squill 1123
Compound plaster of Spanish flies 949
Compound powder of aloes 1161
Compound powder of alum 1162
Compound powder of antimony 882
Compound powder of catechu 1162
Compound powder of chalk 1163
Compound powder of chalk with opium 1163
Compound powder of ipecacuanha 1164
Compound powder of jalap 1165
Compound powder of kino 1165
Compound powder of rhubarb 1166
Compound powder of scammony 1166
Compound powder of tragacanth 1166
Compound resin cerate 926
Compound saline powder 1166
Compound solution of alum 855
Compound solution of iodide of potassium 1157
Compound solution of iodine 1064
Compound spirit of ether 834
Compound spirit of horseradish 1189
Compound spirit of juniper 1190
Compound spirit of lavender 1190
Compound sulphur ointment 1267
Compound syrup of sarsaparilla 1211
Compound syrup of squill 1212
Compound tincture of ammonia 1220
Compound tincture of benzoin 1222
Compound tincture of cardamom 1224
Compound tincture of cinnamon 1228
Compound tincture of colchicum 1229
Compound tincture of gentian 1232
Compound tincture of iodine 1236
Compound tincture of Peruvian bark 1227
Compound tincture of quassia 1244
Compound tincture of quinia 1244
Compound tincture of rhubarb 1245
Compound tincture of senna 1247
Comptonia asplenifolia 1320
Concrete oil of nutmeg 487
Concrete oil of wine 833
Confectio amygdalæ 928
Confectio aromatica 929
Confectio aurantii corticis 929
Confectio cassiæ 929
Confectio catechu composita 929
Confectio opii 930
Confectio piperis 930
Confectio rosæ 931
Confectio rosæ caninæ 931
Confectio rutæ 931
Confectio scammonii 932
Confectio sennæ 932
Confectio sulphuris 933
Confectio terebinthinæ 933
Confection, aromatic 929
Confection of black pepper 930
Confection of cassia 929
Confection of catechu, compound 929
Confection of dog rose 931
Confection of opium 930
Confection of orange peel 929
Confection of roses 931
Confection of rue 931
Confection of scammony 932
Confection of senna 932
Confection of sulphur 933
Confection of turpentine 933
Confectiones 927
Confections 927
Conia 282
Conii folia 280
Conii semen 280
Coniic acid 282
Conium 280
Conium maculatum 280
Conserva amygdalarum 928
Conserva aurantii 929
Conserva rosæ 931
Conserva rosæ fructûs 931
Conserve of roses 931
Conserves 928
Constantinople opium 529
Contrayerva 285
Contusion 770
Convallaria majalis 1320
Convallaria multiflora 1320
Convallaria polygonatum 1320
Convolvulus batatas 93
Convolvulus jalapa 422
Convolvulus Orizabensis 424
Convolvulus panduratus 285
Convolvulus scammonia 660
Cooper's gelatin 404
Copaiba 286
Copaifera Beyrichii 286
Copaifera bijuga 286
Copaifera cordifolia 286
Copaifera coriacea 286
Copaifera Guianensis 286
Copaifera Jaquini 286
Copaifera Jussieui 286
Copaifera Langsdorffii 286
Copaifera laxa 286
Copaifera Martii 286
Copaifera multijuga 286
Copaifera nitida 286
Copaifera oblongifolia 286
Copaifera officinalis 286
Copaifera Sellowii 286
Copaiva balsam 286
Copaivic acid 288
Copal 1320
Copalchi bark 190
Copalm balsam 1356
Copper 304
Copper, acetate of 1289
Copper, ammoniated 933
Copper as a poison 304
Copper, nitrate of 1367
Copper, preparations of 933
Copper, subacetate of 305
Copper, sulphate of 306, 935
Copperas 348
Coptis 290
Coptis teeta 291
Coptis trifolia 290
Coquetta bark 243, 245
Coral 1321
Corallium rubrum 1321

Coriander 291
Coriandrum 291
Coriandrum sativum 291
Coriaria myrtifolia 673
Corinthian currants 742
Corn poppy 618
Corn spirit oil 851
Cornine 294
Cornu 292
Cornu ustum 292
Cornus circinata 292
Cornus Florida 293
Cornus sericea 294
Correspondence between different thermometers 1430
Corrosive chloride of mercury 1025
Corrosive sublimate 1025
Corsican moss 1330
Cortex caryophyllata 1321
Cortex culilaban 1324
Cortex frangulæ 608
Corylus rostrata 1321
Coscinium fenestratum 280
Cosso 1351
Cotarnine 533
Cotton 371
Cotton, gun 1337
Cotula 294
Cotyledon umbilicus 1322
Couch grass 1401
Coumarin 1400
Coumarouna odorata 1400
Court plaster, 404, 1222
Cowbane 1314
Cowhage 484
Cow-parsnep 385
Coxe's hive syrup 1213
Crabs' claws 1322
Crabs' eyes 1322
Crabstones 1322
Cranesbill 365
Crawfish, European 1322
Cream of tartar 580
Cream of tartar, soluble 689
Cream of tartar whey 582
Creasote 295
Creasote mixture 1078
Creasotum 295
Cremor tartari 580
Creta 299
Creta præcipitata 913
Creta præparata 914
Crocus 300
Crocus of antimony 1322
Crocus sativus 300
Croton benzoë 144
Croton cascarilla 191
Croton Eleuteria 190
Croton lacciferum 1352
Croton lineare 191
Croton oil 521
Croton oil liniment 1067
Croton pavana 523
Croton pseudo-china 190
Croton suberosum 190
Croton tiglium 521
Crotonic acid 522
Crotonin 522
Crotonis oleum 521
Crowfoot 604
Crown bark of Loxa 229
Crucibles 776
Crumb of bread 344
Crystal mineral 590
Crystallization 783
Crystals of tartar 580
Crystals of Venus 306, 1289
Cubeba 302
Cubebin 303
Cubebs 302
Cubic nitre 1367
Cubic pyrites 1018
Cuckoo-flower 1309
Cucumber ointment 1323
Cucumber seeds 1323
Cucumber tree 461
Cucumis colocynthis 275
Cucumis melo 1323
Cucumis sativus 1323
Cucurbita citrullus 1323
Cucurbita lagenaria 1323
Cucurbita pepo 1323
Cudbear 438
Cudweed 1334
Cuichunchulli 419, 1350
Culilawan 1324
Culver's physic 1355
Cumin plaster 949
Cumin seed 310
Cuminum 310
Cuminum cyminum 310
Cunila mariana 1324
Cunila pulegioides 379
Cupellation 117
Cupels 547
Cupri acetas 1289
Cupri ammoniati solutio 935
Cupri ammonio-sulphas 933
Cupri nitras 1367
Cupri subacetas 305
Cupri subacetas præparatum 933
Cupri sulphas 306, 935
Cupri sulphas venalis 306
Cupro-sulphate of ammonia 934
Cuprum 304
Cuprum ammoniatum 933
Curcas multifidus 1300
Curcas purgans 1300
Curcuma 308
Curcuma angustifolia 467
Curcuma longa 308
Curcuma rotunda 308
Curcuma zedoaria 1405
Curcuma zerumbet 1405
Curcumin 308
Currant wine 755
Currants, Corinthian 742
Cusco bark 236, 237
Cusparia 98
Cusparia febrifuga 98, 99
Cusparin 100
Cusso 1351
Cuttle-fish bone 1324
Cyanide of silver 895
Cyanogen 810
Cyanohydric acid 805
Cyanuret of ethyle 1342
Cyanuret of gold 1335
Cyanuret of mercury 1035
Cyanuret of potassium 1150
Cyanuret of silver 895
Cyanuret of zinc 1324
Cycas circinalis 639
Cycas revoluta 639
Cydonia vulgaris 309
Cydonin 310
Cydonium 309
Cyminum 310
Cynanchum argel 672
Cynanchum Monspeliacum 663
Cynanchum oleæfolium 672
Cynanchum vincetoxicum 1324
Cynara scolymus 1324
Cynips quercûsfolii 357
Cynoglossum officinale 1325
Cypripedium acaule 1325
Cypripedium humile 1325
Cypripedium parviflorum 1325
Cypripedium pubescens 1325
Cypripedium spectabile 1325
Cytisin 120
Cytisus laburnum 120
Cytisus scoparius 667

D

Daffodil 1366
Dalby's carminative 458
Damarra turpentine 733
Dandelion 726
Daphne Alpina 479
Daphne gnidium 478
Daphne laureola 478
Daphne mezereum 478
Daphnin 479
Datura ferox 710
Datura stramonium 709
Datura tatula 709
Daturia 710
Dauci radix 184
Daucus carota 184
De Valangin's arsenical solution 903
Deadly nightshade 140
Decantation 772
Decocta 935
Decoction 781

Decoction of aloes, compound 936
Decoction of barley 940
Decoction of barley, compound 941
Decoction of bittersweet 939
Decoction of broom 944
Decoction of broom, compound 944
Decoction of dandelion 945
Decoction of dogwood 939
Decoction of elm bark 945
Decoction of flaxseed, compound 941
Decoction of galls 939
Decoction of guaiacum wood 940
Decoction of Iceland moss 937
Decoction of logwood 940
Decoction of mezereon 941
Decoction of myrrh 941
Decoction of oak bark 942
Decoction of pale bark 938
Decoction of pareira brava 942
Decoction of pipsissewa 937
Decoction of pomegranate 939
Decoction of pomegranate root 939
Decoction of poppy 941
Decoction of quince seed 939
Decoction of red bark 938
Decoction of sarsaparilla 942
Decoction of sarsaparilla, compound 943
Decoction of seneka 945
Decoction of the woods 940
Decoction of tormentil 945
Decoction of uva ursi 945
Decoction of white oak bark 942
Decoction of wintergreen 937
Decoction of yellow bark 938
Decoction of Zittmann 944
Decoctions 935
Decoctum ad ictericos 1312
Decoctum alöes compositum 936
Decoctum amyli 1093
Decoctum cetrariæ 937
Decoctum chimaphilæ 937
Decoctum cinchonæ 938
Decoctum cinchonæ flavæ 938
Decoctum cinchonæ pallidæ 938
Decoctum cinchonæ rubræ 938
Decoctum cornûs Floridæ 939
Decoctum cydonii 939
Decoctum dulcamaræ 939
Decoctum gallæ 939
Decoctum granati 939
Decoctum granati radicis 939
Decoctum guaiaci 940
Decoctum hæmatoxyli 940
Decoctum hordei 940
Decoctum hordei compositum 941
Decoctum lichenis Islandici 937
Decoctum lini compositum 941
Decoctum mezerei 941
Decoctum myrrhæ 941
Decoctum papaveris 941
Decoctum pareira 942
Decoctum pyrolæ 937
Decoctum quercûs 942
Decoctum quercûs albæ 942
Decoctum sarsaparillæ 942
Decoctum sarsaparillæ compositum 943
Decoctum scoparii 944
Decoctum scoparii compositum 944
Decoctum senegæ 945
Decoctum taraxaci 945
Decoctum tormentillæ 945
Decoctum ulmi 945
Decoctum uvæ ursi 945
Decoctum Zittmanni 944
Deer-berry 362
Delphinia 311, 705
Delphinium 310
Delphinium consolida 311
Delphinium exaltatum 311
Delphinium staphisagria 705
Demulcents 2
Denarcotized laudanum 1242
Dentelaire 1382
Dentellaria 1382
Deobstruents 3
Depilatory, Atkinson's 1373
Depilatory of sulphuret of calcium 1394
Deshler's salve 926
Dewberry root 623
Dextrine 95
Dextro-tartaric acid 53
Dhak-tree 433
Diachylon 956
Diamond 176
Dianthus caryophyllus 1325
Diaphoretic antimony 1325
Diaphoretics 2
Diastase 390
Dictamus albus 1326
Diet drink, Lisbon 944
Digestion 781
Digitalic acid 313
Digitalin 312
Digitalis 311
Digitalis purpurea 311
Dilatometer 754
Dill seeds 96
Dill water 890
Diluted acetic acid 800
Diluted alcohol 854
Diluted hydrocyanic acid 805
Diluted muriatic acid 812
Diluted nitric acid 812
Diluted phosphoric acid 815
Diluted solution of subacetate of lead 1126
Diluted sulphuric acid 816
Dinneford's magnesia 457
Dinner pills 1111
Diosma 148
Diosma crenata 149
Diospyros 315
Diospyros Virginiana 315
Diplolepis gallæ tinctoriæ 357
Dippel's animal oil 1326
Dipterix odorata 1400
Dirca palustris 1326
Diserneston gummiferum 88
Disinfecting fluid, Burnett's 1282
Dispensing of medicines 784
Displacement, method of 782, 789
Distillation 777, 793
Distillation, apparatus for 793
Distillation in vacuo 779
Distilled oils 495, 1094
Distilled verdigris 1289
Distilled vinegar 794
Distilled water 884
Distilled waters 885
Distylium racemosum 357
Disulphate of cinchonia 252
Disulphate of quinia 1172
Dittany, American 1324
Dittany, bastard 1326
Diuretic salt 1135
Diuretics 2
Divinum remedium 1345
Dixon's antibilious pills 75
Dock, blunt-leaved 625
Dock, water 625
Dock, yellow-rooted water 625
Dog rose 620
Dog-grass 1401
Dog's-bane 106
Dog's-tooth violet 332
Dogwood 293
Dogwood, Jamaica 1381
Dogwood, round-leaved 292
Dogwood, swamp 294
Dolichos pruriens 484
Dolomite 458
Dombeya excelsa 733
Dombeya turpentine 733
Donovan's solution 904
Dorema ammoniacum 88
Dorsch 506
Dorstenia Brasiliensis 285
Dorstenia contrayerva 285
Dorstenia Drakena 285
Dorstenia Houstonia 285
Dose of medicines 1407

Double aqua fortis 41
Double sulphate of sesquioxide of iron and potassa 1393
Dover's powder 1164
Dracæna draco 1327
Draconin 1327
Dracontium 316
Dragon-root 122
Dragon's blood 1326
Dried alum 855
Dried carbonate of soda 1178
Dried sulphate of iron 1017
Drimys Chilensis 758
Drimys Winteri 758
Drops, table of 1420
Drugs and medicines not officinal 1288
Dry wines 751
Drying of plants 765
Drying oils 494
Dryobalanops aromatica 162
Dryobalanops camphora 162
Dublin weights 1415
Dulcamara 317
Dupuytren's ointment of Spanish flies 1255
Dutch camphor 160
Dutch liquid 1313
Dutch pink 1327
Dwarf elder 116
Dwarf nettle 1402
Dyers' alkanet 1293
Dyers' broom 1332
Dyers' oak 357
Dyers' saffron 186
Dyers' weed 1332, 1385

E

East India arrow-root 468
East India kino 431
Eau de Javelle 1312
Eau de luce 650, 1220
Eau medicinale d'Husson 274
Ebullioscope 754
Ecbalium agreste 321
Ecbalium elaterium 321
Eczema mercuriale 397
Effervescing draught 1144, 1413
Effervescing powders 1163
Effervescing water of potassa 1142
Effervescing water of soda 1181
Egg 548
Eglantine 1302
Egyptian opium 529
Elæocarpus copalliferus 1320
Elaïdic acid 495
Elaïdin 495
Elaïn 58
Elais Guiniensis 1377
Elaphrium elemiferum 324
Elaphrium tomentosum 1396
Elaterin 323
Elaterium 320
Elder flowers 644
Elder ointment 1266
Elder water 893
Elecampane 405
Electric calamine 150
Electuaries 927
Electuarium aromaticum 929
Electuarium catechu 929
Electuarium opii 930
Electuarium piperis 930
Electuarium sennæ 932
Electuary, lenitive 932
Elemi 324
Elemin 324
Eleoptene 496
Elettaria cardamomum 183
Elettaria major 181
Elixir of opium 1242
Elixir of vitriol 816
Elixir proprietatis 1220
Elixir sacrum 1245
Elixir salutis 1247, 1248
Ellagic acid 358
Ellis's magnesia 1070
Elm bark 739
Elm, red 740
Elm, slippery 740
Elm, white 740
Elutriation 771
Emery 1327
Emetia 417
Emetic tartar 867
Emetics 2
Emmenagogues 2
Emollients 2
Emplastra 946
Emplastrum adhæsivum 956
Emplastrum ammoniaci 947
Emplastrum ammoniaci cum hydrargyro 948
Emplastrum assafœtidæ 948
Emplastrum belladonnæ 949
Emplastrum calefaciens 953
Emplastrum cantharidis 921
Emplastrum cantharidis compositum 949
Emplastrum ceræ 958
Emplastrum cumini 949
Emplastrum de Vigo cum mercurio 952
Emplastrum epispasticum 921
Emplastrum ferri 950
Emplastrum galbani 950
Emplastrum galbani compositum 950
Emplastrum gummosum 951
Emplastrum hydrargyri 951
Emplastrum lithargyri 954
Emplastrum opii 952
Emplastrum picis 952
Emplastrum picis Burgundicæ 953
Emplastrum picis cum cantharide 953
Emplastrum plumbi 954
Emplastrum potassii iodidi 956
Emplastrum resinæ 956
Emplastrum roborans 950
Emplastrum saponis 957
Emplastrum simplex 957
Empyreumatic oils 778
Emulsin 91
Emulsion 1075
Emulsion, almond 1076
Emulsion of bitter almonds 1077
Endive 1314
Enema aloës 958
Enema anodynum 959
Enema assafœtidæ 958
Enema catharticum 959
Enema colocynthidis 959
Enema fœtidum 958
Enema opii 959
Enema tabaci 1062
Enema terebinthinæ 960
Enemata 958
English barilla 692
English court-plaster 404
English garlic 65
English port 753
English rhubarb 614
Ens martis 1020
Epidendrum vanilla 1402
Epifagus Americanus 1372
Epigæa repens 1327
Epispastics 2
Epsom salt 458
Equivalents, table of pharmaceutical 1421
Ergot 325
Ergota 325
Ergotætia abortifaciens 326
Ergotate of secalin 327
Ergotin 327, 329
Erigeron annuum 331
Erigeron Canadense 330
Erigeron heterophyllum 331
Erigeron Philadelphicum 331
Erigeron pusilum 330
Errhines 2
Eryngium 331
Eryngium aquaticum 331
Eryngo, water 331
Erysimum alliaria 1293
Erysimum officinale 1390
Erythræa centaurium 203
Erythræa Chilensis 203
Erythric acid 437
Erythronium 332
Erythronium Americanum 332
Erythronium lanceolatum 332

Erythrophleum judiciale 1388
Erythroretin 615
Erythrose 616
Escharotics 2
Esculin 1290
Essence de petit grain 131
Essence of ambergris 1190
Essence of anise 1221
Essence of bergamot 500
Essence of caraway 1225
Essence of cinnamon 1228
Essence of European pennyroyal 1240
Essence of fennel 1232
Essence of nutmeg 1239
Essence of peppermint 1240
Essence of pimento 1244
Essence of rosemary 1246
Essence of roses 517
Essence of spearmint 1240
Essence of spruce 729
Essences, artificial fruit 1328
Essentia anisi 1221
Essentia carui 1225
Essentia cinnamomi 1228
Essentia fœniculi 1232
Essentia menthæ piperitæ 1240
Essentia menthæ pulegii 1240
Essentia menthæ viridis 1240
Essentia myristicæ moschatæ 1239
Essentia pimentæ 1244
Essentia rosmarini 1246
Essential oils 495, 1095
Essential salt of lemons 1376
Ethal 209
Ethalic acid 209
Ether 825
Ether, acetic 1289
Ether, hydric 825, 829
Ether, hydriodic 1342
Ether, hydrocyanic 1342
Ether, hyponitrous 838
Ether, muriatic 1363
Ether, nitric 838
Ether, nitrous 838
Ether, œnanthic 753
Ether, sulphuric 825
Ethereal oil 832
Ethereal solution of gun cotton 849
Ethereal tincture of ergot 1232
Ethereal tincture of lobelia 1238
Etherine 829
Etherization 831
Etherole 833
Etherosulphuric acid 829
Ethers 825
Ethiops mineral 1044
Ethyle 829
Ethylic ether 1328
Eucalyptus dumosa 464
Eucalyptus mannifera 464
Eucalyptus resinifera 433
Eugenia caryophyllata 188
Eugenia pimenta 559
Eugenic acid 1100
Eugenin 189
Euonymus Americanus 1327
Euonymus atropurpureus 1327
Euonymus Europæus 1327
Eupatorium 332
Eupatorium aya-pana 333
Eupatorium cannabinum 333
Eupatorium perfoliatum 332, 333
Eupatorium pilosum 333
Eupatorium purpureum 332
Eupatorium teucrifolium 333
Eupatorium verbenæfolium 333
Euphorbia antiquorum 337
Euphorbia Canariensis 337
Euphorbia corollata 334, 335
Euphorbia hypericifolia 335
Euphorbia ipecacuanha 336
Euphorbia lathyris 1370
Euphorbia maculata 335
Euphorbia officinarum 337
Euphorbium 337
Euphrasia officinalis 1328
Eupione 295
European pennyroyal 598
European rhubarb 614
Euxanthic acid 1346
Evaporation 777
Everitt's salt 806
Exogonium purga 423
Exostemma 219
Exostemma Caribæa 247
Exostemma floribunda 247
Expectorants 2
Expressed oils 493
Expression 774
Extemporaneous prescriptions, examples of 1411
Extract of aconite 968
Extract of aconite, alcoholic 969
Extract of aloes 970
Extract of belladonna 971
Extract of belladonna, alcoholic 972
Extract of bittersweet 977
Extract of black hellebore 978
Extract of black pepper, fluid 990
Extract of butternut 981
Extract of chamomile 970
Extract of colchicum 973
Extract of colchicum, acetic 973
Extract of colocynth 974
Extract of colocynth, compound 975
Extract of cubebs, fluid 989
Extract of dandelion 987
Extract of foxglove 977
Extract of gentian 977
Extract of hemlock 975
Extract of hemlock, alcoholic 976
Extract of hemp 338
Extract of henbane 979
Extract of henbane, alcoholic 979
Extract of hops 982
Extract of jalap 979, 980
Extract of le' uce 982
Extract of logwood 978
Extract of may-apple 984
Extract of nux vomica 982
Extract of opium 983
Extract of opium, denarcotized 983
Extract of pale bark 972
Extract of pareira brava 984
Extract of poppy 984
Extract of quassia 985
Extract of red bark 972
Extract of rhatany 981
Extract of rhubarb 985
Extract of rhubarb, fluid 990
Extract of sarsaparilla 986
Extract of sarsaparilla, fluid 991
Extract of scammony 986
Extract of senna, fluid 992
Extract of spigelia and senna, fluid 992
Extract of stramonium leaves 987
Extract of stramonium seed 987
Extract of taraxacum, fluid 988
Extract of uva ursi 989
Extract of valerian, fluid 992
Extract of yellow bark 972
Extracta 960
Extracta fluida 989
Extractive 960
Extracts 960
Extracts, fluid 989
Extractum aconiti 968
Extractum aconiti alcoholicum 969
Extractum aloës 970
Extractum aloës Barbadensis 970
Extractum anthemidis 970
Extractum belladonnæ 971
Extractum belladonnæ alcoholicum 972
Extractum cannabis 338
Extractum cannabis Indicæ 338

Extractum cannabis Indicæ purificatum 339
Extractum cinchonæ 972
Extractum cinchonæ flavæ 972
Extractum cinchonæ pallidæ 972
Extractum cinchonæ rubræ 972
Extractum colchici 973
Extractum colchici aceticum 973
Extractum colocynthidis 974
Extractum colocynthidis compositum 975
Extractum conii 975
Extractum conii alcoholicum 976
Extractum cubebæ fluidum 989
Extractum digitalis 977
Extractum dulcamaræ 977
Extractum elaterii 320
Extractum gentianæ 977
Extractum glycyrrhizæ 340
Extractum hæmatoxyli 978
Extractum hellebori 978
Extractum hyoscyami 979
Extractum hyoscyami alcoholicum 979
Extractum jalapæ 979, 980
Extractum juglandis 981
Extractum krameriæ 981
Extractum lactucæ 982
Extractum lupuli 982
Extractum nucis vomicæ 982
Extractum opii 983
Extractum opii aquosum 983
Extractum papaveris 984
Extractum pareiræ 984
Extractum piperis fluidum 990
Extractum podophylli 984
Extractum quassiæ 985
Extractum rhei 985
Extractum rhei fluidum 990
Extractum sarsaparillæ 986
Extractum sarsaparillæ fluidum 991
Extractum scammonii 986
Extractum sennæ fluidum 992
Extractum spigeliæ et sennæ fluidum 992
Extractum stramonii 987
Extractum stramonii foliorum 987
Extractum stramonii seminis 987
Extractum styracis 1024
Extractum taraxaci 987
Extractum uvæ ursi 989
Extractum valerianæ fluidum 992
Eyebright 1328

F

Faba Sancti Ignatii 1301
Fagara octandra 1396
False angustura 100
False barks 246
False sarsaparilla 115
False sunflower 1339
False unicorn plant 1339
Farina 341
Fat lute 779
Fat manna 465
Febure's remedy for cancer 24
Fel bovinum 1376
Fellinic acid 1377
Female fern 1299
Fennel, common 352
Fennel, sweet 353
Fennel water 891
Fennel-flower, small 1367
Fennel-seed 352
Fenugreek 1400
Fermentation, alcoholic 60
Fermentation, vinous 60
Fern, female 1299
Fern, male 350
Feronia elephantum 7
Ferri ammonio-chloridum 1019
Ferri ammonio-citras 999
Ferri ammonio-tartras 1294
Ferri arsenias 1298
Ferri bromidum 1305
Ferri carbonas 1013
Ferri carbonas cum saccharo 995
Ferri carbonas saccharatum 995
Ferri carburetum 1309
Ferri citras 998
Ferri et magnesiæ citras 1315
Ferri et potassæ tartras 999
Ferri et quiniæ citras 1315
Ferri ferrocyanuretum 1001
Ferri filum 347
Ferri iodidi syrupus 1005
Ferri iodidum 1003
Ferri lactas 1353
Ferri limatura 347
Ferri muriatis tinctura 996
Ferri oxidum hydratum 1008
Ferri oxidum nigrum 1010
Ferri oxidum rubrum 1013
Ferri oxydum magneticum 1011
Ferri pernitratis liquor 1007
Ferri peroxydum 1012
Ferri peroxydum hydratum 1008
Ferri phosphas 1012
Ferri potassio-tartras 999
Ferri pulvis 993
Ferri ramenta 347
Ferri sesquioxidum 1013
Ferri subcarbonas 1013
Ferri sulphas 1014
Ferri sulphas exsiccatum 1017
Ferri sulphas granulatum 1017
Ferri sulphas venalis 348
Ferri sulphuretum 1018
Ferri tannas 1397
Ferri valerianas 1018
Ferric acid 345
Ferrocyanate of potassa 593
Ferrocyanate of quinia 251
Ferrocyanide of potassium 593
Ferrocyanogen 594
Ferrocyanuret of iron 1001
Ferrocyanuret of potassium 593
Ferrocyanuret of zinc 1328
Ferro-manganic preparations 1359
Ferroprussiate of potassa 593
Ferrugo 1008
Ferrum 344
Ferrum ammoniatum 1019
Ferrum tartarizatum 999
Ferula ammonifera 88
Ferula assafœtida 127
Ferula erubescens 355
Ferula ferulago 355
Ferula galbanifera, 355
Ferula Persica 127, 639
Ferula tingitana 88
Fetid aloes 72
Fetid spirit of ammonia 865
Fever-bush 1302
Feverfew 1385
Fever-root 739
Fibrin, vegetable 342
Fibroïn 704
Fibrous Carthagena bark 243, 244
Ficus 348
Ficus carica 349
Ficus Indica 1352
Ficus religiosa 1352
Figs 348
Figwort 1389
Filicic acid 351
Filix 350
Filix mas 350
Filter, Boullay's 782
Filters 772
Filtration 772
Filtration by displacement 782, 789
Fine-leaved water-hemlock 1369
Fish glue 402
Fishery salt 696
Fixed oils 493
Flag, blue 421

Flag, sweet 151
Flake manna 465
Flammula Jovis 1315
Flax 448
Flax, purging 450
Flaxseed 448
Flaxseed cataplasm 919
Flaxseed meal 449
Flaxseed oil 505
Fleabane, Canada 330
Fleabane, Philadelphia 330
Fleabane, various leaved 330
Fleawort 1382
Flesh-coloured asclepias 124
Flies, potato 171
Flies, Spanish 166
Flint, powdered 680
Flix weed 1391
Florence receiver 1097
Florentine orris 420
Flores martiales 1020
Flores sulphuris 716
Florida anise tree 1344
Florida arrow-root 468
Flour, wheat 341
Flowering ash 464
Flowers of benzoin 801
Flowers of sulphur 716
Flowers of zinc 1283
Fluid extract of bark 262
Fluid extract of black pepper 990
Fluid extract of buchu 149
Fluid extract of cubebs 989
Fluid extract of ergot 329
Fluid extract of rhubarb 990
Fluid extract of sarsaparilla 991
Fluid extract of senna 992
Fluid extract of serpentaria 679
Fluid extract of spigelia and senna 992
Fluid extract of taraxacum 988
Fluid extract of valerian 992
Fluid extract of vanilla 1403
Fluid extracts 989
Flux 784
Fly-trap 1388
Fœniculum 352
Fœniculum dulce 353
Fœniculum officinale 352
Fœniculum vulgare 352
Folia Malabathri 264
Foliated earth of tartar 1135
Formulæ for prescriptions 1411
Formyl, terchloride of 840
Fossil salt 695
Fothergill's pills 75
Fowler's solution 905
Foxglove 311
Frangulæ cortex 608
Frankincense 563, 1371
Frasera 354
Frasera Carolinensis 354
Frasera Walteri 354
Fraxinella, white 1326
Fraxinus excelsior 464, 1328
Fraxinus ornus 464
Fraxinus parviflora 464
French berries 607
French chalk 1328
French rhubarb 614
French vinegar 12
Friar's balsam 1222
Frost-weed 380
Frostwort 380
Fruit essences, artificial 1328
Fruit sugar 631
Fucus crispus 216
Fucus helminthocorton 1330
Fucus palmatus 406
Fucus vesiculosus 1329
Fuligo ligni 1391
Fuligokali 1330
Fumaria officinalis 1330
Fumaric acid 1364
Fumigating pastiles 145
Fuming sulphuric acid of Nordhausen 47
Fumitory 1330
Fungi 1364
Fungic acid 1364
Fungin 1291, 1364
Fungus rosarum 1302
Funnel stands 774
Furnaces 775
Fusagasuga bark 245
Fused nitrate of silver 899
Fusel oil 851
Fusiform jalap 425
Fusion 784
Fustic 1330

G

Gaduin 508
Gadus Æglifinus 506
Gadus callarias 506
Gadus carbonarius 506
Gadus merluccius 506
Gadus morrhua 506
Gadus pollachius 506
Galam, gum 8
Galanga 1331
Galangal 1331
Galbanum 355
Galbanum officinale 355
Galbanum plaster, compound 950
Galbanum præparatum 1024
Galega officinalis 1331
Galega tinctoria 1346
Galega Virginiana 1331
Galena 566
Galipea cusparia 99
Galipea officinalis 99
Galipot 731
Galitannic acid 1331
Galium aperine 1331
Galium tinctorium 1332
Galium verum 1331
Galla 356
Gallic acid 803
Gallic acid fermentation 804
Gallo-tannic acid 821
Galls 356
Galls, Chinese, 357
Gallus Bankiva 548
Gambir 200
Gamboge 359
Gambogia 359
Gambogic acid 361
Garbling of drugs 767
Garcinia cambogia 359
Garcinia morella 360
Garden angelica 97
Garden carrot-root 184
Garlic 65
Gas burners 776
Gas liquor 85
Gaultheria 362
Gaultheria procumbens 362
Gay feather 1355
Gein 110
Gelatin, capsules of 1333
Gelseminum nitidum 1332
Gelseminum sempervirens 1332
General remedies 2
Genista tinctoria 1332
Gentian 363
Gentian, blue 365
Gentiana 363
Gentiana Catesbæi 365
Gentiana chirayta 215
Gentiana lutea 363
Gentiana macrophylla 363
Gentiana Pannonica 363
Gentiana punctata 363
Gentiana purpurea 363
Gentiana saponaria 365
Gentianin 364
Gentisic acid 364
Gentisin 364
Geoffroya inermis 1306
Geoffroya Surinamensis 1306
Geranium 365
Geranium maculatum 366
Geranium Robertianum 1332
German chamomile 472
Germander 1399
Geum 366
Geum rivale 367
Geum urbanum 367
Gigartina helminthocorton 1330
Gigartina lichenoides 1330
Gillenia 368
Gillenia stipulacea 368
Gillenia trifoliata 368

Ginger 762
Ginger syrup 1216
Ginseng 549
Glacial acetic acid 16, 19
Glacial phosphoric acid 815
Glasgow soft soap 652
Glass of antimony 1333
Glass of borax 689
Glass of lead 1333
Glauber's salt 693
Glechoma hederacea 1333
Glu 1304
Glucic acid 637
Glucose 631
Glue 1333
Gluten 342
Glycerin 1021
Glycerin ointment 1022
Glycerina 1021
Glyceryle 1022
Glycion 370
Glycocoll 404
Glycyrrhiza 369
Glycyrrhiza echinata 369
Glycyrrhiza glabra 369
Glycyrrhiza lepidota 369
Glycyrrhizæ radix 369
Glycyrrhizin 370
Gnaphalium margaritaceum 1334
Gnaphalium polycephalum 1334
Goat's rue 1331
Godfrey's cordial 1244
Gold, preparations of 1334
Golden sulphur of antimony 880
Golden-rod 697
Goldthread 290
Gombo 1340
Gondret's vesicating ointment 85
Goose-grass 1331
Gossypium 371
Gossypium herbaceum 371
Goulard's cerate 925
Goulard's extract 1126
Gourd seeds 1323
Grain oil 851
Grains of paradise 182
Grana Molucca 522
Grana moschata 1340
Grana paradisi 182
Grana tiglia 522
Granati fructûs cortex 372
Granati radicis cortex 372
Granatum 372
Granulated sulphate of iron 1017
Grape sugar 631
Grape, varieties of the 751
Gratiola officinalis 1336
Gravel-root 332
Gray bark 230
Greaves 593
Green iodide of mercury 1036
Green vitriol 348, 1014
Green weed 1332
Griffith's antihectic myrrh mixture 1079
Grinding 770
Groats 133
Gromwell 1357
Ground-ivy 1333
Ground laurel 1327
Ground pine 1292
Groundsell, common 1390
Gruel, oatmeal 133
Gruffs 769
Guaco 1336
Guaiac 376
Guaiac mixture 1080
Guaiaci lignum 374
Guaiaci resina 376
Guaiacic acid 375, 377
Guaiacin 377
Guaiacum 376
Guaiacum arboreum 375
Guaiacum officinale 374
Guaiacum sanctum 375
Guaiacum wood 374
Guanine 1336
Guano 1336
Guarana 1378
Guaranin 1378
Guatemala sarsaparilla 655
Guilandina bonduc 216
Guilandina moringa 1370
Guinea grains 182
Gum 9
Gum animé 1296
Gum Arabic 5
Gum Arabic mixture 1075
Gum, artificial 95
Gum, Australian 9
Gum, Barbary 8
Gum, Bassora 1300
Gum, Cape 9
Gum elastic 1308
Gum galam 8
Gum gedda 7
Gum, India 8
Gum, pectoral 12
Gum plaster 951
Gum, Senegal 8
Gum turic 7
Gum, Turkey 7
Gummi acaciæ 5
Gummi gutta 360
Gummi rubrum astringens Gambinense 433
Gummi-resinæ 1023
Gum-resins 1023
Gun cotton 1337
Gun cotton, ethereal solution of 849
Gunjah 338
Gutta percha 1337
Gyromia Virginica 1360

H

Haddock 506
Hæmatoxylon 378
Hæmatoxylon Campechianum 378
Hagenia Abyssinica 1351
Hair-cap moss 1383
Hake 506
Hamamelis Virginica 1338
Hard Carthagena bark 242
Hard water 139
Hardhack 700
Harris's patent sieve 770
Harrowgate water 112
Hartshorn 292
Harts-tongue 1389
Hashish 338
Heal-all 1320, 1384
Heat, application of 775
Heavy carbonate of magnesia 456
Heavy oil of wine 832
Heavy spar 139
Hebradendron cambogioides 359
Hedeoma 379
Hedeoma pulegioides 379
Hedera helix 1339
Hederic acid 1339
Hederin 1339
Hedge garlic 1293
Hedge hyssop 1336
Hedge mustard 1390
Hedysarum Alhagi 464
Helenin 405
Helenium autumnale 1339
Helianthemum 380
Helianthemum Canadense 380
Helianthemum corymbosum 380
Helianthus annuus 1362
Hellebore, American 748
Hellebore, black 381
Hellebore, white 747
Helleborin 382
Helleborus 381
Helleborus fœtidus 1339
Helleborus niger 381
Helleborus orientalis 381
Helleborus viridis 381
Helminthocorton 1330
Helonias dioica 1339
Helonias officinalis 628
Hematin 379
Hematoxylin 379
Hemidesmic acid 383
Hemidesmus 383
Hemidesmus Indicus 383
Hemlock 281
Hemlock cataplasm 919
Hemlock gum 564
Hemlock leaves 280
Hemlock, oil of 564

Hemlock seed 280
Hemlock spruce 564
Hemlock water-dropwort 1369
Hemp 338
Hemp, Indian 107, 338
Henbane leaves 399
Henbane seed 399
Henry's aromatic spirit of vinegar 799
Henry's magnesia 1069
Hepar sulphuris 1158
Hepatic aloes 71
Hepatica 384
Hepatica acutiloba 384
Hepatica Americana 384
Hepatica triloba 384
Heptree 620
Heracleum 384
Heracleum gummiferum 88
Heracleum lanatum 384
Herb Christopher 1290
Herb Robert 1332
Herba Britannica 625
Hermodactyls 1340
Heuchera 385
Heuchera Americana 385
Heuchera cortusa 385
Heuchera viscida 385
Heudelotia Africana 1301
Hevea Guianensis 1308
Hibiscus abelmoschus 1340
Hibiscus esculentus 1340
Hickory ashes and soot, infusion of 1392
Hiera picra 1162
Himalaya rhubarb 615
Hircic acid 680
Hircin 680
Hirudo 385
Hirudo decora 387
Hirudo medicinalis 386
Hive-syrup 1212
Hoffmann's anodyne liquor 834
Holly 1344
Hollyhock 77
Homberg's pyrophorus 79
Honduras sarsaparilla 654
Honey 473
Honey, clarified 1073
Honey of borax 1074
Honey of roses 1074
Honey, preparations of 1073
Honeysuckle 1357
Hooper's pills 1111
Hops 391
Hordein 390
Hordeum 389
Hordeum distichon 389
Hordeum perlatum 390
Hordeum vulgare 389
Horehound 469
Horse aloes 72
Horse brimstone 715
Horse-balm 1320
Horsechestnut 1290
Horsemint 480
Horse-radish 118
Horse-radish tree 1370
Horse-weed 1320
Hot bath 114
Hound's tongue 1325
Houseleek, common 1390
Houseleek, small 1390
Howard's hydrosublimate of mercury 1032
Huamilies bark 232
Huanuco bark 230
Humulus 391
Humulus lupulus 391
Hundred-leaved roses 620
Hungarian balsam 1386
Hura Brasiliensis 1340
Hura crepitans 1340
Husband's magnesia 1070
Huxham's tincture of bark 1227
Hydrangea arborescens 1341
Hydrangea, common 1341
Hydrargyri ammoniochloridum 1047
Hydrargyri bichloridum 1025
Hydrargyri biniodidum 1037
Hydrargyri binoxidum 1042
Hydrargyri bisulphuretum 1045
Hydrargyri chloridum 1031
Hydrargyri chloridum corrosivum 1025
Hydrargyri chloridum mite 1031
Hydrargyri cyanuretum 1035
Hydrargyri et quiniæ chloridum 1312
Hydrargyri iodidum 1036
Hydrargyri iodidum rubrum 1037
Hydrargyri iodidum viride 1036
Hydrargyri nitrico-oxidum 1040
Hydrargyri oxidum nigrum 1038
Hydrargyri oxidum rubrum, *U. S.* 1040
Hydrargyri oxydum rubrum, *Dub.* 1040
Hydrargyri pernitratis liquor 1042
Hydrargyri precipitatum album 1047
Hydrargyri sulphas 1043
Hydrargyri sulphas flavus 1043
Hydrargyri sulphuretum nigrum 1044
Hydrargyri sulphuretum rubrum 1045
Hydrargyria 397
Hydrargyrum 393
Hydrargyrum ammoniatum 1047
Hydrargyrum cum cretâ 1048
Hydrargyrum cum magnesiâ 1049
Hydrargyrum præcipitatum per se 1041
Hydrargyrum purum 1024
Hydrastin 1341
Hydrastis Canadensis 1341
Hydrate of potassa 1131
Hydrated oxide of iron 1008
Hydrated sesquioxide (peroxide) of iron 1008
Hydric ether 825, 829
Hydriodate of ammonia 1347
Hydriodate of arsenic and mercury, solution of 904
Hydriodate of potassa 1154
Hydriodic acid 1341
Hydriodic ether 1342
Hydrochlorate of ammonia 85
Hydrochlorate of lime 152
Hydrochlorate of morphia 1088
Hydrochloric acid 35
Hydrocotyle Asiatica 1342
Hydrocyanate of etherine 1342
Hydrocyanic acid, anhydrous 808, 809
Hydrocyanic acid, diluted 805
Hydrocyanic ether 1342
Hydrogen 1284
Hydrometer, Baumé's 768, 1431
Hydrosublimate of mercury 1032
Hydrosulphate of lime 1394
Hydrosulphuret of ammonia 858
Hydrosulphuric acid 1018
Hydruret of benzyle 499
Hydruret of salicyle 196
Hymenæa courbaril 1296
Hymenæa verrucosa 1321
Hyoscyami folia 399
Hyoscyami semen 399
Hyoscyamia 400
Hyoscyamus 399
Hyoscyamus albus 400
Hyoscyamus niger 399
Hyperanthera moringa 1370
Hypericum perforatum 1343
Hyperiodic acid 407
Hypermanganic acid 462
Hypermanganate of potassa 1359

Hyperoxymuriate of potassa 585
Hypochlorite of lime 155
Hypochlorite of soda 1183
Hyponitrous ether 838
Hypopicrotoxic acid 268
Hyposulphite of soda 1343
Hyposulphite of soda and silver 1343
Hyposulphuric acid 716
Hyposulphurous acid 716
Hyraceum 196
Hyrax Capensis 196
Hyssop 1343
Hyssopus officinalis 1343

I

Iberis amara 1344
Ice-plant 1361
Iceland moss 210
Ichthyocolla 402
Icica icicariba 324
Ictodes fœtidus 316
Idrialine 713
Igasuria 490
Igasuric acid 490
Ignatia amara 1301
Ilex 1344
Ilex aquifolium 1303, 1344
Ilex cassina 1344
Ilex dahoon 1344
Ilex mate 1344
Ilex opaca 1344
Ilex Paraguaiensis 1344
Ilex vomitoria 1344
Ilicin 1344
Illicium anisatum 102, 1345
Illicium Floridanum 1344
Illicium parviflorum 1345
Impatiens balsamina 1345
Impatiens fulva 1345
Impatiens noli-me-tangere 1345
Impatiens pallida 1345
Imperatoria ostruthium 1345
Imperial 582
Imperial measure 1415
Impure carbonate of potassa 582
Impure oxide of zinc 1401
Impure potassa 582
Impure soda 690
Incineration 784
Incitants 2
Indelible ink 1345
India aloes 72
India gum 8
India myrrh 488
India opium 529
India rhubarb 612
India senna 673
Indian corn 1405
Indian cucumber 1360
Indian hemp 107, 338
Indian physic 368
Indian poke 748
Indian red 1346
Indian rubber 1308
Indian sarsaparilla 383
Indian tobacco 452
Indian turnip 122
Indian yellow 1346
Indigo 1346
Indigo, sulphate of 1346
Indigo, wild 1300
Indigofera anil 1346
Indigofera argentea 1346
Indigofera tinctoria 1346
Indigotin 1346
Infusa 1049
Infusion 781
Infusion jar, Alsop's 1050
Infusion of angustura bark 1051
Infusion of buchu 1052
Infusion of cascarilla 1052
Infusion of catechu, compound 1053
Infusion of Cayenne pepper 1052
Infusion of chamomile 1051
Infusion of chiretta 1053
Infusion of cloves 1052
Infusion of columbo 1055
Infusion of dandelion 1062
Infusion of ergot 1056
Infusion of flaxseed, compound 1058
Infusion of foxglove 1056
Infusion of gentian, compound 1056
Infusion of ginger 1062
Infusion of hickory ashes and soot 1392
Infusion of hops 1057
Infusion of horse-radish 1051
Infusion of juniper 1057
Infusion of matico 1058
Infusion of orange peel, compound 1052
Infusion of pale bark 1054
Infusion of pale bark, inspissated 1055
Infusion of pareira brava 1058
Infusion of Peruvian bark, compound 1053
Infusion of Peruvian bark, inspissated 1055
Infusion of pinkroot 1062
Infusion of quassia 1059
Infusion of red bark 1054
Infusion of rhatany 1057
Infusion of rhubarb 1059
Infusion of roses, compound 1059
Infusion of sarsaparilla 1060
Infusion of sassafras pith 1060
Infusion of seneka 1060
Infusion of senna 1061
Infusion of senna, compound 1061
Infusion of simaruba 1061
Infusion of slippery elm bark 1062
Infusion of spearmint 1058
Infusion of thoroughwort 1056
Infusion of tobacco 1062
Infusion of valerian 1062
Infusion of Virginia snakeroot 1061
Infusion of wild-cherry bark 1058
Infusion of yellow bark 1053
Infusions 1049
Infusum angusturæ 1051
Infusum anthemidis 1051
Infusum armoraciæ 1051
Infusum armoraciæ compositum 1051
Infusum aurantii 1052
Infusum aurantii compositum 1052
Infusum buchu 1052
Infusum calumbæ 1055
Infusum capsici 1052
Infusum caryophylli 1052
Infusum cascarillæ 1052
Infusum catechu compositum 1053
Infusum chirettæ 1053
Infusum cinchonæ 1053, 1054
Infusum cinchonæ compositum 1053
Infusum cinchonæ flavæ 1053
Infusum cinchonæ pallidæ 1054
Infusum cinchonæ pallidæ spissatum 1055
Infusum cinchonæ rubræ 1054
Infusum cinchonæ spissatum 1055
Infusum colombæ 1055
Infusum cuspariæ 1051
Infusum digitalis 1056
Infusum ergotæ 1056
Infusum eupatorii 1056
Infusum gentianæ compositum 1056
Infusum humuli 1057
Infusum juniperi 1057
Infusum krameriæ 1057
Infusum lini compositum 1058
Infusum lupuli 1057
Infusum matico 1058
Infusum menthæ viridis 1058
Infusum pareiræ 1058
Infusum polygalæ 1060

Infusum pruni Virginianæ 1058
Infusum quassiæ 1059
Infusum rhei 1059
Infusum rosæ acidum 1059
Infusum rosæ compositum 1059
Infusum sarsaparillæ 1060
Infusum sassafras medullæ 1060
Infusum senegæ 1060
Infusum sennæ 1061
Infusum sennæ compositum 1061
Infusum serpentariæ 1061
Infusum simarubæ 1061
Infusum spigeliæ 1062
Infusum tabaci 1062
Infusum taraxaci 1062
Infusum ulmi 1062
Infusum valerianæ 1062
Infusum zingiberis 1062
Ink 1397
Inspissated infusion of pale bark 1055
Inspissated infusion of Peruvian bark 1055
Inula 405
Inula helenium 405
Inulin 405
Iodic acid 407
Iodide of ammonium 1347
Iodide of arsenic 904
Iodide of arsenic and mercury, solution of 904
Iodide of barium 1347
Iodide of ethyle 1342
Iodide of gold 1334
Iodide of iron 1003
Iodide of iron, solution of 1005
Iodide of iron, syrup of 1005
Iodide of lead 1126
Iodide of manganese 1358
Iodide of mercury 1036
Iodide of potassium 1152
Iodide of silver 1347
Iodide of starch 1347
Iodide of sulphate of quinia 1172
Iodide of sulphur 1198
Iodide of zinc 1348
Iodides of calomel 1349
Iodine 406
Iodine baths 412
Iodine, bisulphuret of 1198
Iodine caustic 412
Iodine, compound solution of 1064
Iodine inhalation 413
Iodine lotion 411
Iodine, Lugol's solution of 411
Iodine ointment of Lugol 411
Iodine, oxide of 407
Iodine, preparations of 1063
Iodine, pure 1063
Iodine, rubefacient solution of 412
Iodinei liquor compositus 1064
Iodinium 406
Iodinium purum 1063
Iodism 409
Iodoform 1349
Iodoformum 1349
Iodohydrargyrate of potassium 1349
Iodous acid 407
Iodoretted oil 414
Ionidium ipecacuanha 419
Ionidium marcucci 419, 1350
Ionidium microphyllum 419
Ionidium parviflorum 419, 1350
Ipecacuanha 415
Ipecacuanha, American 336, 368
Ipecacuanha, amylaceous 418
Ipecacuanha, black 418
Ipecacuanha, Peruvian 418
Ipecacuanha spurge 336
Ipecacuanha, striated 418
Ipecacuanha, undulated 418
Ipecacuanha, white 418
Ipecacuanhas, non-officinal 418
Ipecacuanhic acid 417
Ipomæa jalapa 423
Ipomæa macrorhiza 422
Ipomæa purga 423
Iris Florentina 420
Iris fœtidissima 421
Iris Germanica 421
Iris pseudo-acorus 421
Iris tuberosa 421, 1340
Iris versicolor 421
Irish moss 216
Iron 344
Iron alum 1393
Iron, ammoniated 1019
Iron, ammonio-chloride of 1019
Iron, ammonio-citrate of 999
Iron, ammonio-tartrate of 1294
Iron and alumina, sulphate of 1393
Iron and magnesia, citrate of 1315
Iron and potassa, tartrate of 999
Iron and quinia, citrate of 1315
Iron, arseniate of 1298
Iron, black oxide of 1010
Iron, bromide of 1305
Iron by hydrogen 993
Iron, carbonate of, with sugar 995
Iron, carburet of 1309
Iron, citrate of 998
Iron, commercial sulphate of 348
Iron, dried sulphate of 1017
Iron, ferrocyanuret of 1001
Iron filings 347
Iron, granulated sulphate of 1017
Iron, hydrated oxide of 1008
Iron in fine powder 348
Iron, iodide of 1003
Iron, lactate of 1353
Iron, magnetic oxide of 1011
Iron, peroxide of 1012
Iron, phosphate of 1012
Iron plaster 950
Iron, powder of 993
Iron, precipitated carbonate of 1013
Iron, preparations of 993
Iron, protoxide of 345
Iron, Quevenne's 993
Iron, red oxide of 1013
Iron, reduced 993
Iron, saccharine carbonate of 995
Iron, sesquioxide of 1012, 1013
Iron, solution of iodide of 1005
Iron, solution of nitrate of 1007
Iron, subcarbonate of 1013
Iron, sulphate of 1014
Iron, sulphuret of 1018
Iron, syrup of iodide of 1005
Iron, table of the preparations of 346
Iron, tannate of 1397
Iron, tartarized 999
Iron, tartrate of protoxide of 1000
Iron, teroxide of 345
Iron, tincture of acetate of 995
Iron, tincture of chloride of 996
Iron, tincture of muriate of 996
Iron, valerianate of 1018
Iron, wine of 1020
Iron wire 347
Isatis tinctoria 1350
Isinglass 402
Isis nobilis 1321
Isonandra gutta 1337
Issue peas 131, 421, 1339
Ivory black 177
Ivy 1339
Ivy gum 1339

J

Jaen bark 231
Jaggary 632
Jalap 422
Jalap, fusiform 425
Jalap, light 424
Jalap, male 424
Jalap, overgrown 425
Jalap, rose-scented 425
Jalapa 422
Jalapin 424
Jamaica dogwood 1381
Jamaica ginger 763
Jamaica kino 432
Jamaica pepper 559
Jamaica sarsaparilla 654
James's powder 882
Jamestown weed 709
Janipha manihot 725
Japan camphor 160
Japan sago 640
Jargonelle pear essence 1329
Jasmine, common white 1371
Jasminum grandiflorum 1371
Jasminum officinale 1371
Jasminum sambac 1371
Jatamansi 1394
Jatropha curcas 1300
Jatropha elastica 1308
Jatropha manihot 725
Jatropha multifida 1300
Jatropha oil 1300
Java cardamom 181
Javelle's water 1312
Jelly, vegetable 185
Jerusalem oak 212, 213
Jervina 747
Jesuits' drops 1222
Jesuits' powder 259
Jewell's hydrosublimate of mercury 1032
Jewel-weed 1345
Juglans 426
Juglans cathartica 426
Juglans cinerea 426
Juglans nigra 426
Juglans regia 426
Jujubæ 1406
Jujube paste 1406
Juniper 428
Juniperus 428
Juniperus communis 428
Juniperus depressa 428
Juniperus lycia 1371
Juniperus oxycedrus 1370
Juniperus sabina 630
Juniperus Virginiana 429

K

Kæmpferia rotunda 1405
Kalium 579
Kalmia angustifolia 1351
Kalmia glauca 1351
Kalmia latifolia 1350
Kava 472
Kelp 691
Kempferid 1331
Kermes mineral 879
Kinate of cinchonia 255
Kinate of quinia 255
King's yellow 1373
Kinic acid 255
Kino 430
Kino, African 433
Kino, Botany Bay 433
Kino Caracas 432
Kino, East India 431
Kino, Jamaica 432
Kino, South American 432
Kino, West India 432
Kinoic acid 431
Kinoïle 256
Kinone 256
Kino-red 431
Kinovic acid 256
Kinovic bitter 249
Knot-grass 1304
Knot-root 1325
Koosso 1351
Krameria 435
Krameria ixina 435
Krameria triandra 435
Krameric acid 436
Krimea rhubarb 614

L

Labarraque's disinfecting liquid 1181
Labdanum 1352
Labrador tea 1355
Lac 1352
Lac ammoniaci 1076
Lac assafœtidæ 1077
Lac sulphuris 1197
Laccin 1353
Lachryma scammony 662
Lacmus 437
Lactate of iron 1353
Lactate of quinia 251
Lactic acid 1354
Lactide 1354
Lactin 638
Lactose 638
Lactuca 438
Lactuca altissima 438
Lactuca elongata 438
Lactuca sativa 438
Lactuca scariola 442
Lactuca virosa 442
Lactucarium 438
Lactucerin 441
Lactucic acid 441
Lactucin 440
Lactucone 440
Ladanum 1352
Ladies' mantle 1293
Ladies' slipper 1325
Lady Webster's pills 1111
Lævo-tartaric acid 53
Lake water 110
Lakes 1355
Lampblack 178
Lamps, alcoholic 776
Lana philosophica 1283
Lancaster black drop 797
Lapilli cancrorum 1322
Lapis bezoar occidentalis 1303
Lapis bezoar orientalis 1303
Lapis calaminaris 149
Lapis infernalis 899
Lapis lazuli 1401
Lappa 442
Lappa major 443
Larch, European 730
Lard 57
Lard, prepared 1253
Large-flowering spurge 334
Larix Europæa 730
Larkspur 310
Laudanum 1240
Laudanum, denarcotized 1242
Laudanum, Rousseau's 1275
Laudanum, Sydenham's 1274
Laurel 1350
Lauro-cerasus 443
Laurus 444
Laurus benzoin 1302
Laurus camphora 159
Laurus cassia 263, 264
Laurus cinnamomum 263
Laurus culilawan 1324
Laurus nobilis 444
Laurus pichurim 1381
Laurus sassafras 658
Lavandula 445
Lavandula spica 445
Lavandula vera 445
Lavender 445
Lavender water 1190
Lazulite 1401
Lead 566
Lead, acetate of 569
Lead, as a poison 567
Lead, carbonate of 571
Lead, diluted solution of subacetate of 1126
Lead, dioxide of 567
Lead, iodide of 1126
Lead, nitrate of 573
Lead plaster 954
Lead, preparations of 1124
Lead, protoxide of 567
Lead, red 574
Lead, red oxide of 574
Lead, semivitrified oxide of 575
Lead, sesquioxide of 567
Lead, solution of subacetate of 1124

Lead, sugar of 569
Lead, tannate of 1397
Lead, white 571
Lead-water 1126
Leadwort 1382
Leather flower 1316
Leather wood 1326
Lecanora tartarea 437
Lecanoric acid 437
Ledoyen's disinfecting fluid 574
Ledum latifolum 1355
Ledum palustre 1355
Leech, mechanical 389
Leeches 385
Leek 1355
Lee's New London Pills 75
Lee's Windham pills 75
Lemon juice 446
Lemon peel 446
Lemon syrup 1207
Lemons 446
Lenitive electuary 932
Lentisk 470
Leontodon taraxacum 726
Leopard's bane 119
Lepra mercurialis 397
Leptandra purpurea 1355
Leptandra Virginica 1355
Lettuce 438
Lettuce, acrid 442
Lettuce opium 440
Lettuce, strong scented 442
Lettuce, wild 438
Leucol 253
Levigation 771
Liatris scariosa 1355
Liatris spicata 1355
Liatris squarrosa 1355
Lichen Islandicus 210
Lichenin 210
Lichstearic acid 211, 1364
Liebig's distillatory apparatus 793
Life-everlasting 1334
Light jalap 424
Light oil of wine 833
Lignum colubrinum 490
Lignum vitæ 375
Ligusticum levisticum 1355
Ligustrin 1356
Ligustrum vulgare 1356
Lilac, common 1396
Lilacin 1396
Lilium candidum 1356
Lily, common white 1356
Lily of the valley 1320
Lima bark 230
Lime 153
Lime, carbonate of 299
Lime, chloride of 155
Lime, chlorinated 154
Lime, fresh-burned 153
Lime, hydrosulphate of 1394
Lime, hypochlorite of 155
Lime liniment 1066
Lime, muriate of 152
Lime, precipitated carbonate of 913
Lime, precipitated phosphate of 916
Lime, preparations of 911
Lime, saccharate of 913
Lime, syrup of 913
Lime, solution of chlorinated 916
Lime, solution of muriate of 915
Limes 447
Limestone 299
Lime-water 911
Limon 446
Limonis cortex 446
Limonum oleum 504
Limonum succus 446
Linaria vulgaris 1297
Lini farina 449
Lini oleum 505
Lini semen 448
Liniment, anodyne 1067
Liniment, camphorated soap 1067
Liniment, mercurial 1067
Liniment of ammonia 1065
Liniment of ammonia, compound 1065
Liniment of opium 1067
Liniment of sesquicarbonate of ammonia 1065
Liniment of Spanish flies 1066
Liniment of turpentine 1068
Liniment of verdigris 1064
Liniment, simple 1068
Liniment, volatile 1065
Linimenta 1064
Liniments 1064
Linimentum æruginis 1064
Linimentum ammoniæ 1065
Linimentum ammoniæ compositum 1065
Linimentum ammoniæ sesquicarbonatis 1065
Linimentum arcæi 1257
Linimentum calcis 1066
Linimentum camphoræ 1066
Linimentum camphoræ compositum 1066
Linimentum cantharidis 1066
Linimentum crotonis 1067
Linimentum hydrargyri 1067
Linimentum opii 1067
Linimentum saponis 1246
Linimentum saponis camphoratum 1067
Linimentum simplex 1068
Linimentum terebinthinæ 1068
Linin 450
Linseed 448
Linseed oil 505
Linum 448
Linum catharticum 450
Linum usitatissimum 448
Lion's foot 1384
Liquefaction 777, 784
Liquid storax 712, 1356
Liquidambar altingia 1356
Liquidambar orientale 712
Liquidambar styraciflua 712, 1356
Liquidamber 1356
Liquor aluminis compositus 855
Liquor ammoniæ 859
Liquor ammoniæ acetatis 861
Liquor ammoniæ citratis 863
Liquor ammoniæ fortior 83
Liquor ammoniæ sesquicarbonatis 858
Liquor arsenicalis 905
Liquor arsenici chloridi 903
Liquor arsenici et hydrargyri iodidi 904
Liquor barii chloridi 909
Liquor calcii chloridi 915
Liquor calcis 911
Liquor cupri ammoniosulphatis 935
Liquor ferri iodidi 1005
Liquor ferri nitratis 1007
Liquor hydrargyri bichloridi 1030
Liquor iodinii compositus 1064
Liquor magnesiæ citratis 1071
Liquor morphiæ acetatis 1088
Liquor morphiæ muriatis 1091
Liquor morphiæ sulphatis 1092
Liquor plumbi diacetatis 1124
Liquor plumbi subacetatis 1124
Liquor plumbi subacetatis dilutus 1126
Liquor potassæ 1128
Liquor potassæ arsenitis 905
Liquor potassæ carbonatis 1139
Liquor potassæ chlorinatæ 1312
Liquor potassæ citratis 1143
Liquor potassii iodidi compositus 1157
Liquor sodæ 1177
Liquor sodæ chlorinatæ 1181
Liquorice 340
Liquorice root 369
Liriodendrin 451

Liriodendron 450
Liriodendron tulipifera 450
Lisbon diet drink 944
Lisbon sarsaparilla 655
Litharge 575
Litharge plaster 954
Lithargyrum 575
Lithia 1356
Lithia, carbonate of 1356
Lithia in mineral waters 111
Lithospermum officinale 1357
Lithospermum tinctorium 1293
Litmus 437
Litmus paper 437
Liver of sulphur 1158
Liverwort 384
Lixiviation 781
Lixivus cinis 582
Lobelia 452
Lobelia cardinalis 454
Lobelia inflata 452
Lobelia syphilitica 454
Lobelic acid 452
Lobelina 452
Loblolly pine 728
Local remedies 2
Logwood 378
Long pepper 562
Long-leaved pine 728
Lonicera caprifolium 1357
Loosestrife 1357
Lotio nigra 1033
Lovage 1355
Loxa bark 229
Lozenges 1250
Lunar caustic 899
Lungwort 1384
Lupulin 392
Lupulina 392
Lupulite 392
Lupulus 391
Luteolin 1385
Lutes 779
Lycoperdon proteus 1365
Lycopodium 1357
Lycopodium clavatum 1357
Lycopus 455
Lycopus Europæus 455
Lycopus Virginicus 455
Lythrum salicaria 1357
Lytta 166
Lytta Nuttalli 173

M

Mace 485, 487
Maceration 781
Macis 485, 487
Macropiper methysticum 472
Macrotys racemosa 217
Madagascar cardamom 182
Madar 1308
Madder 622
Madeira wine 752
Magistery of bismuth 911
Magnesia 1068
Magnesia, acetate of 1289
Magnesia alba 455
Magnesia, calcined 1071
Magnesia, carbonate of 455
Magnesia, Dinneford's 457
Magnesia, Ellis's 1070
Magnesia, heavy carbonate of 456
Magnesia, Henry's 1069
Magnesia, Husband's 1070
Magnesia, muriate of 1312
Magnesia, preparations of 1068
Magnesia, solution of citrate of 1071
Magnesia, sulphate of 458
Magnesiæ acetas 1289
Magnesiæ carbonas 455
Magnesiæ carbonas ponderosum 456
Magnesiæ citratis, liquor 1071
Magnesiæ sulphas 458
Magnesii chloridum 1312
Magnesite 459
Magnesium 1070
Magnetic oxide of iron 1011
Magnetic pyrites 1018
Magnolia 460
Magnolia acuminata 460
Magnolia glauca 460
Magnolia grandiflora 460
Magnolia tripetala 461
Maguey 1292
Mahogany tree 1395
Mahy's plaster 956
Maidenhair 1290
Maize 1405
Malabathri folia 264
Malambo bark 1357
Male fern 350
Male jalap 424
Male nutmeg 486
Male orchis 1386
Mallow, common 461
Malt 390
Malt vinegar 14
Maltha 553
Malva 461
Malva alcea 77
Malva rotundifolia 462
Malva sylvestris 461
Malwa opium 530
Mandioca 725
Mandragora 1357
Mandragora officinalis 1357
Mandrake 577, 1357
Manganese 462, 1358
Manganese, carbonate of 1359
Manganese, iodide of 1358
Manganese, malate of 1359
Manganese, oxide of 462
Manganese, phosphate of 1359
Manganese, sulphate of 1358
Manganese, tartrate of 1359
Manganesii oxidum 462
Manganesii peroxidum 462
Manganesium 1358
Manganic acid 462
Manna 464
Manna, Briançon 464
Manna cannulata 465
Mannite 466
Maple sugar 632
Maracaybo bark 241
Maranta 467
Maranta allouya 467
Maranta arundinacea 467
Maranta galanga 1331
Maranta Indica 467
Maranta nobilis 467
Marble 469
Margaric acid 649
Margarin 59, 494
Marine acid 35
Marjoram, common 546
Marjoram, sweet 546
Marmor 469
Marrubium 469
Marrubium vulgare 470
Marseilles vinegar 799
Marseilles white soap 652
Marsh rosemary 706
Marsh tea 1355
Marsh trefoil 477
Marsh water 110
Marsh water-cress 1367
Marsh's test for arsenic 31
Marshmallow 76
Marshmallow flowers 76
Marshmallow leaves 76
Marshmallow mixture 1076
Marshmallow root 76
Martial ethiops 1011
Martin's cancer powder 1373
Marygold 1307
Massicot 567
Masterwort 97, 384, 1345
Mastich 470
Mastiche 470
Masticin 471
Matias bark 1357
Maticin 472
Matico 471
Matonia 182
Matricaria 472
Matricaria chamomilla 472
Matricaria parthenium 1385
May-apple 577
Mayflower 1327
Maynard's adhesive liquid 849
May-weed 294

Mead 755
Meadow anemone 1295
Meadow-saffron 271
Meadow-sweet 700
Mealy starwort 64
Measurement, approximate 1420
Measures and weights 767, 1415
Meat biscuit 1360
Mecca senna 674
Mechanical division 769
Mechanical leech 389
Mechoacan 424
Meconic acid 538
Meconin 537
Medeola Virginica 1360
Medicated vinegars 793
Medicated waters 885
Medicated wines 1272
Medicinal hydrocyanic acid 808
Medicines and drugs not officinal 1288
Mel 473
Mel Ægyptiacum 1064
Mel boracis 1074
Mel depuratum 1073
Mel despumatum 1073
Mel rosæ 1074
Mel scillæ compositum 1213
Melaleuca cajuputi 501
Melaleuca hypericifolia 501
Melaleuca leucadendron 501
Melaleuca minor 501
Melampodium 382
Melassic acid 637
Melegueta pepper 182
Melia azedarach 133
Melilot 1360
Melilotus officinalis 1360
Melissa 474
Melissa officinalis 474
Melissic acid 205
Melissine 205
Mellita 1073
Meloe majalis 167
Meloe niger 173
Meloe proscarabæus 167
Meloe trianthemæ 167
Menispermin 268
Menispermum Canadense 1361
Menispermum cocculus 267
Menispermum palmatum 277
Mentha piperita 475
Mentha pulegium 598
Mentha viridis 476
Menyanthes 476
Menyanthes trifoliata 477
Menyanthin 477
Mercurial liniment 1067
Mercurial ointment 1257
Mercurial pills 1119
Mercurial plaster 951
Mercurius 393
Mercury 393
Mercury, acid nitrate of 1042
Mercury, ammoniated 1047
Mercury and quinia, chloride of 1312
Mercury, bibromide of 1305
Mercury, bichloride of 1025
Mercury, bicyanuret of 1035
Mercury, biniodide of 1037
Mercury, binoxide of 1042
Mercury, bisulphuret of 1045
Mercury, black oxide of 1038
Mercury, black sulphuret of 1044
Mercury, bromides of 1305
Mercury, calcined 1041
Mercury, corrosive chloride of 1025
Mercury, cyanuret of 1035
Mercury, green iodide of 1036
Mercury, hydrosublimate of 1032
Mercury, iodide of 1036
Mercury, mild chloride of 1031
Mercury, preparations of 1024
Mercury, protiodide of 1036
Mercury, protobromide of 1305
Mercury, prussiate of 1035
Mercury, pure 1024
Mercury, red iodide of 1037
Mercury, red oxide of 1040
Mercury, red sulphuret of 1045
Mercury, solution of pernitrate of 1042
Mercury, sulphate of 1043
Mercury, table of the preparations of 398
Mercury with chalk 1048
Mercury with magnesia 1049
Mercury, yellow sulphate of 1043
Mesembryanthemum crystallinum 1361
Metacinnameine 136
Metaphosphoric acid 815
Methylamine 534
Methyle 701
Methylic alcohol 701
Methylic chloroform 842
Metroxylon sagu 640
Mezereon 477
Mezereum 477
Mica panis 344
Mikania guaco 1336
Mild chloride of mercury 1031
Mild volatile alkali 855
Milder common caustic 1133
Milder ointment of nitrate of mercury 1263
Milfoil 1289
Milium solis 1357
Milk of ammoniac 1076
Milk of assafetida 1077
Milk of lime 154
Milk of sulphur 1197
Milk-weed 125, 335
Mimosa Nilotica 6
Mindererus, spirit of 861
Mineral, ethiops 1044
Mineral, kermes 879
Mineral tar 553
Mineral, turpeth 1043
Mineral water 887
Mineral waters 111
Mineral yellow 1378
Minium 574
Mint 476
Mistletoe 1404
Mistura acaciæ, *Ed.* 1075
Mistura acaciæ, *Lond.* 1093
Mistura althææ 1076
Mistura ammoniaci 1076
Mistura amygdalæ 1076
Mistura assafœtidæ 1077
Mistura camphoræ, *Lond.* 890
Mistura camphoræ cum magnesiâ 1077
Mistura creasoti 1078
Mistura cretæ 1078
Mistura ferri aromatica 1078
Mistura ferri composita 1079
Mistura gentianæ composita 1079
Mistura glycyrrhizæ composita 1080
Mistura guaiaci 1080
Mistura hordei 941
Mistura scammonii 1080
Mistura spiritûs vini Gallici 1080
Misturæ 1075
Mithridate 930
Mixture, almond 1076
Mixture, ammoniac 1076
Mixture, assafetida 1077
Mixture, brandy 1080
Mixture, brown 1080
Mixture, chalk 1078
Mixture, creasote 1078
Mixture, guaiac 1080
Mixture, gum Arabic 1075
Mixture, marsh mallow 1076
Mixture, neutral 1143, 1413
Mixture of camphor with magnesia 1077
Mixture of gentian, compound 1079
Mixture of iron, aromatic 1078
Mixture of iron, compound 1079

Mixture of liquorice, compound 1080
Mixture, oleaginous 1413
Mixture, scammony 1080
Mixtures 1075
Moccasin plant 1325
Mocha aloes 72
Mocha senna 673
Mode of administering medicines 1408
Molasses 631, 633, 637
Mole-plant 1370
Momordica balsamina 1361
Momordica elaterium 321
Monarda 480
Monarda punctata 480
Monesia 1361
Monesin 1361
Monkshood 55
Monohydrated nitric acid 40
Montpellier scammony 663
Mori succus 480
Moringa aptera 1370
Moringa pterygosperma 1370
Morphia 1080
Morphia, acetate of 1087
Morphia, hydrochlorate of 1088
Morphia, muriate of 1088
Morphia, preparations of 1080
Morphia, solution of acetate of 1088
Morphia, solution of muriate of 1091
Morphia, solution of sulphate of 1092
Morphia, sulphate of 1091
Morphiæ acetas 1087
Morphiæ hydrochloras 1088
Morphiæ murias 1088
Morphiæ muriatis solutio 1091
Morphiæ sulphas 1091
Morrhua Americana 506
Morrhua vulgaris 506
Morrhuæ oleum 506
Mortars 770
Morus alba 481
Morus nigra 480
Morus rubra 481
Morus tinctoria 1330
Moschus 481
Moschus factitius 1365
Moschus moschiferus 481
Mountain damson 681
Mountain laurel 1350
Mountain mahogany 1303
Mountain rhubarb 626
Mountain-tea 362
Moxa 1362
Mucilage 449, 1092
Mucilage of barley 1093
Mucilage of gum Arabic 1093
Mucilage of starch 1093
Mucilage of tragacanth 1094
Mucilages 1092
Mucilagines 1092
Mucilago 1093
Mucilago acaciæ 1093
Mucilago amyli 1093
Mucilago hordei 1093
Mucilago tragacanthæ 1094
Mucuna 484
Mucuna pruriens 484
Mucuna prurita 485
Mudar 1308
Mugwort 4
Mulberry juice 480
Mullein 1403
Muriate of ammonia 85
Muriate of baryta 908
Muriate of baryta, solution of 909
Muriate of etherine 1363
Muriate of iron, tincture of 996
Muriate of lime 152
Muriate of lime, solution of 915
Muriate of magnesia 1312
Muriate of morphia 1088
Muriate of morphia, solution of 1091
Muriate of quinia 1176
Muriate of soda 695
Muriate of soda, pure 1185
Muriate of strychnia 1197
Muriatic acid 35
Muriatic acid, commercial 35, 38
Muriatic acid, diluted 812
Muriatic acid gas 39
Muriatic acid, table of the specific gravity of 37
Muriatic ether 1363
Mushrooms 1364
Musk 481
Musk, artificial 1365
Muskmelon seeds 1323
Musk-root 1394
Must 750
Mustard 682
Mustard cataplasm 919
Mustard seeds, black 683
Mustard seeds, white 683
Mustard, volatile oil of 683
Mylabris cichorii 166
Mylabris pustulata 167
Mynsicht's acid elixir 816
Myrica cerifera 207
Myricin 205
Myristica 485
Myristica moschata 485
Myristica officinalis 485
Myristicæ adeps 485, 487
Myristicæ oleum 487, 510
Myristicic acid 487
Myristicin 487
Myrobalani 1365
Myrobalans 1365
Myronate of potassa 683
Myronic acid 683, 684
Myrospermum of Sonsonate 135
Myrospermum Pereira 135
Myrospermum peruiferum 134
Myrospermum pubescens 135
Myrospermum toluiferum 137
Myrosyne 683, 684
Myroxocarpin 136
Myroxylon balsamiferum 135
Myroxylon peruiferum 134
Myroxylon toluiferum 137
Myrrh 488
Myrrha 488
Myrrhic acid 489
Myrrhin 489
Myrtle wax 207
Myrtus acris 1321
Myrtus caryophyllata 1321
Myrtus pimenta 559

N

Naphtha 552
Naphtha, artificial 553
Naphthaline 1366
Naples yellow 1366
Narcein 536
Narcissus pseudo-narcissus 1366
Narcotics 2
Narcotin 533
Narcotina 533
Nard 1367
Nardus celtica 1367
Nardus Indica 1367
Nardus montana 1367
Narthex assafœtida 127
Nasturtium amphibium 1367
Nasturtium officinale 1367
Nasturtium palustre 1367
Native soda 690
Natron 690
Nauclea Brunonis 199
Nauclea gambir 200
Navel-wort 1322
Neat's-foot oil 500
Nebuel 8
Nectandra puchury 1381
Nectandra Rodiei 1301
Nepaul cardamom 182
Nepeta cataria 197
Nepeta glechoma 1333
Nephrodium filix mas 350
Nereck 8
Neroli 131
Nettle, common 1402
Nettle, dwarf 1402
Neutral mixture 1143, 1413
New bark 247
New Jersey tea 1310

New York petroleum 553
Nicaragua wood 1305
Niccoli sulphas 1393
Nickel, sulphate of 1393
Nicotia 719
Nicotiana fruticosa 718
Nicotiana paniculata 718
Nicotiana quadrivalvis 718
Nicotiana rustica 718
Nicotiana tabacum 717
Nicotianin 720
Nicotin 719
Nicotina 719
Nigella sativa 1367
Nigellin 1367
Nightshade, black 318
Nightshade, common 318
Nightshade, deadly 140
Nightshade, woody 318
Nihil album 1283
Nitrate of bismuth 910
Nitrate of copper 1367
Nitrate of iron, solution of 1007
Nitrate of lead 573
Nitrate of potassa 587
Nitrate of potassa, pure 1145
Nitrate of silver 896
Nitrate of silver, fused 899
Nitrate of silver, in crystals 896
Nitrate of soda 1367
Nitrate of water 40
Nitre 587
Nitre, cubic 1367
Nitre, sweet spirit of 835
Nitre-beds, artificial 588
Nitric acid 40
Nitric acid, anhydrous 44
Nitric acid, commercial 41
Nitric acid, diluted 812
Nitric acid fumigation 44
Nitric acid, pure 813
Nitric acid, table of the specific gravity of 43
Nitric ether 838
Nitric starch 1348
Nitrification 588
Nitrobenzide 1302
Nitrobenzole 499, 1302
Nitrobenzule 1302
Nitromuriatic acid 813
Nitromuriatic oxide of antimony 1384
Nitroprussic acid 1368
Nitroprusside of sodium 1368
Nitrosulphate of ammonia 1368
Nitrosulphuric acid 1368
Nitrous ether 838
Nitrous oxide 1368
Nitrous oxide water 1368
Nitrous powders 591, 1411
Nopal 269
Nordhausen, fuming sulphuric acid of 47
Norway spruce 563
Nutmeg 485
Nutmeg, concrete oil of 487
Nutmeg-flower 1367
Nux moschata 486
Nux vomica 490
Nymphæa alba 1369
Nymphæa odorata 1368

O

Oak bark 602
Oatmeal 132
Oatmeal gruel 133
Ochres 1369
Ocimum basilicum 1369
Ocotea pichurim 1381
Œnanthe crocata 1369
Œnanthe phellandrium 1369
Œnanthic ether 753, 1329
Œnanthin 1369
Œnothera biennis 1370
Officinal directions, general 788
Officinal medicines, meaning of the term 1288
Oidium abortifaciens 326
Oil, benne 518, 679
Oil, cajeput 501
Oil, castor 513
Oil, cedar 430
Oil, cod-liver 506
Oil, croton 521
Oil, ethereal 832
Oil, flaxseed 505
Oil, linseed 505
Oil, neats-foot 500
Oil of almonds 498
Oil of amber 1106
Oil of amber, rectified 1107
Oil of anda 1370
Oil of anise 1098, 1345
Oil of ben 1370
Oil of benne 679
Oil of bergamot 500
Oil of bitter almonds 498
Oil of bitter almonds, artificial 499
Oil of cade 428, 1370
Oil of camphor 162
Oil of caraway 1099
Oil of cassia 503
Oil of chamomile 1099
Oil of cinnamon 502
Oil of cloves 1100
Oil of copaiba 1101
Oil of cubebs 1101
Oil of dill 1098
Oil of ergot 327, 329
Oil of euphorbia 1370
Oil of fennel 1101
Oil of fern 351
Oil of hemlock 564
Oil of horsemint 1104
Oil of jasmine 1371
Oil of juniper 1102
Oil of lavender 1103
Oil of lemons 504
Oil of mace 487
Oil of marjoram 1104
Oil of mustard 683
Oil of nutmeg 510
Oil of nutmeg, expressed 487
Oil of origanum 1104
Oil of partridge-berry 1102
Oil of pennyroyal, American 1102
Oil of pennyroyal, European 1105
Oil of peppermint 1103
Oil of pimento 1105
Oil of rosemary 1105
Oil of roses 517
Oil of rue 1106
Oil of sassafras 1106
Oil of savine 1106
Oil of spearmint 1104
Oil of spike 1103
Oil of sweet marjoram 1105
Oil of tar 565
Oil of thyme 1400
Oil of tobacco 1108
Oil of turpentine 518
Oil of turpentine, purified 1108
Oil of valerian 1108
Oil of vitriol 45
Oil of wine camphor 833
Oil of wine, concrete 833
Oil of wine, heavy 832
Oil of wine, light 833
Oil of wormseed 1100
Oil, olive 511
Oil, palm 1377
Oil, phosphorated 556
Oil-cake 449
Oilnut 427
Oils 493
Oils, distilled 495, 1094
Oils, drying 494
Oils, empyreumatic 778
Oils, essential 495, 1094
Oils, expressed 493
Oils, fixed 493
Oils, volatile 495, 1094
Ointment, antimonial 1254
Ointment, citrine 1260
Ointment, compound sulphur 1267
Ointment, elder 1266
Ointment, mercurial 1257
Ointment of acetate of lead 1265
Ointment of ammoniated mercury 1260
Ointment of belladonna 1254
Ointment of bromide of potassium 1150

Ointment of carbonate of lead 1265
Ointment of cocculus Indicus 1256
Ointment of creasote 1256
Ointment of elemi 1257
Ointment of galls 1257
Ointment of galls, compound 1257
Ointment of hemlock 1256
Ointment of iodide of lead 1266
Ointment of iodide of mercury 1260
Ointment of iodide of potassium 1266
Ointment of iodide of sulphur 1267
Ointment of iodine 1264
Ointment of iodine, compound 1264
Ointment of lead, compound 1265
Ointment of mezereon 1264
Ointment of nitrate of mercury 1260
Ointment of nitrate of mercury, milder 1263
Ointment of nitric acid 1263
Ointment of opium 1265
Ointment of oxide of zinc 1268
Ointment of pitch 1265
Ointment of red iodide of mercury 1260
Ointment of red oxide of mercury 1263
Ointment of rose water 1254
Ointment of Spanish flies 1255
Ointment of stramonium 1266
Ointment of subacetate of copper 1256
Ointment of the powder of Spanish flies 1255
Ointment of white hellebore 1268
Ointment of white precipitate 1260
Ointment, simple 1266
Ointment, spermaceti 1256
Ointment, sulphur 1266
Ointment, tar 1265
Ointment, tartar emetic 1254
Ointment, tobacco 1267
Ointments 1253
Okra 1340
Old field pine 728
Olea 493
Olea destillata 1094
Olea Europœa 511
Olea fixa 493
Olea fragrans 1398
Olea volatilia 495
Oleaginous mixture 1413
Olefiant gas, chloride of 1313
Oleic acid 649
Olein 58, 494
Oleo-saccharum 636
Oleum absinthii 5
Oleum æthereum 832
Oleum amygdalæ 498
Oleum amygdalæ amaræ 498
Oleum anethi 1098
Oleum anisi 1098
Oleum anthemidis 1099
Oleum bergamii 500
Oleum bubulum 500
Oleum cadinum 1370
Oleum cajuputi 501
Oleum cari 1099
Oleum carui 1099
Oleum caryophylli 1100
Oleum chenopodii 1100
Oleum cinnamomi 502
Oleum copaibæ 1101
Oleum cornu cervi 1326
Oleum cubebæ 1101
Oleum fœniculi 1101
Oleum gaultheriæ 1102
Oleum hedeomæ 1102
Oleum hyperici 1343
Oleum jecoris aselli 506
Oleum juniperi 1102
Oleum lavandulæ 1103
Oleum limonis 504
Oleum lini 505
Oleum menthæ piperitæ 1103
Oleum menthæ pulegii 1105
Oleum menthæ viridis 1104
Oleum monardæ 1104
Oleum morrhuæ 506
Oleum myristicæ 510
Oleum olivæ 511
Oleum origani 1104
Oleum phosphoratum 556
Oleum pimentæ 1105
Oleum pulegii 1105
Oleum ricini 513
Oleum rosæ 517
Oleum rosmarini 1105
Oleum rutæ 1106
Oleum sabinæ 1106
Oleum sassafras 1106
Oleum sesami 518, 679
Oleum succini 1106
Oleum succini rectificatum 1107
Oleum sulphuratum 1299
Oleum tabaci 1108
Oleum tartari per deliquium 1137
Oleum terebinthinæ 518
Oleum terebinthinæ purificatum 1108
Oleum thymi 1400
Oleum tiglii 521
Oleum valerianæ 1108
Olibanum 1371
Olivæ oleum 511
Olive oil 511
Olivile 511
Onion 1372
Ophelia chirata 215
Opiania 532
Opianic acid 533
Opianine 532
Opiate pills of lead 1122
Opine 537
Opium 524
Opium, Bengal 530
Opium, Constantinople 529
Opium, Egyptian 529
Opium, India 529
Opium, Malwa 530
Opium, Patna 530
Opium, Persia 530
Opium plaster 952
Opium, Smyrna 528
Opium, tests of 539
Opium, thebaicum 527
Opium, Turkey 528
Opobalsamum 1299
Opodeldoc 1067
Opoidia galbanifera 355
Opopanax 1372
Opopanax chironium 1372
Opuntia cochinillifera 269
Orange berries 131
Orange flower water 131
Orange mineral 1372
Orange peel 129
Orange red 1372
Orange root 1341
Oranges 131
Orchil 438
Orchilla weed 437
Orchis mascula 1386
Orenburgh gum 730
Orgeat, syrup of 1204
Origanum 545
Origanum majorana 546
Origanum majoranoides 546
Origanum vulgare 546
Orleana 1296
Ornus Europœa 464
Ornus rotundifolia 465
Orobanche Americana 1373
Orobanche uniflora 1373
Orobanche Virginiana 1372
Orpiment 1373
Orpiment, artificial 1373
Orris, Florentine 420
Orsellic acid 437
Oryza sativa 1373
Os 546
Os sepiæ 1324
Ossa 546
Ostrea edulis 734
Otolithus regalis 404
Otto of roses 517
Overflowing wells 110
Overgrown jalap 425
Ovum 548
Oxalate of potassa 1374

Oxalhydric acid 838
Oxalic acid 1373
Oxalis acetosella 1376
Oxalis crassicaulis 1376
Oxalis violacea 1376
Ox-gall 1376
Oxide of antimony 866
Oxide of gold 1334
Oxide of manganese 462
Oxide of silver 901
Oxide of zinc 1282
Oxide of zinc, impure 1401
Oxychloride of antimony 1384
Oxychloride of sodium 1183
Oxymel 1074
Oxymel of squill 1075
Oxymel scillæ 1075
Oxymuriate of lime 155
Oxypicric acid 1346
Oxysulphuret of antimony 878
Oyster 734
Oyster-shell 734
Oyster-shell, prepared 915
Ozone 47

P

Pæonia officinalis 1377
Pagliari's styptic 145
Pale bark 228
Palm oil 1377
Palm soap 650
Palm sugar 632
Palma Christi 513
Palmic acid 516
Palmin 516
Palmitic acid 1378
Palmitin 1378
Panacea lapsorum 120
Panax 549
Panax quinquefolium 549
Panax schinseng 549
Panis 550
Pansy 757
Papaver 550
Papaver orientale 524
Papaver rhœas 618
Papaver somniferum 524
Papaverina 532
Papaverine 532
Paraffine 295
Paraguay tea 1344
Paralactic acid 1355
Paramenispermin 268
Paramorphia 536
Paratartaric acid 53, 742, 750
Paregoric elixir 1243
Pareira 551
Pareira brava 551
Parietaria officinalis 1378
Pariglin 656
Parillinic acid 656
Paris white 1404
Parsley root 554
Parsnep, rough 1372
Parthenium integrifolium 1378
Partridge-berry 362
Pastel 1350
Pastiles, fumigating 145
Pastinaca opopanax 1372
Patent yellow 1378
Patna opium 530
Paullinia 1378
Paullinia sorbilis 1378
Peach leaves 1379
Peach wood 1305
Pearl barley 390
Pearl sago 640
Pearl tapioca 725
Pearl white 911
Pearlash 582
Pearson's arsenical solution 23
Pectase 804
Pectic acid 185
Pectin 185
Pectoral gum 12
Pectose 186, 804
Pegu catechu 199
Pelargonate of ethylic ether 1329
Pelargonic acid 1329
Pelargonic ether 1329
Pelargonium roseum 1329
Pellitory 599
Pellitory, wall 1378
Pemmican 1360
Penæa mucronata 1387
Penæa sarcocolla 1387
Pennsylvania sumach 619
Pennyroyal 379
Pennyroyal, European 598
Pennyroyal water 893
Penny-wort 1322
Peony 1377
Pepper, black 560
Pepper, Cayenne 173
Pepper, long 562
Pepper, white 560
Peppermint 475
Peppermint water 892
Perchloride of carbon 844
Percolation 782, 789
Percolator 782
Periploca Indica 383
Periploca secamone 662
Permanganate of potassa 1359
Pernambuco wood 1305
Pernitrate of iron, solution of 1007
Peroxide of iron 1012
Peroxide of manganese 462
Perry 755
Persia opium 530
Persian galbanum 356
Persica vulgaris 1379
Persicaria mitis 1304
Persicaria urens 1304
Persimmon 315
Peruvian bark 218
Peruvian Calisaya 237
Peruvian ipecacuanha 418
Peruvine 136
Peter's pills 75
Petinin 1326
Petroleum 552
Petroselinum 554
Petroselinum sativum 554
Phæoretin 615
Phalaris Canariensis 1308
Pharmaceutical equivalents, table of 1421
Phasianus gallus 548
Phellandrium aquaticum 1369
Phene 1302
Phenyle, hydruret of 1302
Phenylic acid 297
Philadelphia fleabane 330
Phloretin 1380
Phloridzin 1379
Phœnix farinifera 639
Phosphate of ammonia 1380
Phosphate of iron 1012
Phosphate of lime, precipitated 916
Phosphate of potassa 1380
Phosphate of quinia 251
Phosphate of soda 1186
Phosphorated oil 556
Phosphoric acid, diluted 815
Phosphorus 555
Phyllanthus emblica 1366
Physalis alkekengi 1381
Physalis viscosa 1381
Physeter macrocephalus 209
Physic nuts 1300
Phytolacca decandra 557
Phytolaccæ baccæ 557
Phytolaccæ radix 557
Picamar 295
Pichurim beans 1381
Picolin 1326
Picræna excelsa 600
Picroglycion 319
Picromel 1377
Picrotoxic acid 268
Picrotoxin 268
Pig iron 344
Pill of aloes with soap 1110
Pill of chloride of mercury, compound 1112
Pill of colocynth, compound 1114
Pill of gamboge, compound 1113
Pill of hemlock, compound 1115

Pill of iodide of manganese 1359
Pill of ipecacuanha with squill 1121
Pill of storax, compound 1124
Pills 1109
Pills, aloetic 1110
Pills, Asiatic 25
Pills, assafetida 1112
Pills, blue 1119
Pills, calomel 1121
Pills, compound calomel 1112
Pills, compound cathartic 1113
Pills, mercurial 1119
Pills of aloes and assafetida 1111
Pills of aloes and iron 1112
Pills of aloes and myrrh 1112
Pills of aloes, compound 1111
Pills of aloes with soap 1110
Pills of ammoniated copper 1116
Pills of calomel and opium 1113
Pills of carbonate of iron 1116
Pills of colocynth and henbane 1115
Pills of copaiba 1115
Pills of digitalis and squill 1116
Pills of galbanum, compound 1118
Pills of iodide of iron 1118
Pills of ipecacuanha and opium 1121
Pills of iron, compound 1117
Pills of lead, opiate 1122
Pills of mild chloride of mercury 1121
Pills of opium 1121
Pills of rhubarb 1122
Pills of rhubarb and iron 1123
Pills of rhubarb, compound 1123
Pills of soap, compound 1123
Pills of squill, compound 1123
Pills of sulphate of iron 1118
Pills of sulphate of quinia 1122
Pills, Vallet's ferruginous 1116
Pilula cambogiæ composita 1113
Pilula colocynthidis composita 1114
Pilula conii composita 1115
Pilula hydrargyri chloridi composita 1112
Pilula ipecacuanhæ cum scillâ 1121
Pilula styracis composita 1124
Pilulæ 1109
Pilulæ aloes 1110
Pilulæ aloes compositæ 1111
Pilulæ aloes cum sapone 1110
Pilulæ aloes et assafœtidæ 1111
Pilulæ aloes et ferri 1112
Pilulæ aloes et myrrhæ 1112
Pilulæ assafœtidæ 1112, 1118
Pilulæ calomelanos compositæ 1112
Pilulæ calomelanos et opii 1113
Pilulæ cambogiæ 1113
Pilulæ catharticæ compositæ 1113
Pilulæ colocynthidis compositæ 1114
Pilulæ colocynthidis et hyoscyami 1115
Pilulæ copaibæ 1115
Pilulæ cupri ammoniati 1116
Pilulæ de cynoglosso 1325
Pilulæ digitalis et scillæ 1116
Pilulæ ferri carbonatis 1116
Pilulæ ferri compositæ 1117
Pilulæ ferri iodidi 1118
Pilulæ ferri sulphatis 1118
Pilulæ galbani compositæ 1118
Pilulæ hydrargyri 1119
Pilulæ hydrargyri chloridi mitis 1121
Pilulæ ipecacuanhæ et opii 1121
Pilulæ opii 1121
Pilulæ plumbi opiatæ 1122
Pilulæ quiniæ sulphatis 1122
Pilulæ rhei 1122
Pilulæ rhei compositæ 1123
Pilulæ rhei et ferri 1123
Pilulæ saponis compositæ 1123
Pilulæ scillæ compositæ 1123
Pilulæ stomachicæ 1111
Pilulæ styracis 1124
Pilulæ Thebaicæ 1121
Pimenta 559
Pimento 559
Pimento water 892
Pimpernel, scarlet 1295
Pimpinella anisum 101
Pimpinella saxifraga 1381
Pinckneya pubens 1381
Pine nuts 729
Pine-apple essence 1328
Pinic acid 606
Pink, Carolina 698
Pink, clove 1325
Pink, wild 1390
Pinkroot 698
Pinus abies 563
Pinus australis 728
Pinus balsamea 729
Pinus Canadensis 564
Pinus cembra 729, 1386
Pinus Damarra 733
Pinus Lambertiana 464
Pinus larix 730
Pinus maritima 729
Pinus nigra 729
Pinus palustris 728
Pinus picea 729
Pinus pinaster 729
Pinus pinea 729
Pinus pumilio 729, 1386
Pinus rigida 565
Pinus sylvestris 729
Pinus tæda 728
Piper 560
Piper angustifolium 471
Piper betel 202, 1297
Piper caninum 302
Piper cubeba 302
Piper elongatum 471
Piper longum 562
Piper methisticum 472
Piper nigrum 560
Piperin 560
Pipsissewa 213
Piscidia erythrina 1381
Pistacia lentiscus 470
Pistacia terebinthus 730
Pitaya bark 245, 247
Pitaya bark, hard 245
Pitaya bark, soft 245
Pitaya condaminea bark 245
Pitayna 247
Pitch 562
Pitch, black 562
Pitch, Burgundy 562
Pitch, Canada 564
Pitch pine 729
Pitch plaster 952
Pittacal 296
Pix 562
Pix arida 562
Pix Burgundica 562
Pix Burgundica præparata 1024
Pix Canadensis 564
Pix liquida 565
Pix nigra 562
Plantago lancifolia 1382
Plantago major 1382
Plantago media 1382
Plantago psyllium 1382
Plantain 1382
Plantain, water 1293
Plants, collecting of 765
Plants, drying of 765
Plaster, adhesive 956, 957
Plaster, blistering 921
Plaster machine 947

Plaster measurer 785
Plaster, mercurial 951
Plaster of aconite 970
Plaster of ammoniac with mercury 948
Plaster of belladonna 949
Plaster of carbonate of lead 956
Plaster of iodide of potassium 956
Plaster of myrrh 489
Plaster of pitch with Spanish flies 953
Plaster of Spanish flies 949
Plaster of Spanish flies, compound 949
Plaster, simple 957
Plaster, strengthening 950
Plaster, warming 953
Plasters 946
Platinum 1382
Pleurisy-root 126
Plumbagin 1382
Plumbago 176, 1309
Plumbago Europœa 1382
Plumbi acetas 569
Plumbi carbonas 571
Plumbi diacetatis solutio 1124
Plumbi iodidum 1126
Plumbi nitras 573
Plumbi oxidum rubrum 574
Plumbi oxidum semivitreum 575
Plumbi subacetatis liquor compositus 1126
Plumbi tannas 1397
Plumbum 566
Plummer's pills 1113
Plumose alum 1393
Poaya 415
Plunket's caustic 24
Podalyria tinctoria 1300
Podophyllin 578
Podophyllum 577
Podophyllum peltatum 577
Poison-oak 735
Poison-vine 735
Poke berries 557
Poke root 557
Pollock 506
Polychroïte 301
Polygala amara 578, 667
Polygala, bitter 578
Polygala paucifolia 1102
Polygala polygama 578
Polygala rubella 578
Polygala senega 667
Polygala vulgaris 667
Polygallic acid 668
Polygonatum multiflorum 1320
Polygonatum uniflorum 1320
Polygonum aviculare 1304
Polygonum bistorta 1304
Polygonum fagopyrum 1304
Polygonum hydropiper 1304
Polygonum hydropiperoides 1304
Polygonum persicaria 1304
Polygonum punctatum 1304
Polygonum tinctorium 1346
Polypodium filix fœmina 1299
Polypodium filix mas 350
Polypodium vulgare 1382
Polypody, common 1382
Polytrichum juniperinum 1383
Pomegranate rind 372, 373
Pomegranate root, bark of 372, 373
Pompholix 1283
Pontefract cakes 341
Poplar 451, 1383
Poppy, black 525
Poppy capsules 550
Poppy, corn 618
Poppy, red 618
Poppy, white 524
Poppy-heads 550
Populin 1383
Populus 1383
Populus balsamifera 1383
Populus nigra 1383
Populus tremula 1383
Populus tremuloides 1383
Porphyrization 771
Porphyroxin 537
Porrum 1355
Port, English 753
Port wine 752
Portable soup 547
Porter 755
Portland arrow-root 123
Portland powder 1399
Portland sago 123
Portulaca oleracea 1383
Potash 583
Potashes, kinds of 584
Potassa 1131
Potassa, acetate of 1133
Potassa alum 78
Potassa, alcoholic 1132
Potassa, bicarbonate of 1139
Potassa, bichromate of 579
Potassa, binoxalate of 1376
Potassa, bisulphate of 1146
Potassa, bitartrate of 580
Potassa, carbonate of 1136
Potassa, caustic 1131
Potassa caustica 1131
Potassa caustica cum calce 1133
Potassa, chlorate of 585
Potassa, citrate of 1142
Potassa cum calce 1133
Potassa, dry 579
Potassa, effervescing water of 1142
Potassa, ferrocyanate of 593
Potassa, hydrate of 1131
Potassa, hydriodate of 1154
Potassa, hypermanganate of 1359
Potassa, impure carbonate of 582
Potassa, nitrate of 587
Potassa, phosphate of 1380
Potassa, preparations of 1128
Potassa, pure carbonate of 1138
Potassa, pure nitrate of 1145
Potassa, quadroxalate of 1376
Potassa, sesquicarbonate of 1142
Potassa, solution of 1128
Potassa, sulphate of 592
Potassa, supertartrate of 580
Potassa, tartrate of 1147
Potassa with lime 1133
Potassæ acetas 1133
Potassæ aqua 1128
Potassæ aqua effervescens 1142
Potassæ biantimonias 1325
Potassæ bicarbonas 1139
Potassæ bichromas 579
Potassæ bisulphas 1146
Potassæ bitartras 580
Potassæ carbonas 1136
Potassæ carbonas è lixivo cinere 1136
Potassæ carbonas impurus 582
Potassæ carbonas purus 1138
Potassæ carbonatis liquor 1139
Potassæ causticæ liquor 1128
Potassæ chloras 585
Potassæ citras 1142
Potassæ et sodæ tartras 1184
Potassæ hydras 1131
Potassæ nitras 587
Potassæ nitras purum 1145
Potassæ phosphas 1380
Potassæ sulphas 592
Potassæ sulphas cum sulphure 1145
Potassæ tartras 1147
Potassii bromidum 1149
Potassii cyanuretum 1150
Potassii ferrocyanidum 593
Potassii ferrocyanuretum 593
Potassii iodidi liquor compositus 1157
Potassii iodidum 1152
Potassii sulphocyanuretum 1394
Potassii sulphuretum 1158
Potassio-sulphate of sesquioxide of iron 1393
Potassium 579
Potassium, bromide of 1149
Potassium, cyanuret of 1150
Potassium, ferrocyanuret of 593

Potassium, iodide of 1152
Potassium, iodohydrargyrate of 1349
Potassium, sulphuret of 1158
Potassium, teroxide of 579
Potato 318
Potato flies 171
Potato spirit oil 851
Potato starch 95
Potentilla reptans 1384
Potentilla tormentilla 735
Pothos 316
Potus imperialis 582
Powder, antimonial 882
Powder, aromatic 1162
Powder, compound saline 1166
Powder, Dover's 1164
Powder folder 786
Powder of Algaroth 1384
Powder of aloes and canella 1162
Powder of aloes, compound 1161
Powder of alum, compound 1162
Powder of catechu, compound 1162
Powder of chalk, compound 1163
Powder of chalk with opium, compound 1163
Powder of ipecacuanha and opium 1164
Powder of ipecacuanha, compound 1164
Powder of iron 993
Powder of jalap, compound 1165
Powder of kino, compound 1165
Powder of rhubarb, compound 1166
Powder of scammony, compound 1166
Powder of tin 1193
Powder of tragacanth, compound 1166
Powder, Portland 1399
Powdering, methods of 769
Powders 1161
Powders, effervescing 1163
Powders, Seidlitz 54
Powders, soda 1164
Prairie dock 1378
Precipitate per se 1041
Precipitated carbonate of iron 1013
Precipitated carbonate of lime 913
Precipitated carbonate of zinc 1277
Precipitated extract of bark 1171
Precipitated phosphate of lime 916
Precipitated sulphur 1197
Precipitated sulphuret of antimony 878
Precipitating jars 772
Precipitation 774
Prenanthes alba 1384
Prenanthes serpentaria 1384
Prepared ammoniac 1023
Prepared assafetida 1023
Prepared Burgundy pitch 1024
Prepared calamine 1277
Prepared chalk 914
Prepared Frankincense 1024
Prepared galbanum 1024
Prepared lard 1253
Prepared oyster-shell 915
Prepared sagapenum 1024
Prepared storax 1024
Prepared subacetate of copper 933
Prepared sulphuret of antimony 877
Prescribing medicines, art of 1407
Prescriptions, formulæ for 1411
Preservation of medicines 766
Preserved juice of taraxacum 988
Preserved vegetable juices 1218
Prickly ash 116, 760
Prickly poppy 1297
Pride of China 134
Pride of India 134
Prinos 595
Prinos verticillatus 595
Privet 1356
Proof spirit 61, 854
Proof vinegar 14
Propylamin 327, 508, 534
Protein 343
Protiodide of mercury 1036
Prunella vulgaris 1384
Prunes 596
Pruni pulpa 1160
Prunum 596
Prunum præparatum 1160
Prunus domestica 596
Prunus lauro-cerasus 443
Prunus spinosa 7
Prunus Virginiana 596
Prussian blue 1001
Prussiate of mercury 1035
Prussiate of potassa 593
Prussic acid 805
Pseudomorphia 537
Psychotria emetica 418
Psyllii semen 1382
Pteris aquilina 1299
Pteritannic acid 351
Pterocarpus 647
Pterocarpus draco 1327
Pterocarpus erinaceus 433
Pterocarpus marsupium 431
Pterocarpus santalinus 647
Puccoon 645
Puce oxide of lead 567
Puff ball 1365
Pulegium 598
Pulmonaria officinalis 1384
Pulp of prunes 1160
Pulp of purging cassia 1160
Pulp of tamarinds 1160
Pulpæ 1159
Pulps 1159
Pulsatilla 1295
Pulveres 1161
Pulveres effervescentes 1163
Pulveres effervescentes citrati 1164
Pulveres effervescentes tartarizati 1163
Pulverization 769
Pulverization, table of loss by 769
Pulverized silex 680
Pulvis Algarothi 1384
Pulvis aloës compositus 1161
Pulvis aloës et canellæ 1162
Pulvis aluminis compositus 1162
Pulvis antimonialis 882
Pulvis antimonii compositus 882
Pulvis aromaticus 1162
Pulvis Capucinorum 629
Pulvis catechu compositus 1162
Pulvis cinnamomi compositus 1162
Pulvis comitissæ 259
Pulvis cretæ compositus 1163
Pulvis cretæ compositus cum opio 1163
Pulvis cretæ opiatus 1163
Pulvis hydrargyri cinereus 1039
Pulvis ipecacuanhæ compositus 1164
Pulvis ipecacuanhæ et opii 1164
Pulvis jalapæ compositus 1165
Pulvis kino compositus 1165
Pulvis rhei compositus 1166
Pulvis salinus compositus 1166
Pulvis scammonii compositus 1166
Pulvis tragacanthæ compositus 1166
Pumex 1385
Pumice stone 1385
Pumpkin seeds 1323
Punica granatum 372

Punicin 373
Pure arsenious acid 903
Pure carbonate of potassa 1138
Pure chloride of sodium 1185
Pure iodine 1063
Pure mercury 1024
Pure muriate of soda 1185
Pure nitric acid 813
Pure nitrate of potassa 1145
Pure Prussian blue 1001
Pure sulphuric acid 818
Pure water 108
Purging agaric 1291
Purging cassia 192
Purging flax 450
Purging nuts 1300
Purified animal charcoal 917
Purified oil of turpentine 1108
Purified pyroligneous acid 15
Purified storax 1024
Purified sugar 635, 637
Purple avens 367
Purple willow-herb 1357
Purree 1346
Purreic acid 1346
Purslane, garden 1383
Pyrethrum 599
Pyrethrum parthenium 1385
Pyretin 562
Pyretin, acid 1391
Pyrites, cubic 1018
Pyrites, magnetic 1018
Pyrmont water 112
Pyroacetic ether 1385
Pyroacetic spirit 1385
Pyrogallic acid 805
Pyroglycerin 1022
Pyrola umbellata 213
Pyroligneous acid 15
Pyroligneous acid, crude 17, 20
Pyroligneous ether 701
Pyroligneous spirit 701
Pyroligneous vinegar 18
Pyrolusite 463
Pyrophosphate of soda 1187
Pyroxylic alcohol 701
Pyroxylic spirit 701
Pyroxylin 1337
Pyrrol 860
Pyrus cydonia 309

Q

Quadrihydrated nitric acid 41
Quadroxalate of potassa 1376
Quaker's black drop 797
Quassia 599
Quassia amara 600
Quassia excelsa 600
Quassia simaruba 681
Quassin 601
Queen of the meadow 700
Queen's delight 707
Queen's root 707
Quercin 603
Querci-tannic acid 821
Quercitric acid 603
Quercitrin 603
Quercitron 603
Quercus 602
Quercus ægilops 357
Quercus alba 602
Quercus cerris 357
Quercus excelsa 357
Quercus falcata 602
Quercus ilex 357
Quercus infectoria 357
Quercus montana 602
Quercus pedunculata 602
Quercus prinus 602
Quercus robur 357, 602
Quercus tinctoria 602, 603
Quercus virens 603
Quevenne's iron 993
Quickens 1401
Quicklime 153
Quicksilver 393
Quinæ disulphas 1167
Quinæ murias 1176
Quinæ valerianas 1176
Quince essence 1329
Quince seed 309
Quinia 250
Quinia, acetate of 251
Quinia, amorphous 1171
Quinia, arsenite of 251
Quinia, citrate of 251
Quinia, ferrocyanate of 251
Quinia, kinate of 255
Quinia, lactate of 251
Quinia, muriate of 1176
Quinia, phosphate of 251
Quinia, preparations of 1167
Quinia, sulphate of 1167
Quinia, tannate of 251
Quinia, valerianate of 1176
Quiniæ sulphas 1167
Quinic acid 255
Quinicine 254
Quinidia 253
Quinidia, sulphate of 254
Quinidina 253
Quinidine 253
Quinoidine 1171
Quinolëin 253

R

Racemic acid 53, 742
Radcliff's elixir 75
Radical vinegar 19
Radices colubrinæ 490
Radix caryophyllatæ 367
Radix zedoariæ 1405
Ragwort 1390
Rain water 109
Raisins 741
Rangoon petroleum 553
Ranunculus 604
Ranunculus acris 604
Ranunculus bulbosus 604
Ranunculus flammula 604
Ranunculus repens 604
Ranunculus sceleratus 604
Raspberry 623
Raspberry syrup 1207
Rattlesnake's master 1292, 1355
Realgar 1385
Rectification 778
Rectified oil of amber 1107
Rectified spirit 59
Red bark 219, 239
Red cedar 429
Red chalk 1385
Red chromate of potassa 579
Red cohosh 1290
Red coral 1321
Red elm 740
Red iodide of mercury 1037
Red lead 574
Red oxide of iron 1013
Red oxide of lead 574
Red oxide of mercury 1040
Red pepper 174
Red poppy 618
Red precipitate 1040
Red roses 621
Red sarsaparilla 654
Red saunders 647
Red sulphuret of mercury 1045
Red tartar 580
Red wine 750
Red wine vinegar 14
Reddle 1385
Redhead 1298
Red-root 1310
Reduced iron 993
Reduction 784
Refrigerants 3
Refrigeratory 793
Regulus of antimony 104
Renealmia cardamomum 183
Reseda luteola 1385
Resin 605
Resin cerate 925
Resin cerate, compound 926
Resin of jalap 980
Resin of scammony 986
Resin oil 606
Resin plaster 956
Resin, white 606
Resin, yellow 606
Resina 605
Resina alba 606
Resina flava 606
Resina jalapæ 980
Resina scammonii 986
Resine de chibou 1309
Resine de Gomart 1309

Rhabarbaric acid 615
Rhabarbarin 616
Rhabarbarum 608
Rhamni baccæ 607
Rhamni succus 607
Rhamnin 607
Rhamnoxanthin 608
Rhamnus catharticus 607
Rhamnus frangula 608
Rhamnus infectorius 607
Rhamnus zizyphus 1406
Rhapontic root 614
Rhapontic root, Siberian 615
Rhapontic rhubarb 614, 615
Rhatany 435
Rhein 616
Rheum 608
Rheum australe 610
Rheum Caspicum 611
Rheum compactum 610
Rheum crassinervium 611
Rheum emodi 610
Rheum hybridum 611
Rheum leucorrhizum 611
Rheum Moorcraftianum 611
Rheum palmatum 610
Rheum Rhaponticum 610
Rheum Russicum vel Turcicum 613
Rheum Sinense vel Indicum 612
Rheum speciforme 611
Rheum undulatum 610
Rheum Webbianum 611
Rheumin 616
Rhodeoretin 424
Rhodeoretinic acid 424
Rhododendrum crysanthum 1385
Rhodymenia palmata 406
Rhœas 618
Rhubarb 608
Rhubarb, Batavian 612
Rhubarb, Bucharian 613, 615
Rhubarb, Chinese 612
Rhubarb, Dutch-trimmed 612
Rhubarb, English 614
Rhubarb, European 614
Rhubarb, French 614
Rhubarb, Himalaya 615
Rhubarb, India 612
Rhubarb, Krimea 614
Rhubarb, Rhapontic 614
Rhubarb, Russian 613
Rhubarb, Taschkent 613
Rhubarb, Turkey 613
Rhus coriaria 1332
Rhus cotinus 1331
Rhus glabrum 618
Rhus pumilum 737
Rhus radicans 735
Rhus toxicodendron 735
Rhus vernix 736
Rib-grass 1382
Rice 1373
Richardsonia Brazilienses 419
Richardsonia emetica 419
Richardsonia scabra 419
Richweed 1320
Ricin 516
Ricini oleum 513
Ricinic acid 516
Ricinoleic acid 516
Ricinolein 516
Ricino-stearic acid 516
Ricino-stearin 516
Ricinus communis 513
Riga balsam 1386
River water 110
Robbin's rye 1383
Roccella tinctoria 437
Roche alum 79
Rochelle salt 1184
Rock oil 552
Rock rose 380
Rock salt 695
Rockbridge alum spring 112
Roll sulphur 715
Roman alum 79
Roman cement 780
Roman chamomile 102
Roman vitriol 306
Rosa canina 620
Rosa centifolia 620
Rosa damascena 517
Rosa Gallica 621
Rosa moschata 517
Rosæ oleum 517
Rose, dog 620
Rose geranium 1329
Rose water 893
Rose-scented jalap 425
Rosemary 621
Roses, hundred leaved 620
Roses, red 621
Rosin 606
Rosmarinus 621
Rosmarinus officinalis 621
Rosmarinus sylvestris 1355
Rotten stone 1386
Roucou 1296
Rouge 186
Round cardamom 181
Round-leaved dogwood 292
Rousseau's laudanum 1275
Rubefacients 2
Rubia 622
Rubia tinctorum 622
Rubichloric acid 1331
Rubigo ferri 1012
Rubus Canadensis 624
Rubus trivialis 623
Rubus villosus 623, 624
Rue 626
Rufus's pills 1112
Rumex acetosa 625
Rumex acetocella 625
Rumex acutus 625
Rumex Alpinus 625
Rumex aquaticus 625
Rumex Britannica 625
Rumex crispus 625
Rumex hydrolapathum 625
Rumex obtusifolius 625
Rumex patientia 625
Rumex sanguineus 625
Rumex scutatus 625
Rumicin 626
Russian rhubarb 613
Rust of iron 1012
Ruta 626
Ruta graveolens 626
Rutinic acid 627
Rutulin 642
Rye 1390

S

Sabadilla 627
Sabadillia 628, 1270
Sabadillic acid 628
Sabadillin 628
Sabbatia 629
Sabbatia angularis 629
Sabina 630
Sacchari fœx 631
Saccharate of lime 913
Saccharic acid 636, 838
Saccharine carbonate of iron 995
Saccharine carbonate of iron and manganese 1360
Saccharine fermentation 60
Saccharine iodide of iron 1006
Saccharum 631
Saccharum commune 631
Saccharum lactis 638
Saccharum officinarum 632
Saccharum purificatum 631
Saccharum saturni 569
Sacchulmic acid 636
Sacchulmin 636
Sack 752
Sacred elixir 1245
Safflower 186
Saffron 300
Saffron of antimony 1322
Sagapenum 639
Sagapenum præparatum 1024
Sage 643
Sago 639
Sago meal 640
Sago palm 640
Sago, pearl 640
Saguerus Rumphii 639
Sagus lævis 639
Sagus Ruffia 639
Sagus Rumphii 640
St. John's wort 1343
Saint Lucia bark 247
Sal absinthii 5
Sal aëratus 1141

Sal alembroth 1027
Sal ammoniac 85
Sal de duobus 592
Sal diureticus 1135
Sal enixum 1147, 1374
Sal gemmæ 695
Sal polychrestus Glaseri 1146
Sal prunelle 590
Salep 1386
Salicin 642
Salicornia 690
Salicyle 642
Salicylous acid 642
Saline mixture 1145
Saline waters 111, 113
Saliretin 642
Salix 641
Salix alba 642
Salix Babylonica 642
Salix caprea 641
Salix helix 643
Salix nigra 642
Salix pentandra 641
Salix purpurea 641
Salix Russeliana 641
Salseparine 656
Salsola 690
Salt, common 695
Salt of sorrel 1376
Salt of tartar 1137, 1138
Salt of wisdom 1027
Salt of wormwood 5
Saltpetre 587
Salvia 643
Salvia officinalis 643
Salvia pratensis 644
Salvia sclarea 644
Sambucus 644
Sambucus Canadensis 644
Sambucus nigra 644
Samovey isinglass 403
Sampfen wood 1305
Sandal wood 1387
Sandaraca 1386
Sandarach 1386
Sandaracin 1386
Sand-bath 777
Sandix 1372
Sanguinaria 645
Sanguinaria Canadensis 645
Sanguinarina 646
Sanguis draconis 1326
Sanguisuga interrupta 386
Sanguisuga medicinalis 386
Sanguisuga officinalis 386
Sanicle 1387
Sanicula Marilandica 1387
Santa Martha bark 242
Santalin 648
Santalum 647, 1387
Santalum album 1387
Santalum citrinum 1387
Santalum freycinetianum 1387
Santalum rubrum 1387
Santonici semen 1404
Santonin 1404
Sap green 607
Sapo 648
Sapo durus 648, 649
Sapo guaiacinus 378
Sapo mollis 648, 650
Sapo vulgaris 648, 650
Saponaria officinalis 1387
Saponification 648
Saponin 1387
Sappan wood 1305
Saratoga water 113
Sarcocolla 1387
Sarcocollin 1388
Sarracenia 1388
Sarracenia flava 1388
Sarracenia variolaris 1388
Sarsa 652
Sarsaparilla 652
Sarsaparilla, false 115
Sarsaparilla, Indian 383
Sarsaparillin 656
Sarza 652
Sassa gum 1388
Sassafras medulla 658
Sassafras officinale 658
Sassafras pith 658, 659
Sassafras radicis cortex 658
Sassafras root, bark of 659
Sassafrid 659
Sassy bark 1388
Satureja hortensis 1389
Satureja montana 1389
Saunders, red 647
Saunders, white 1387
Saunders, yellow 1387
Savine 630
Savine cerate 926
Savory 1389
Saxifraga 1381
Scabious 331
Scammonium 660
Scammony 660
Scammony, factitious 663
Scammony, genuine 661
Scammony, in shells 661
Scammony mixture 1080
Scandix cerefolium 1296
Scarlet pimpernel 1295
Schuylkill water 111
Scilla 664
Scilla maritima 664
Scillitin 665
Sclerotium clavus 325
Scolopendrium officinarum 1389
Scoparin 667
Scoparius 666
Scotch fir 729
Scrophularia nodosa 1389
Scullcap 1389
Scurvy-grass 1316
Scutellaria galericulata 1389
Scutellaria hyssopifolia 1389
Scutellaria integrifolia 1389
Scutellaria lateriflora 1389
Sea salt 695
Sea water 113
Sealing wax 1353
Sea-side balsam 191
Sea-side grape 432
Sea-wrack 1329
Secale cereale 325, 1390
Secale cornutum 325
Secalin 327
Sedum acre 1390
Sedum album 1390
Sedum rupestre 1390
Sedum telephium 1390
Seed lac 1352
Seidlitz powders 54
Seidlitz water 113
Seignette's salt 1185
Self-heal 1384
Seltzer water 112
Seltzer water, artificial 887
Semen abelmoschi 1340
Semen contra 1404
Semen cynæ 1404
Semen nigellæ 1367
Semen psyllii 1382
Semivitrified oxide of lead 575
Sempervivum tectorum 1390
Seneca oil 553
Senecio aureus 1390
Senecio vulgaris 1390
Senega 667
Senegal gum 8
Senegin 668
Seneka 667
Senna 670
Senna, American 193
Separation of liquids 775
Separation of mixed substances 772
Separation of solids from liquids 772
Separatory 775, 1097
Sepia 1324
Sepia officinalis 1324
Septfoil 735
Serpentaria 676
Sesami folia 679
Sesamum Indicum 679
Sesamum orientale 679
Sesquicarbonate of ammonia 855
Sesquicarbonate of potassa 1142
Sesquicarbonate of soda 690
Sesquioxide of iron 1012, 1013
Seven barks 1341
Sevum 680
Shaddock 130
Sheep-laurel 1351
Shell lac 1352
Sherry wine 752

Shining aloes 69
Sialagogues 2
Siberian Rhapontic root 615
Siberian rhubarb 615
Side-saddle plant 1388
Sienna 1390
Sieves 770
Signs and abbreviations, table of 1411
Silene Pennsylvanica 1390
Silene Virginica 1390
Silex contritus 680
Silex pulverized 680
Silica 680
Silicate of zinc 150, 760
Silicic acid 680
Silicon, teroxide of 681
Silk-weed, common 124
Silurus glanis 403
Silver 117
Silver bark 230
Silver, chloride of 1313
Silver, cyanide of 895
Silver, cyanuret of 895
Silver fir, American 729
Silver fir, European 729
Silver, fused nitrate of 899
Silver, iodide of 1347
Silver, nitrate of 896
Silver, oxide of 901
Silver, preparations of 895
Simaba cedron 1310
Simaruba 681
Simaruba amara 681
Simaruba excelsa 600
Simaruba officinalis 681
Simple cerate 927
Simple liniment 1068
Simple ointment 1266
Simple plaster 957
Simple syrup 1202
Sinapis 682
Sinapis alba 682
Sinapis nigra 682
Sinapisin 683, 684
Sinapisms 920
Single aqua fortis 41
Sipeerin 1301
Siphonia cahuchu 1308
Siphonia elastica 1308
Sirop de capillaire 1290
Sirop de Cuisinier 1211
Sisymbrium nasturtium 1367
Sisymbrium officinale 1390
Sisymbrium sophia 1391
Sium latifolium 1391
Sium nodiflorum 1391
Sium sisarum 1391
Skirret 1391
Skunk cabbage 316
Slippery elm bark 740
Small burnet saxifrage 1381
Small fennel-flower 1367
Small houseleek 1390
Small sea-side balsam 191
Small spikenard 115
Smalt 1391
Smart-weed 1304
Smilacin 656
Smilasperic acid 383
Smilax aspera 653
Smilax China 653
Smilax Cumanensis 653
Smilax medica 654
Smilax officinalis 653
Smilax papyracea 654
Smilax sarsaparilla 653
Smilax syphilitica 653
Smooth sumach 619
Smyrna opium 528
Smyrna scammony 661
Snakeroot, black 217, 1387
Snakeroot, button 331, 1355
Snakeroot, Canada 123
Snakeroot, seneka 668
Snakeroot, Virginia 676
Sneezewort 1339
Snow water 109
Soap 648
Soap, almond oil 650
Soap, amygdaline 650
Soap balls 650
Soap, beef's marrow 650
Soap, Castile 651
Soap cerate 926
Soap, common 648, 650
Soap, common yellow 650
Soap, grain 649
Soap liniment 1247
Soap liniment, camphorated 1067
Soap, marbled 649
Soap of guaiac 378
Soap, palm 650
Soap plaster 957
Soap, rosin 650
Soap, soft 648, 650, 651
Soap, Starkey's 650
Soap, transparent 650
Soap, Windsor 650
Soaps, insoluble 649
Soaps, soluble 649
Soapwort 1387
Socotrine aloes 69
Soda, acetate of 686
Soda, artificial 691
Soda ball 691
Soda, biborate of 689
Soda, bicarbonate of 1178
Soda, borate of 687
Soda, carbonate of 690
Soda, caustic 686
Soda, citrate of 1315
Soda, dried carbonate of 1178
Soda, dry 686
Soda, effervescing water of 1181
Soda, hydrate of 686
Soda, hypochlorite of 1183
Soda, hyposulphite of 1343
Soda, impure 690
Soda, muriate of 695
Soda, native 690
Soda of vegetable origin 690
Soda, phosphate of 1186
Soda powders 1164
Soda, preparations of 1177
Soda, sesquicarbonate of 690
Soda soap, animal oil 651
Soda soap, olive oil 651
Soda, solution of 1177
Soda, solution of chlorinated 1181
Soda, sulphate of 693
Soda, tartarized 1184
Soda, tartrate of 1397
Soda, tribasic phosphate of 1186
Soda, valerianate of 1188
Soda, vitriolated 693
Soda water 887
Soda-ash 692
Sodæ acetas 686
Sodæ aqua effervescens 1181
Sodæ bicarbonas 1178
Sodæ boras 687
Sodæ carbonas 690
Sodæ carbonas exsiccatus 1178
Sodæ carbonatis liquor 1178
Sodæ causticæ liquor 1177
Sodæ chlorinatæ liquor 1181
Sodæ citras 1315
Sodæ et argenti hyposulphis 1343
Sodæ et potassæ tartras 1184
Sodæ hyposulphis 1343
Sodæ murias 695
Sodæ murias purum 1185
Sodæ phosphas 1186
Sodæ potassio-tartras 1184
Sodæ sulphas 693
Sodæ sulphis 1394
Sodæ tartras 1397
Sodæ valerianas 1188
Soda-pyrophosphate of iron 1013
Sodii chloridum 695
Sodium 686
Sodium, chloride of 695
Sodium, nitroprusside of 1368
Sodium, sesquioxide of 686
Soft soap 648, 650, 651
Soft water 109
Solania 319
Solanum dulcamara 318
Solanum nigrum 318
Solanum tuberosum 318
Solidago 697
Solidago odora 698
Solidago virgaurea 697
Solomon's seal 1320
Soluble cream of tartar 689

Soluble iodide of starch 1348
Soluble tartar 1147
Solutio barytæ muriatis 909
Solutio solventis mineralis 903
Solution 780
Solution of acetate of ammonia 861
Solution of acetate of morphia 1088
Solution of alum, compound 855
Solution of ammonia 859
Solution of ammoniated copper 935
Solution of arsenite of potassa 905
Solution of bichloride of mercury 1030
Solution of carbonate of potassa 1139
Solution of carbonate of soda 1178
Solution of caustic soda 1177
Solution of chloride of arsenic 903
Solution of chloride of barium 909
Solution of chloride of calcium 915
Solution of chloride of potassa 1312
Solution of chloride of soda 1181
Solution of chloride of zinc 1281
Solution of chlorinated lime 916
Solution of chlorinated soda 1181
Solution of chlorine 894
Solution of citrate of ammonia 863
Solution of citrate of magnesia 1071
Solution of citrate of potassa 1143
Solution of hydriodate of arsenic and mercury 904
Solution of hydrochlorate of morphia 1091
Solution of hydrosulphate of ammonia 858
Solution of iodide of arsenic and mercury 904
Solution of iodide of iron 1005
Solution of iodide of potassium, compound 1157
Solution of iodine, compound 1064
Solution of muriate of baryta 909
Solution of muriate of lime 915
Solution of muriate of morphia 1091
Solution of nitrate of iron 1007
Solution of pernitrate of iron 1007
Solution of pernitrate of mercury 1042
Solution of potassa 1128
Solution of sesquicarbonate of ammonia 858
Solution of soda 1177
Solution of subacetate of lead 1124
Solution of subacetate of lead, diluted 1126
Solution of sulphate of morphia 1092
Solution of terchloride of antimony 865
Solution of ternitrate of iron 1007
Soot 1391
Sophora tinctoria 1300
Soporifics 3
Sorbin 631
Sorbus aucuparia 631
Sorrel 625
Sorrel-tree 1295
South American kino 432
South American saltpetre 589
Southernwood 4
Southernwood, Tartarian 1404
Spa water 111
Spanish barilla 691
Spanish broom 1392
Spanish brown 1392
Spanish flies 166
Spanish soap 651
Spartein 667
Spartium junceum 1392
Spartium scoparium 667
Spearmint 476
Spearmint water 892
Specific gravity 768
Specific gravity bottle 768
Speediman's pills 75
Speedwell 1404
Speiss 1393
Speltre 761
Spermaceti 209
Spermaceti cerate 924
Spermaceti ointment 1256
Sphacelia segetum 325
Sphærococcus crispus 216
Spiced plasters 1162
Spiced syrup of rhubarb 1210
Spice-bush 1302
Spice-wood 1302
Spider's web 1316
Spigelia 698
Spigelia anthelmia 698
Spigelia Marilandica 698
Spikenard 1367
Spikenard, American 116
Spikenard, small 115
Spindletree 1327
Spiræa 700
Spiræa lobata 1102
Spiræa tomentosa 700
Spiræa ulmaria 700, 1102
Spirit lamps 776
Spirit of ammonia 863
Spirit of ammonia, aromatic 864
Spirit of ammonia, fetid 865
Spirit of aniseed 1189
Spirit of caraway 1189
Spirit of cassia 1189
Spirit of cinnamon 1189
Spirit of ether, compound 834
Spirit of hartshorn 292
Spirit of horse-radish, compound 1189
Spirit of juniper, compound 1190
Spirit of lavender 1190
Spirit of lavender, compound 1190
Spirit of Mindererus 861
Spirit of nitre 40
Spirit of nitric ether 835
Spirit of nutmeg 1191
Spirit of pennyroyal, European 1192
Spirit of peppermint 1191
Spirit of pimento 1192
Spirit of rosemary 1192
Spirit of sea-salt 35
Spirit of spearmint 1191
Spirit of sulphuric ether 833
Spirit of turpentine 518
Spirit of wine 59
Spirit, proof 61, 854
Spirit, pyroacetic 1385
Spirit, pyroxylic 701
Spirits 1188
Spiritus 1188
Spiritus æthereus nitrosus 835
Spiritus æthereus oleosus 834
Spiritus ætheris compositus 834
Spiritus ætheris nitrici 835
Spiritus ætheris sulphurici 833
Spiritus ammoniæ 863
Spiritus ammoniæ aromaticus 864
Spiritus ammoniæ fœtidus 865
Spiritus ammoniæ succinatus 1220

Spiritus anisi 1189
Spiritus armoraciæ compositus 1189
Spiritus camphoræ 1223
Spiritus carui 1189
Spiritus cassiæ 1189
Spiritus cinnamomi 1189
Spiritus colchici ammoniatus 1229
Spiritus fortior 852
Spiritus juniperi compositus 1190
Spiritus lavandulæ 1190
Spiritus lavandulæ compositus 1190
Spiritus menthæ piperitæ 1191
Spiritus menthæ viridis 1191
Spiritus Mindereri 861
Spiritus myristicæ 1191
Spiritus nitri dulcis 835
Spiritus pimentæ 1192
Spiritus pyroxilicus 701
Spiritus pulegii 1192
Spiritus rectificatus 59
Spiritus rosmarini 1192
Spiritus tenuior 854
Spiritus vini Gallici 702
Spleenwort, black 1299
Spleenwort, common 1299
Spleenwort fern 1320
Sponge 703
Sponge, burnt 1192
Sponge tent 704
Spongia 703
Spongia officinalis 703
Spongia usta 1192
Spongy Carthagena bark 243
Spotted winter green 214
Spring water 110
Spruce beer 730
Spruce, essence of 729
Spunk 1291
Spurge, ipecacuanha 336
Spurge, large flowering 334
Spurge laurel 478
Spurred rye 325
Squill 664
Squilla maritima 664
Squirting cucumber 321
Staff-tree, climbing 1311
Stalagmitis cambogioides 359
Stanni pulvis 1193
Stannic acid 705
Stannum 704
Staphisagria 705
Star aniseed 101, 1345
Star grass 64
Starch 93
Starch, iodide of 1347
Starkey's soap 650
Star-wort 1339
Statice 706
Statice Caroliniana 706
Statice limonium 707
Stavesacre 705
Steam bath 777
Stearic acid 649
Stearin 58, 494
Stearoptene 496
Steel 346
Sterlet 403
Stibium 104
Stick lac 1352
Still and worm, common 778
Stillingia 707
Stillingia sebifera 707
Stillingia sylvatica 707
Stimulants 2
Stizolobium pruriens 484
St. John's wort 1343
St. Lucia bark 247
Stone-crop, biting 1390
Stone-pine 729
Stone-root 1320
Storax 711
Storax, purified 1024
Stoved salt 696
Strainers 773
Stramonii folia 708
Stramonii radix 708
Stramonii semen 708
Stramonium 708
Strasburg turpentine 729, 732
Strengthening plaster 950
Striated ipecacuanha 418
Strong acetic acid 16
Strong chloric ether 849
Stronger solution of ammonia 83
Stronger spirit 852
Strongest common caustic 1132
Strong-scented lettuce 442
Strychnia 490, 1193
Strychnia, muriate of 1197
Strychniæ murias 1197
Strychnos colubrina 490
Strychnos Ignatia 1301
Strychnos nux vomica 490
Sturgeon 403
Styptic, Pagliari's 145
Styracine 1356
Styrax 711
Styrax benzoin 144
Styrax officinale 711
Styrax præparata 1024
Styrax purificata 1024
Subacetate of copper 305
Subacetate of copper, prepared 933
Subacetate of lead, solution of 1124
Subcarbonate of iron 1013
Sublimate 779
Sublimation 779
Sublimatus corrosivus 1025
Sublimed sulphur 716
Subnitrate of bismuth 910
Succinate of ammonia 1392
Succinic acid 1392
Succinum 713
Succory 1314
Suet 680
Sugar 631
Sugar, barley 636
Sugar, brown 631, 637
Sugar cane 632
Sugar, Havana 633
Sugar maple 632
Sugar, Muscovado 631
Sugar of gelatin 404
Sugar of grapes 631, 742
Sugar of lead 569
Sugar of milk 638
Sugar of mushrooms 1364
Sugar, palm 632
Sugar, purified 635, 637
Sugar, uncrystallizable 631
Sugar, white 635, 637
Sugar-candy 636
Sugar-house molasses 635, 637
Sulphate of alumina 1392
Sulphate of alumina and iron 1393
Sulphate of alumina and potassa 77
Sulphate of atropia 907
Sulphate of baryta 139
Sulphate of cadmium 1393
Sulphate of cinchonia 252, 1170
Sulphate of copper 306, 935
Sulphate of ether and etherine 832
Sulphate of indigo 1346
Sulphate of iron 1014
Sulphate of iron, dried 1017
Sulphate of iron, granulated 1017
Sulphate of magnesia 458
Sulphate of manganese 1358
Sulphate of mercury 1043
Sulphate of morphia 1091
Sulphate of morphia, solution of 1092
Sulphate of nickel 1393
Sulphate of potassa 592
Sulphate of potassa with sulphur 1145
Sulphate of quinia 1167
Sulphate of quinidia 254
Sulphate of soda 693
Sulphate of zinc 1283
Sulphite of soda 1394
Sulphocyanuret of potassium 1394
Sulphoglyceric acid 1022
Sulphohydric acid 716
Sulpho-salts 716
Sulpho-sinapisin 684
Sulphovinic acid 829
Sulphur 714

Sulphur, brown viscid 716
Sulphur, crude 715
Sulphur, flowers of 715, 716
Sulphur, iodide of 1198
Sulphur lotum 714
Sulphur, milk of 1197
Sulphur, native 714
Sulphur ointment 1266
Sulphur præcipitatum 1197
Sulphur, precipitated 1197
Sulphur, preparations of 1197
Sulphur, roll 715
Sulphur sublimatum 714
Sulphur, sublimed 715, 716
Sulphur vivum 715
Sulphur, volcanic 714
Sulphur, washed 714, 717
Sulphurated oil 1299
Sulphuret of antimony 106
Sulphuret of calcium 1394
Sulphuret of iron 1018
Sulphuret of potassium 1158
Sulphuretted hydrogen 716, 1018
Sulphuretted waters 111, 112
Sulphuric acid 45
Sulphuric acid, aromatic 816
Sulphuric acid, commercial 45
Sulphuric acid, diluted 816
Sulphuric acid, pure 818
Sulphuric acid, table of the specific gravity of 49
Sulphuric ether 825
Sulphuris iodidum 1198
Sulphurous acid 716
Sumach 618
Sumach, swamp 736
Sumatra camphor 162
Sumbul 1394
Sumbulic acid 1395
Summer savory 1389
Sunflower 1362
Superphosphate of iron 1012
Supertartrate of potassa 580
Suppositories 1395
Swallowwort, white 1324
Swamp dogwood 294
Swamp hellebore 748
Swamp sassafras 460
Swamp sumach 736
Swamp-laurel 1351
Sweet almonds 90, 91
Sweet bay 460
Sweet birch 1303
Sweet briar 1302
Sweet fennel 353
Sweet fern 1320
Sweet flag 151
Sweet marjoram 546
Sweet principle of oils 1021
Sweet spirit of nitre 835
Sweet-gum 1356
Swietenia febrifuga 1395
Swietenia mahagoni 1395
Swietenia senegalensis 1396
Swift's drug mill 771
Sydenham's laudanum 1274
Sylvic acid 606
Symphytum officinale 1396
Symplocarpus fœtidus 316
Synaptase 91
Syrian herb mastich 1399
Syringia vulgaris 1396
Syrup 1202
Syrup, ginger 1216
Syrup, lemon 1207
Syrup of acetate of morphia 1208
Syrup of albuminate of iron and potassa 1292
Syrup of almonds 1204
Syrup of assafetida 1077
Syrup of blackberries 1207
Syrup of buckthorn 1209
Syrup of citric acid 1203
Syrup of cochineal 1205
Syrup of currants 1207
Syrup of fruits, preparation of 1207
Syrup of garlic 1203
Syrup of ginger 1216
Syrup of gum Arabic 1203
Syrup of hyposulphite of soda 1343
Syrup of Indian sarsaparilla 1205
Syrup of iodide of iron 1005
Syrup of iodide of iron and manganese 1359
Syrup of iodide of starch 1348
Syrup of iodide of zinc 1349
Syrup of ipecacuanha 1205
Syrup of lime 913
Syrup of marshmallow 1203
Syrup of mulberries 1207
Syrup of muriate of morphia 1208
Syrup of orange peel 1204
Syrup of orgeat 1204
Syrup of pineapples 1208
Syrup of poppies 1208
Syrup of pyrophosphate of iron 1013
Syrup of raspberries 1207
Syrup of red poppy 1210
Syrup of red roses 1210
Syrup of rhatany 1206
Syrup of rhubarb 1209
Syrup of rhubarb, aromatic 1209
Syrup of roses 1210
Syrup of saffron 1205
Syrup of sarsaparilla 1211
Syrup of sarsaparilla, compound 1211
Syrup of seneka 1214
Syrup of senna 1214
Syrup of squill 1212
Syrup of squill, compound 1212
Syrup of strawberries 1207
Syrup of tolu 1214
Syrup of vinegar 1203
Syrup of violets 1215
Syrup of wild-cherry bark 1209
Syrup, simple 1202
Syrupi 1199
Syrups 1199
Syrupus 1202
Syrupus acaciæ 1203
Syrupus aceti 1203
Syrupus acidi citrici 1203
Syrupus allii 1203
Syrupus althææ 1203
Syrupus amygdalæ 1204
Syrupus aurantii corticis 1204
Syrupus cocci 1205
Syrupus croci 1205
Syrupus ferri iodidi 1005
Syrupus hemidesmi 1205
Syrupus ipecacuanhæ 1205
Syrupus krameriæ 1206
Syrupus limonis 1207
Syrupus mori 1207
Syrupus morphiæ acetatis 1208
Syrupus morphiæ muriatis 1208
Syrupus papaveris 1208
Syrupus pruni Virginianæ 1209
Syrupus rhamni 1209
Syrupus rhei 1209
Syrupus rhei aromaticus 1209
Syrupus rhœados 1210
Syrupus rosæ 1210
Syrupus rosæ Gallicæ 1210
Syrupus sarsæ 1211
Syrupus sarsaparillæ compositus 1211
Syrupus scillæ 1212
Syrupus scillæ compositus 1212
Syrupus senegæ 1214
Syrupus sennæ 1214
Syrupus simplex 1202
Syrupus tolutanus 1214
Syrupus violæ 1215
Syrupus zingiberis 1216

T

Tabacum 717
Table of Baumé's and Cartier's hydrometer 1433
Table of Cartier's hydrometer and the centesimal alcoholmeter 1434
Table of drops 1434

Table of pharmaceutical equivalents 1421
Table of signs and abbreviations 1411
Tables of the value in sp. gr. of Baumé's hydrometer degrees 1431
Tables of weights and measures 1415
Tacamahac 1396
Tacca fecula 468
Tacca oceanica 468
Tacca pinnatifida 468
Tallow, vegetable 707
Tamarindi pulpa 1160
Tamarinds 722
Tamarindus 722
Tamarindus Indica 722
Tamarindus præparatus 1160
Tamarix Gallica 464
Tanacetic acid 724
Tanacetum 723
Tanacetum vulgare 724
Tannaspidic acid 351
Tannate of alumina 1396
Tannate of iron 1397
Tannate of lead 1397
Tannate of quinia 251
Tannic acid 819
Tannin 820
Tansy 723
Tapioca 724
Tar 565
Tar, Barbadoes 552
Tar beer 566
Tar, mineral 553
Tar ointment 1265
Tar water 566
Taraxacin 727
Taraxacum 726
Taraxacum dens-leonis 726
Tartar, 51, 580
Tartar, cream of 580
Tartar, crude 580
Tartar, crystals of 580
Tartar, emetic 867
Tartar emetic ointment 1254
Tartar, red 580
Tartar, salt of 1138
Tartar, soluble 1147
Tartar, white 580
Tartarian moss 437
Tartarian southernwood 1404
Tartaric acid 51
Tartarized antimony 867
Tartarized iron 999
Tartarized soda 1184
Tartarum vitriolatum 592
Tartrate of antimony and potassa 867
Tartrate of iron and potassa 999
Tartrate of potassa 1147
Tartrate of potassa and magnesia 1185
Tartrate of potassa and soda 1184
Tartrate of protoxide of iron 1000
Tartrate of soda 1397
Taschkent rhubarb 613
Tasteless ague drop 906
Taurin 1377
Tea 1397
Tea-berry 362
Tegeneria domestica 1316
Tegeneria medicinalis 1316
Tela araneæ 1316
Tellurite of potassa 1399
Tellurium 1399
Temperature, officinal, for different operations 789
Teneriffe wine 752
Tephrosia Apollinea 672
Tepid bath 115
Terchloride of antimony, solution of 865
Terchloride of formyle 840
Terebinthina 727, 730
Terebinthina Canadensis 727
Terebinthina Chia 728
Terebinthina Veneta 728
Terebinthina vulgaris 731
Terebinthinæ oleum 518
Teriodide of formyle 1349
Terminalia bellirica 1366
Terminalia benzoin 144
Terminalia chebula 1366
Ternitrate of iron, solution of 1007
Ternitrate of sesquioxide of iron 1007
Teroxide of antimony 866
Teroxide of bismuth 146
Terra cariosa 1386
Terra di sienna 1390
Terra foliata tartari 686
Terra Japonica 200
Terra Tripolitana 1400
Terra umbria 1401
Terræ sigillatæ 1305
Tersulphuret of antimony 106
Testa 734
Testa præparata 915
Teucrium chamædrys 1399
Teucrium marum 1399
Teucrium polium 1399
Teucrium scordium 1399
Thallochlor 211
Thea Bohea 1397
Thea Chinensis 1397
Thea stricta 1397
Thea viridis 1397
Thebaina 536
Thein 1399
Theobroma cacao 1316
Theobromin 1317
Theriaca 930
Theriaca, *Dub.* 631
Thermometers, comparative value of the degrees of 1430
Thick-leaved pennywort 1342
Thieves' vinegar 799
Thornapple 709
Thoroughwort 332
Thridace 439
Thus 563
Thus præparatum 1024
Thuja occidentalis 1400
Thuya articulata 1386
Thyme 1400
Thymus serpillum 1400
Thymus vulgaris 1400
Tiglii oleum 521
Tin 704
Tin, powder of 1193
Tincal 687
Tinctura aconiti foliorum 1219
Tinctura aconiti radicis 1219
Tinctura aloës 1220
Tinctura aloës composita 1220
Tinctura aloës et myrrhæ 1220
Tinctura ammoniæ composita 1220
Tinctura assafœtidæ 1221
Tinctura aurantii 1221
Tinctura belladonnæ 1222
Tinctura benzoini composita 1222
Tinctura buchu 1222
Tinctura calumbæ 1229
Tinctura camphoræ 1223
Tinctura camphoræ composita 1243
Tinctura cannabis Indicæ 1223
Tinctura cantharidis 1223
Tinctura capsici 1224
Tinctura cardamomi 1224
Tinctura cardamomi composita 1224
Tinctura cascarillæ 1225
Tinctura cassiæ 1225
Tinctura castorei 1225
Tinctura castorei ammoniata 1225
Tinctura catechu 1226
Tinctura chirettæ 1226
Tinctura cinchonæ 1226
Tinctura cinchonæ composita 1227
Tinctura cinchonæ ferrata 1227
Tinctura cinchonæ pallidæ 1228
Tinctura cinnamomi 1228
Tinctura cinnamomi composita 1228
Tinctura cocci cacti 1229

Tinctura colchici 1229
Tinctura colchici composita 1229
Tinctura colchici seminis 1229
Tinctura colombæ 1229
Tinctura conii 1230
Tinctura croci 1231
Tinctura cubebæ 1231
Tinctura cuspariæ 1231
Tinctura digitalis 1231
Tinctura ergotæ 1232
Tinctura ergotæ ætherea 1232
Tinctura ferri acetatis 995
Tinctura ferri ammoniochloridi 1020
Tinctura ferri chloridi 996
Tinctura ferri muriatis 996
Tinctura ferri sesquichloridi 996
Tinctura gallæ 1232
Tinctura gentianæ composita 1232
Tinctura guaiaci 1233
Tinctura guaiaci ammoniata 1233
Tinctura hellebori 1234
Tinctura humuli 1234
Tinctura hyoscyami 1234
Tinctura iodinii 1235
Tinctura iodinii composita 1236
Tinctura jalapæ 1236
Tinctura kino 1237
Tinctura krameriæ 1237
Tinctura lactucarii 1237
Tinctura lavandulæ composita 1190
Tinctura limonis 1238
Tinctura lobeliæ 1238
Tinctura lobeliæ ætherea 1238
Tinctura lupuli 1234
Tinctura lupulinæ 1238
Tinctura matico 1239
Tinctura melampodii 1234
Tinctura myrrhæ 1239
Tinctura nucis vomicæ 1239
Tinctura olei menthæ piperitæ 1240
Tinctura olei menthæ viridis 1240
Tinctura opii 1240
Tinctura opii acetata 1242
Tinctura opii ammoniata 1243
Tinctura opii camphorata 1243
Tinctura quassiæ 1244
Tinctura quassiæ composita 1244
Tinctura quinæ composita 1244
Tinctura rhei 1245
Tinctura rhei composita 1245
Tinctura rhei et aloës 1245
Tinctura rhei et gentianæ 1245
Tinctura rhei et sennæ 1246
Tinctura sanguinariæ 1246
Tinctura saponis camphorata 1246
Tinctura scillæ 1247
Tinctura seminum colchici 1229
Tinctura sennæ composita 1247, 1248
Tinctura sennæ et jalapæ 1248
Tinctura serpentariæ 1248
Tinctura stramonii 1248
Tinctura thebaica 1241
Tinctura tolutana 1249
Tinctura valerianæ 1249
Tinctura valerianæ ammoniata 1249
Tinctura zingiberis 1250
Tincturæ 1216
Tincture of acetate of iron 995
Tincture of aconite, Fleming's 1219
Tincture of aconite leaves 1219
Tincture of aconite root 1219
Tincture of aloes 1220
Tincture of aloes and myrrh 1220
Tincture of ammonia, compound 1220
Tincture of ammoniochloride of iron 1020
Tincture of Angustura bark 1231
Tincture of assafetida 1221
Tincture of belladonna 1222
Tincture of benzoin, compound 1222
Tincture of black hellebore 1234
Tincture of bloodroot 1246
Tincture of buchu 1222
Tincture of camphor 1223
Tincture of cardamom 1224
Tincture of cardamom, compound 1224
Tincture of cascarilla 1225
Tincture of cassia 1225
Tincture of castor 1225
Tincture of castor, ammoniated 1225
Tincture of catechu 1226
Tincture of Cayenne pepper 1224
Tincture of chiretta 1226
Tincture of chloride of iron 996
Tincture of chloroform 849
Tincture of cinnamon 1228
Tincture of cinnamon, compound 1228
Tincture of cloves 189
Tincture of cochineal 1229
Tincture of colchicum, compound 1229
Tincture of colchicum seed 1229
Tincture of columbo 1229
Tincture of cubebs 1231
Tincture of ergot 1232
Tincture of ergot, ethereal 1232
Tincture of foxglove 1231
Tincture of galls 1232
Tincture of gentian, compound 1232
Tincture of ginger 1250
Tincture of guaiac 1233
Tincture of guaiac, ammoniated 1233
Tincture of hemlock 1230
Tincture of henbane 1234
Tincture of hops 1234
Tincture of Indian hemp 1223
Tincture of iodine 1235
Tincture of iodine, compound 1236
Tincture of jalap 1236
Tincture of kino 1237
Tincture of lactucarium 1237
Tincture of lemon peel 1238
Tincture of litmus 437
Tincture of lobelia 1238
Tincture of lobelia, ethereal 1238
Tincture of lupulin 1238
Tincture of matico 1239
Tincture of muriate of iron 996
Tincture of myrrh 1239
Tincture of nux vomica 1239
Tincture of oil of peppermint 1240
Tincture of oil of spearmint 1240
Tincture of opium 1240
Tincture of opium, acetated 1242
Tincture of opium, ammoniated 1243
Tincture of opium, camphorated 1243
Tincture of orange peel 1221
Tincture of pale bark 1228
Tincture of Peruvian bark 1226
Tincture of Peruvian bark, compound 1227
Tincture of quassia 1244
Tincture of quassia, compound 1244
Tincture of quinia, compound 1244

Tincture of rhatany 1237
Tincture of rhubarb 1245
Tincture of rhubarb and aloes 1245
Tincture of rhubarb and gentian 1245
Tincture of rhubarb and senna 1246
Tincture of rhubarb, compound 1245
Tincture of saffron 1231
Tincture of senna and jalap 1248
Tincture of senna, compound 1247
Tincture of soap 651
Tincture of soap, camphorated 1246
Tincture of Spanish flies 1223
Tincture of squill 1247
Tincture of stramonium 1248
Tincture of tolu 1249
Tincture of valerian 1249
Tincture of valerian, ammoniated 1249
Tincture of Virginia snakeroot 1248
Tinctures 1216
Tinder 1291
Tin-foil 704
Tinnevelly senna 674
Toadflax, common 1297
Tobacco 717
Tobacco ointment 1267
Tolene 137
Tolu, balsam of 137
Toluifera balsamum 137
Tonics 2
Tonka bean 1400
Toothache-tree 116
Tormentil 734
Tormentilla 734
Tormentilla erecta 735
Tormentilla officinalis 735
Torula aceti 12
Torula cerevisiæ 60
Touch-me-not 1345
Touchwood 1291
Tous les mois 166
Toxicodendron 735
Tragacanth 737
Tragacantha 737
Tragacanthin 738
Trailing arbutus 1327
Travellers' joy 1316
Treacle 631
Tree primrose 1370
Tribasic phosphate of soda 1186
Trifolium melilotus 1400
Trigonella fœnumgræcum 1400
Trillium 1400
Trillium erectum 1400
Triosteum 739
Triosteum perfoliatum 739
Tripoli 1400
Tripoli senna 673
Trisnitrate of bismuth 910
Triticum æstivum 342
Triticum compositum 342
Triticum hybernum 341
Triticum repens 1401
Triticum vulgare 341
Trituration 771
Troches 1250
Troches of bicarbonate of soda 1253
Troches of chalk 1251
Troches of gum Arabic 1251
Troches of ipecacuanha 1252
Troches of lactucarium 1252
Troches of liquorice 1251
Troches of liquorice and opium 1251
Troches of magnesia 1252
Troches of morphia 1252
Troches of morphia and ipecacuanha 1253
Troches of peppermint 1252
Troches of tartaric acid 1251
Trochisci 1250
Trochisci acaciæ 1251
Trochisci acidi tartarici 1251
Trochisci cretæ 1251
Trochisci glycyrrhizæ 1251
Trochisci glycyrrhizæ et opii 1251
Trochisci ipecacuanhæ 1252
Trochisci lactucarii 1252
Trochisci magnesiæ 1252
Trochisci menthæ piperitæ 1252
Trochisci morphiæ 1252
Trochisci morphiæ et ipecacuanhæ 1253
Trochisci opii 1251
Trochisci sodæ bicarbonatis 1253
Trona 690
Tub camphor 160
Tulip-tree bark 450
Tunbridge water 112
Turkey gum 7
Turkey myrrh 488
Turkey opium 528
Turkey rhubarb 613
Turlington's balsam 1222
Turmeric 308
Turmeric paper 309
Turner's cerate 920
Turnsole 437
Turpentine 727
Turpentine, Bordeaux 731
Turpentine, Canada 727, 731
Turpentine, Chian 728, 732
Turpentine, common American 730
Turpentine, common European 731
Turpentine, Damara 733
Turpentine, Dombeya 733
Turpentine, Strasburg 732
Turpentine, Venice 728, 732
Turpentine, white 730
Turpentinic acid 519
Turpeth mineral 1043
Tussilago farfara 1401
Tutia 1401
Tutty 1401
Tutty ointment 1268

U

Ulmic acid 740
Ulmin 110, 740
Ulmus 739, 740
Ulmus alata 1328
Ulmus Americana 740
Ulmus campestris 740
Ulmus fulva 740
Ulmus rubra 740
Ultramarine 1401
Umber 1401
Umbrella tree 461
Uncaria gambir 200
Uncrystallizable sugar 631
Undulated ipecacuanha 418
Unguenta 1253
Unguentum æruginis 1256
Unguentum antimonii 1254
Unguentum aquæ rosæ 1254
Unguentum belladonnæ 1254
Unguentum cantharidis, *Ed.* 1255
Unguentum cantharidis, *U. S.* 1255
Unguentum ceræ albæ 1266
Unguentum cetacei, *Dub.* 924
Unguentum cetacei, *Lond.* 1256
Unguentum citrinum 1260
Unguentum cocculi 1256
Unguentum conii 1256
Unguentum creasoti 1256
Unguentum cupri subacetatis 1256
Unguentum elemi 1257
Unguentum gallæ 1257
Unguentum gallæ compositum 1257
Unguentum hydrargyri 1257
Unguentum hydrargyri ammoniati 1260
Unguentum hydrargyri iodidi 1260
Unguentum hydrargyri iodidi rubri 1260
Unguentum hydrargyri nitratis 1260
Unguentum hydrargyri nitratis mitius 1263
Unguentum hydrargyri nitrico-oxidi 1263

Unguentum hydrargyri oxidi rubri 1263
Unguentum infusi cantharidis 1255
Unguentum iodinii 1264
Unguentum iodinii compositum 1264
Unguentum mezerei 1264
Unguentum opii 1265
Unguentum oxidi hydrargyri 1263
Unguentum picis 1265
Unguentum picis liquidæ 1265
Unguentum plumbi acetatis 1265
Unguentum plumbi carbonatis 1265
Unguentum plumbi compositum 1265
Unguentum plumbi iodidi 1266
Unguentum populeum 1383
Unguentum potassii iodidi 1266
Unguentum precipitati albi 1260
Unguentum resinæ 925
Unguentum resinosum 925
Unguentum sabinæ 926
Unguentum sambuci 1266
Unguentum simplex 1266
Unguentum stramonii 1266
Unguentum sulphuris 1266
Unguentum sulphuris compositum 1267
Unguentum sulphuris iodidi 1267
Unguentum tabaci 1267
Unguentum tutiæ 1268
Unguentum veratri albi 1268
Unguentum zinci 1268
Unguentum zinci oxidi 1268
Unicorn plant, false 1339
Upland sumach 619
Urate of ammonia 1401
Urea 1402
Ursin 744
Urtica dioica 1402
Urtica urens 1402
Ustulation 784
Uva passa 741
Uva ursi 743
Uvæ passæ minores 742
Uvic acid 53

V

Vaccinium vitis Idæa 743
Valerian 744
Valeriana 744
Valeriana Celtica 1367
Valeriana dioica 746
Valeriana jatamensi 1367
Valeriana officinalis 745
Valeriana phu 746
Valeriana tuberosa 1367
Valerianate of amylic ether 1329
Valerianate of bismuth 1402
Valerianate of iron 1018
Valerianate of quinia 1176
Valerianate of soda 1188
Valerianate of zinc 1286
Valerianic acid 745
Valeric acid 745
Vallet's ferruginous pills 1116
Vanilla 1402
Vanilla aromatica 1402
Vanilla planifolia 1402
Vapour bath 114
Vareck 691
Variolaria 437
Various-leaved fleabane 330
Varvicite 462
Vateria Indica 1296, 1320
Vegetable albumen 343
Vegetable charcoal 179
Vegetable ethiops 1330
Vegetable fibrin 342
Vegetable jelly 185
Vegetable juices, preserved 1218
Vegetable sulphur 1357
Vegetable tallow 707
Vegetable wax 206
Vegeto-animal substances 342
Vegeto-mineral water 1126
Venetian red 1403
Venice sumach 1331
Venice turpentine 728, 732
Vera Cruz sarsaparilla 654
Veratria 1268
Veratric acid 628
Veratrin 1270
Veratrum album 747
Veratrum officinale 628
Veratrum sabadilla 628
Veratrum viride 748
Verbascum thapsus 1403
Verbena hastata 1403
Verbena officinalis 1403
Verbena urticifolia 1403
Verdigris 305
Verdigris, distilled 1289
Verditer 1403
Vereck 8
Verjuice 742
Vermilion 1046
Veronica beccabunga 1404
Veronica officinalis 1404
Veronica Virginica 1355
Vervain 1403
Vesicating ammoniacal ointment 85
Vesicating taffetas 923
Vesicatories 2
Viburnic acid 645
Vienna caustic 1133
Vina medicata 1272
Vincetoxicum 1324
Vinegar 12
Vinegar, distilled 794
Vinegar generator 12
Vinegar of colchicum 796
Vinegar of opium 796
Vinegar of Spanish flies 795
Vinegar of squill 798
Vinegar, radical 19
Vinegars 793
Vinous fermentation 60
Vinum album 750, 752
Vinum album Hispanicum 750
Vinum aloës 1272
Vinum antimonii 876
Vinum colchici radicis 1272
Vinum colchici seminis 1273
Vinum ergotæ 1273
Vinum ferri 1020
Vinum gentianæ 1274
Vinum ipecacuanhæ 1274
Vinum opii 1274
Vinum rhei 1275
Vinum rubrum 750, 752
Vinum tabaci 1275
Vinum veratri albi 1275
Vinum Xericum 750
Viola 756
Viola odorata 756
Viola ovata 756
Viola pedata 757
Viola tricolor 757
Violet 756
Violine 757
Virgin scammony 661, 662
Virgineic acid 668
Virginia snakeroot 676
Virgin's bower, common 1316
Virgin's bower, sweet-scented 1316
Virgin's bower, upright 1315
Viscin 1304
Viscum album 1303, 1404
Vitellus ovi 548
Viti vinifera 741
Vitriol, blue 306
Vitriol, green 348, 1014
Vitriol, white 1283
Vitriolated soda 693
Vitriolated tartar 592
Vitrum antimonii 1333
Viverra civetta 1315
Viverra zibetha 1315
Volatile alkali 81
Volatile alkali, mild 855
Volatile liniment 1065
Volatile oils 495, 1094
Volatile oils, table of drops of 1098
Vulcanized caoutchouc 1308

W

Wade's balsam 1222
Wahoo 1327
Wake-robin 122
Wall pellitory 1378
Walnut, black 426
Walnut, European 426
Walnut, white 427
Warm bath 114
Warming plaster 953
Warner's gout cordial 1246
Washed sulphur 714, 717
Water 108
Water avens 366
Water bath 777
Water, distilled 884
Water dock 625
Water eryngo 331
Water germander 1399
Water hemlock 1314
Water hemlock, American 1315
Water of ammonia 859
Water of ammonia, table of the strength of 861
Water of carbonate of ammonia 858
Water of cassia 891
Water plantain 1293
Watercress 1367
Water-dropwort, hemlock 1369
Water-hemlock, fine-leaved 1369
Water-lily, sweet-scented 1368
Water-lily, white 1369
Watermelon 1323
Water-parsnep 1391
Water-pepper 1304
Water-radish 1367
Waters 885
Waters, distilled 885
Waters, medicated 885
Wax, myrtle 207
Wax, vegetable 206
Wax, white 204
Wax, yellow 204
Waxed cloth 923
Weak fish 404
Weights and measures 767
Weights and measures, tables of 1415
Weld 1385
Well water 110
West India kino 432
Wheat, common winter 341
Wheat flour 341
Wheat starch 95
White agaric 1291
White arsenic 21
White balsam 135
White bay 460
White bismuth 910
White bryony 1306
White cohosh 1290
White elm 740
White flux 582
White fraxinella 1326
White hellebore 747
White horehound 470
White ipecacuanha 418
White lead 571
White lily 1356
White mustard seeds 683
White oxide of arsenic of commerce 21
White oxide of bismuth 910
White pepper 560
White poppy 524
White precipitate 1047
White resin 606
White saunders 1387
White sulphur water 112
White swallow-wort 1324
White tartar 580
White turpentine 730
White vitriol 1283
White walnut 427
White water-lily 1369
White wax 204
White wine 750
White wine vinegar 14
White-oak bark 602
Whiting 1404
Wild briar 620
Wild cardamom 181
Wild carrot 184
Wild chamomile 295
Wild cucumber 321
Wild ginger 124
Wild horehound 333
Wild indigo 1300
Wild ipecac 739
Wild lemon 577
Wild lettuce 438
Wild nutmeg 486
Wild pink 1390
Wild potato 285
Wild sarsaparilla 115
Wild senna 194
Wild thyme 1400
Wild-cherry bark 596
Willow 641
Willow-herb, purple 1357
Windsor soap 650
Wine 750
Wine, antimonial 876
Wine, claret 752
Wine, madeira 752
Wine measure 1415
Wine of aloes 1272
Wine of colchicum root 1272
Wine of colchicum seed 1273
Wine of ergot 1273
Wine of gentian 1274
Wine of ipecacuanha 1274
Wine of iron 1020
Wine of opium 1274
Wine of rhubarb 1275
Wine of tar 566
Wine of tobacco 1275
Wine of white hellebore 1275
Wine, port 752
Wine, sherry 752
Wine, teneriffe 752
Wine vinegar 14
Wine-whey 756
Wines, acidulous 751
Wines, astringent 751
Wines, dry 751
Wines, light 751
Wines, medicated 1272
Wines of different countries 751
Wines, red 751
Wines, rough 751
Wines, sparkling 751
Wines, spirituous 751
Wines, sweet 751
Wines, table of the strength of 754
Wines, white 751
Wintera 757
Wintera aromatica 758
Winter-berry 595
Winter-cherry, common 1381
Winter-green 213, 362
Winter-green, spotted 214
Winter's bark 757
Wistar's cough lozenges 1252
Witch-hazel 1338
Witherite 139
Woad 1350
Wolfsbane 55
Wood alcohol 701
Wood betony 1303
Wood naphtha 701
Wood spirit 701
Wood vinegar 20
Wood-sorrel 1376
Woody nightshade 318
Woorari 1404
Worm tea 700
Wormseed 212
Wormseed, European 1404
Wormwood 4
Wrightia tinctoria 1346

X

Xanthochymus ovalifolius 359
Xanthopicrite 760
Xanthorrhiza 758
Xanthorrhiza apiifolia 758
Xanthorrhiza tinctoria 758
Xanthorrhœa resins 1405
Xanthoxylin 760
Xanthoxylum 759
Xanthoxylum Americanum 759
Xanthoxylum clava Herculis 760

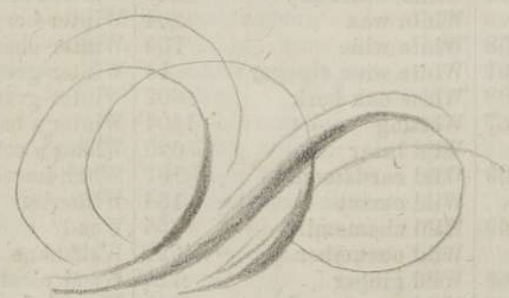
Xanthoxylum fraxineum 759
Xylobalsamum 1299

Y

Yarrow 1289
Yeast 207
Yeast cataplasm 919
Yellow bark 218, 233
Yellow Carthagena bark, common 242
Yellow gentian 363
Yellow jasmine 1332
Yellow ladies' bed-straw 1331
Yellow pine 728
Yellow resin 606
Yellow saunders 1387
Yellow sulphate of mercury 1043
Yellow wax 204
Yellow-flowered rhododendron 1385
Yellow-root 758, 1341
Yellow-rooted water dock 625

Z

Zamia integrifolia 468
Zamia lanuginosa 639
Zea mays 1405
Zedoary 1405
Zein 1405
Zerumbet 1405
Zibethum 1315
Zinc 760
Zinc, acetate of 1276
Zinc, butter of 1278
Zinc, carbonate of 1277
Zinc, chloride of 1278
Zinc colic 761
Zinc, cyanuret of 1324
Zinc, ferrocyanuret of 1328
Zinc, flowers of 1283
Zinc, impure oxide of 1401
Zinc, iodide of 1348
Zinc, oxide of 1282
Zinc, precipitated carbonate of 1277
Zinc, preparations of 1276
Zinc, silicate of 150, 760
Zinc, sulphate of 1283
Zinc, table of the preparations of 762
Zinc, valerianate of 1286
Zinci acetas 1276
Zinci carbonas 1277
Zinci carbonas præcipitatus 1277
Zinci chloridi liquor 1281
Zinci chloridum 1278
Zinci cyanuretum 1324
Zinci ferrocyanuretum 1328
Zinci iodidum 1348
Zinci oxidum 1282
Zinci sulphas 1283
Zinci valerianas 1286
Zincum 760
Zingiber 762
Zingiber cassumuniar 1405
Zingiber officinale 762
Zingiber zerumbet 1405
Zittmann's decoction 944
Zizyphus jujuba 1406
Zizyphus lotus 1406
Zizyphus vulgaris 1406



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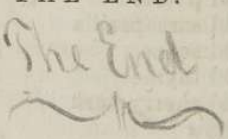

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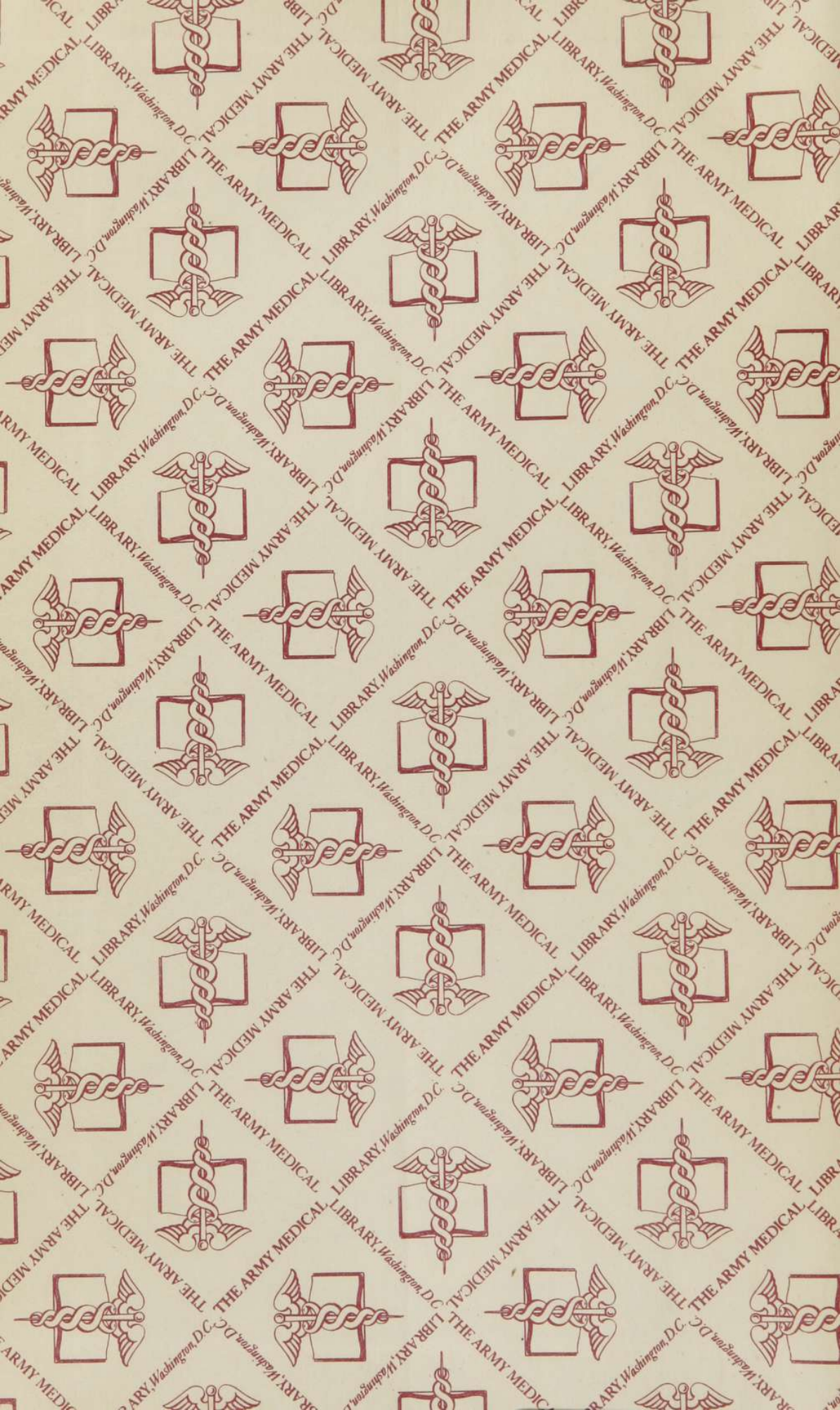
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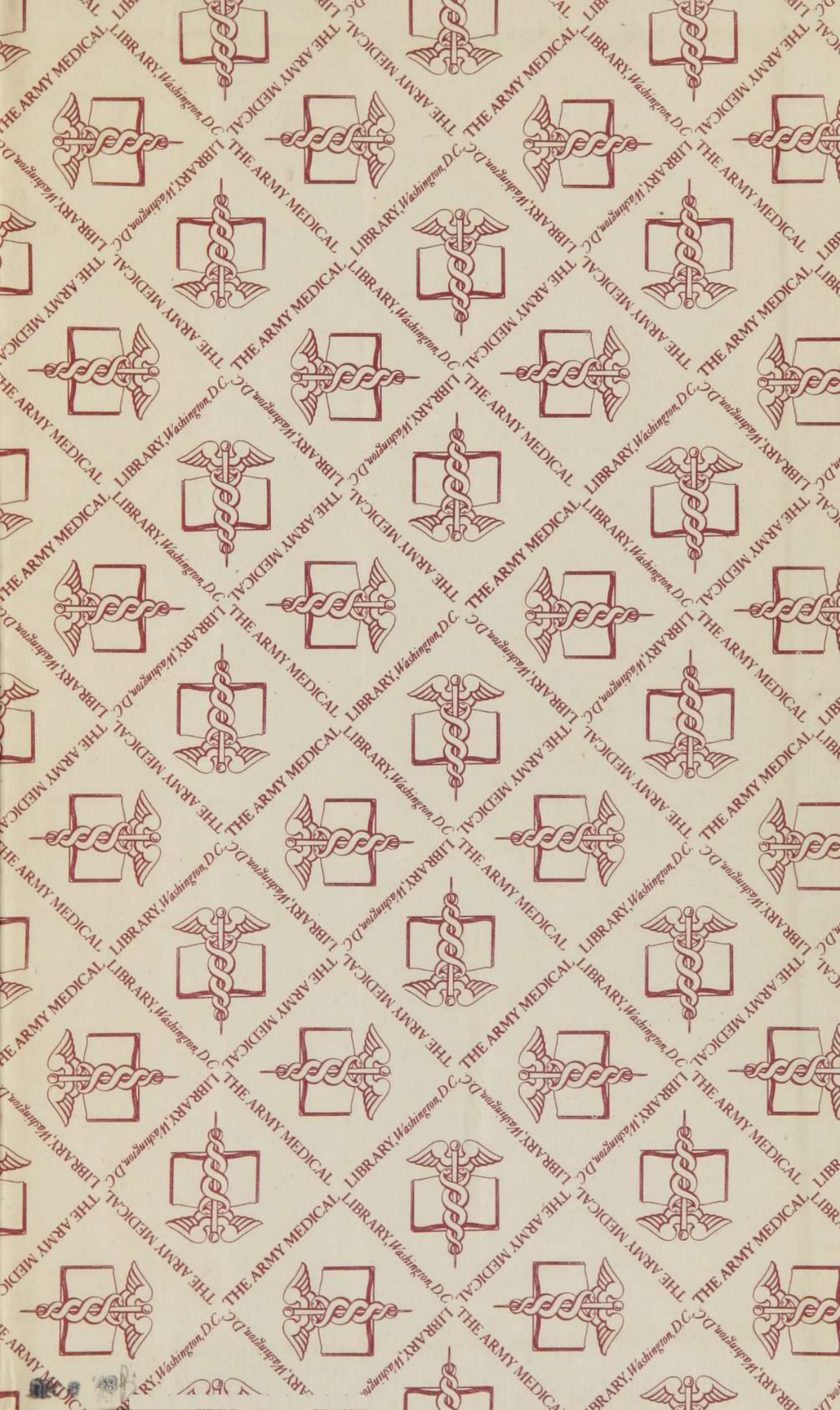
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